EDEN Research Workshop Proceedings

Towards Smart and Inclusive Learning Ecosystem

EDEN 2022 Research Workshop

hosted by

Faculty of Organization and Informatics, University of Zagreb, Croatia

19-20 September 2022

Edited by

Josep M.Duart, Elena Trepule

on the behalf of EDEN Digital Learning Europe

EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, 2022
ISSN: 2707-2819

Published by EDEN Digital learning Europe

Editors:
Josep M. Duart
Elena Trepule

Editorial co-ordination:
Gabija Kvieskaite
Carlos Madrid

EDEN DLE Secretariat
Roosikrantsi 2, 10119, Tallinn, Republic of Estonia
E-mail: secretariat@eden-europe.eu
https://eden-europe.eu/

Supported by the Erasmus+ Programme of the European Union
The publication reflects the authors' view, the EACEA and the European Commission are not responsible for any use that may be made of the information it contains.

Acknowledgement and thanks are given to the Program and Organising Committees

Programme Committee:

Denise Whitelock, EDEN DLE Vice-President of Research, UK

Josep M. Duart, EDEN DLE President, Spain

Airina Volungevičienė, Lithuania

Sandra Kučina Softić, Croatia

Helga Dorner, Hungary

Alfredo Soeiro, Portugal

Mart Laanpere, Estonia

Antonella Poce, Italy

Wim E.A. Van Petegem, Belgium

Vlad Mihăescu, Romania

Igor Balaban, Croatia

Bojan Zugec, Croatia

Goran Hajdin, Croatia

Dijana Plantak Vukovac, Croatia

Elena Trepule, Lithuania

Organising Committee:

Josep M Duart, Spain

Elena Trepule, Lithuania

Carlos Madrid, Spain

Evelina Grigule, Lithuania

Gabija Kvieskaite, Lithuania

Petra Grd, Croatia

Igor Balaban, Croatia

Ivana Fojs, Croatia

Ena Barčić, Croatia

TABLE OF CONTENTS

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

ANALYSING DIGITAL TOOLS FOR TECHNICAL UNIVERSITIES

Andrei Ternauciuc, Politehnica University of Timisoara, Romania,

Diana Andone, Politehnica University of Timisoara, Romania,

P.J. Wall, Trinity College Dublin, Ireland,

Manuel Salvador Araujo, Instituto Politecnico do Porto, Portugal,

Rosa Maria Arnaldo, Universidad Politecnica de Madrid, Spain

Abstract

The COVID-19 global pandemic proved a powerful catalyst for many changes in all aspects of society, which was faced with either adapting to the online medium in order to compensate for social distancing, or with grinding to a halt. Most of the activities which could move online did so, throwing many industries and individuals into a medium which until then was considered appropriate mainly for entertainment.

And while e-Learning as a concept has existed for some time and has been researched extensively, there are many areas of education where it is less suited to replace traditional learning paradigms. One such area is Engineering, where the hands-on characteristics of laboratory work, as well as the more traditional approach to the teaching methodologies, make the shift to online-only learning a challenge.

The purpose of this paper is to present part of the research that the ACADIGIA consortium, a multi-national association of technical higher education institutions, has performed in order to achieve its stated goal of accelerating digital readiness for adopting online tools for fully distanced, as well as blended learning scenarios. This research included an extensive analysis of the digital tools that can be used in various educational settings.

Introduction

There is little doubt that the effects of the COVID-19 global pandemic will be seen for decades to come. From long-lasting societal changes to national and international policy shifts, the far-reaching health emergency has touched almost all aspects of our daily lives.

Education is not an exception, with face-to-face learning sessions representing in most cases an unacceptable risk. Thankfully, distance learning has long past the experimental phase, and provided a solid starting point for the transition to online-only teaching and learning.

However, like everything else, e-Learning needed to adapt in order to accommodate the growing number and variety of actors involved: students, educators, academia, policy makers.

There have always been issues with the large-scale adoption of distance learning, like the lack of proper documentation and support, the need for training, or the rigors of pedagogical constraints (Mozelius & Rydell, 2017).

The COVID-19 pandemic has had a different but significant impact on higher education institutions in Europe and this impact was analysed at European Union level (EU Report, 2021) but also at different national levels. The pandemic has changed the way the education is being delivered (in terms of campus closures and the shift to online learning) and highlighted the importance of digital technologies readiness in universities.

In this study we analyse the different impact of the digital technologies' readiness in technical universities in Portugal, Romania, Spain, Ireland, Italy and Greece. This paper is based on the analysis performed in the ACADIGIA Erasmus+ project.

The **Erasmus+ project titled ACADIGIA - Accelerating aCAdemia's DIGItal readiness for online and blended Augmented teaching** is an initiative reuniting partners from 6 European countries with the objective of developing an accelerated model that allows Polytechnic Institutes and other technical HEIs to embrace the digital

transformation in education, and promote blended and distance learning. In order to achieve this objective, the project aims to transform educators from target institutions into mentors who will animate and support groups of assisted practitioners, organized in expanding peer-to-peer networks.

The training program to be developed requires a special methodology and corresponding content, containing:

Frameworks and Compendium – Compiling guidelines from the most recent and relevant frameworks about online and blended learning

Tool guides – Tutorials and guide materials for becoming proficient users of the most popular open and easily available online pedagogic tools

Capacitation Programs – A complete training kit to transform the academia staff into highly qualified mentors for digital teaching methods

Acceleration model – A detailed model to outline an accelerated implementation, accompanied by policy recommendations

This paper focuses on the methodology for choosing and analyzing the appropriate online tools previously mentioned, as well as some of the results of this analysis.

Starting from existing studies (Reimers, Schleicher, Saavedra, & Tuominen, 2020), a list of tools was compiled which included Learning Management Systems, communication and assessment tools, as well as other auxiliary applications which could be used in online learning. Contributions from the partner institutions were also added.

One of the first outputs of the ACADIGIA project was a set of National Reports that each partner compiled according to the response of the specific country to the COVID-19 initial restrictions. These reports, as well as the personal experiences of the project team members were used to filter the proposed list of tools to a final list of 12, which were assigned to the partner teams (two each).

Other factors in choosing the final tools were considered. According to the research performed, pedagogical competences for remote teaching, followed by technical competences, were the main skills identified as necessary to implement distance learning. At the same time, the teachers also highlighted the difficulty in transforming their materials from face-to-face classes into distance learning. Assessment was the most difficult issue to address in distance learning during school closures due to lack of trust in online systems. This difficulty mainly showed that teachers needed training in e-learning strategies to be able to efficiently implement online assessment strategies (Peres, Silva, & Silva, 2021).

The **12 chosen pedagogical tools** were as follows:

Microsoft Teams

Zoom

Blackboard

Moodle

Google Classroom

Skype

Cisco Webex

Microsoft Forms

Digital Whiteboard

Kahoot

Kaltura

Jupyter Notebook

Each of the partners was allocated two of these tools and received the task of creating an analysis report based on a template. The report needed to include:

Introduction

Tool evaluation & testing

Functionalities supporting blended learning

Additional tool resources

Additionally, the tools evaluation & testing sections include:

Supporting professional engagement

Supporting digital resources, supporting teaching & learning

Supporting the empowerment of learners

Facilitating learners' digital competence

Aside from the resulting report (in document form), each tool was finally complemented with a video and a presentation-style document (PowerPoint) tutorial.

Results

The resulting tool reports were adapted alongside the 6 national reports into a Compendium, which will be available on the project website (ACADIGIA Project official website, 2022).

Meanwhile, the short text tutorials, as well as the video instructions, are already available in the dedicated section on the website (ACADIGIA Results, 2022):

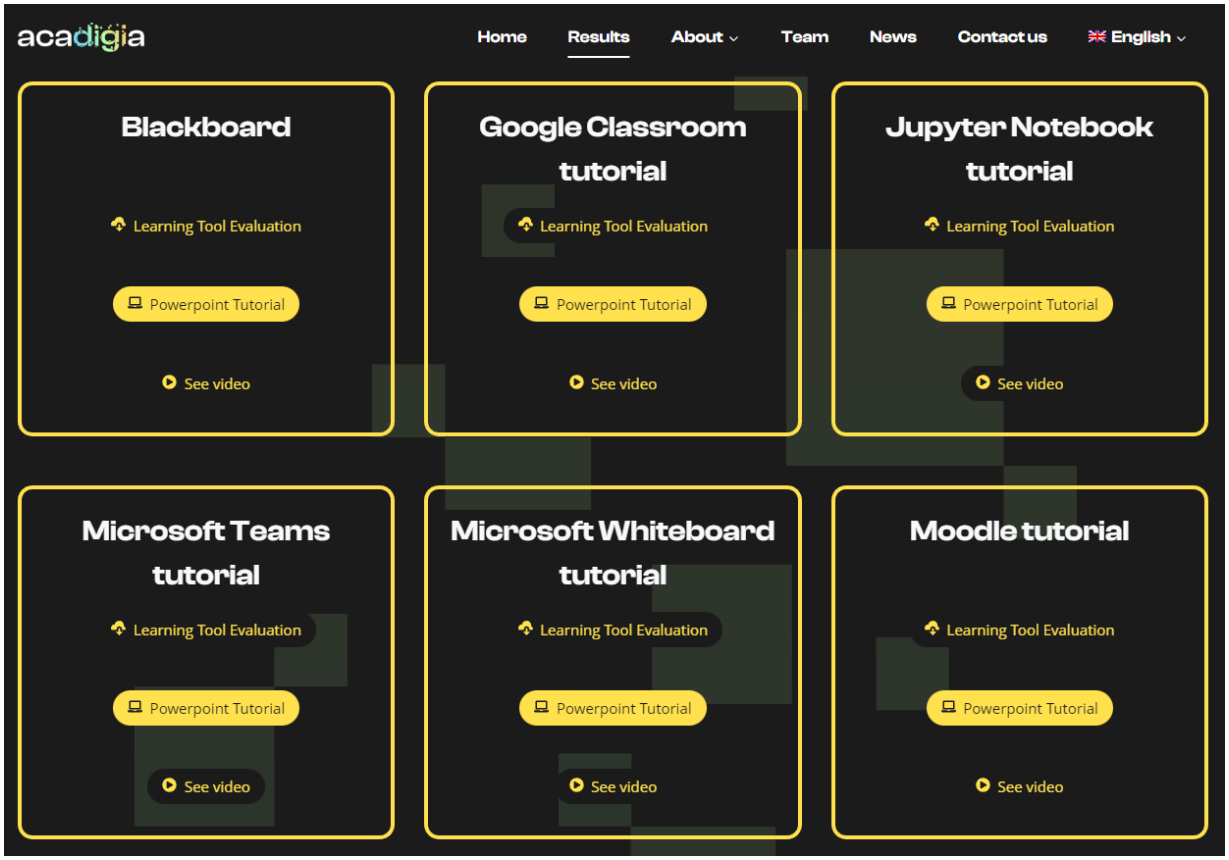

Figure 1. ACADIGIA Website - Results section

A summary of the findings of these reports is presented in **Error! Reference source not found.Error! Reference source not found.**. It compares the characteristics, strengths and weaknesses of each tool, allowing a quick decision in choosing one of the solutions presented according the individual needs of most educational scenarios.

Tool	Characteristics	Strengths	Weaknesses
Microsoft Teams	Synchronous videoconferencing, communication and collaboration platform that combines chat, video conferencing, file storage, and workplace application integration.	Rich feature set including video conferencing and file sharing. Multiple forms of chat are possible, with potential to create various different teams and breakout rooms. Full integration with Microsoft Office 365.	Some incompatibility with operating systems other than Microsoft Windows. Limits on the length of meetings and number of participants if using the free version.
Zoom	Synchronous videoconferencing, communication and collaboration platform that combines chat, video conferencing, file storage, and workplace application integration.	Rich feature set including video conferencing, waiting room, file sharing, recording of meetings, etc. Possible to create different breakout rooms.	Maximum number of participants and meeting time limits for free version.
Blackboard	Collaborative teaching and learning platform designed to provide educators, administrators, and learners with an open, robust, secure platform to create and deliver personalized learning environments.	Widespread adoption by many HEIs and educational institutions worldwide. Intuitive and easy to use interface with complex file management. Creation of quizzes, exams and other multi-media content is possible.	Paid version only with no free version available. Dedicated technology expertise within the HEI needed to set up and maintain Blackboard.
Moodle	Collaborative teaching and learning platform designed to provide educators, administrators, and learners with an open, robust, secure and free platform to create and deliver personalized learning environments	Widespread adoption by many HEIs and educational institutions worldwide. The platform is free and open source.	Dedicated technology expertise within the HEI needed to set up and maintain Moodle.
Google Classroom	Suite of classroom tools provided by Google containing tools designed to help educators manage, measure, and enrich learning experiences.	Widespread use of Google Classroom by schools and HEIs. Simple, easy, and inituitave to use the tools.	Lacking in some features compared to other platforms such as Blackboard and Moodle. Not as common in HEIs, and mainly seen as a high school platform.
Skype	Synchronous videoconferencing, communication and collaboration platform that combines chat, video conferencing, file storage, and workplace application integration.	Calls between Skype and landlines/mobile phones is possible. Skype has both free and paid versions. Allows file exchange, video calling, voice calling and chat, and various forms of group calls.	Skype lacks some of the features available in the other platforms such as Zoom and Blackboard. Seen as somewhat outdated and surpassed by Zoom and Microsoft Teams.
Webex	Synchronous videoconferencing, communication and collaboration platform that combines chat, video conferencing, file storage, and workplace application integration.	Easy to set up and use, with a paid version available. The platform has a wide variety of features available similar to other platforms.	The platform is not as widely used in HEIs and schools as other platforms. There are some potential issues with non-Webex users to connect via audio.
Microsoft forms	Microsoft Forms allows creation of a variety of forms, surveys and quizzes. It also allows the user to	Microsoft Forms is simple and intuative to use, as well as being free and widely used.	Microsoft Forms is sometimes seen as too simple and lacking in

	invite others to respond using a web browser or mobile device, see real-time results as they're submitted, use built-in analytics to evaluate responses, and export results to Excel for additional analysis or grading.	There is a huge variety of support available and a strong community of users.	functionality when compared with other platforms. Microsoft Forms is not as widely used as some other collaborative learning platforms.
Digital Whiteboard	Digital Whiteboard is a simple and intuitive interactive digital whiteboard.	The platform is free, intuitive and easy to use. The platform integrates with other pedagogic tools.	Digital Whiteboard is lacking in functionality when compared with other platforms. Not as widely used as some other collaborative learning platforms.
Kahoot	Kahoot is a game-based learning platform that makes it easy to create, share and play learning games or trivia quizzes.	Kahoot is highly creative and results in high levels of student engagement. The platform has been gaining wide use in HEIs over the past few years.	There is a learning curve for both student and teacher to learn all functions of the system and platform. Although it is gaining popularity, Kahoot is not as widely used as some other platforms.
Kaltura	A multimedia management platform integrated into Aula Global which allows the user to create, edit and manage interactive videos and incorporate them into courses.	Possible to record interactive video assignments, assessments and tutorials. The platform is gaining wider use within HEIs over the past years.	Although gaining popularity, the platform is not as widely used as some other learning platforms. Kaltura requires some technoval knowledge and steep learning curve for both student and teacher.
Jupyter Notebook	Web-based interactive development environment designed specifically for notebooks, code, and other technical data.	A modular design allows for a highly flexible interface allows users to configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning.	Jupyter is a speciality platform focusing on computer science and engineering students. As such, the platform is not widely used by HEIs and outside the computer science and engineering fields.

Table 1. Comparison of the tools analyzed

Conclusions

The purpose of the ACADIGIA Project is to accelerate digital readiness of Polytechnic HEIs towards the sustainable and effective adoption of online and blended teaching and learning approaches. In order to achieve this objective, part of the efforts were focused on analyzing a list of digital tools that educators could use in their work with students, especially in the Polytechnic Higher Education Institutions.

This paper detailed the process of creating the list of potential candidates, the criteria by which the final tools were selected, the methodology of analysis as well as a short description of the findings. The study performed provides critical information about different digital education tools and the use scenarios for technical, engineering higher education. It has become clear that a critical analysis from technological, educational perspective of any educational tools is the first and important step to be performed by any university teacher, academic administrator and this report is resource that has proved its usefulness. As it is based on the first-hand experiences of a mix of university teachers, academic managers, educational support, and technical developers the report is a diagram of the last 2 years, during COVID-19 time, and so it should be used only as indicator of fully online education as it reflects that period, but it provides clear indication and evidence for other types of education – hybrid, hyflex, or blended learning.

References

ACADIGIA Project official website. (2022, 08 15). Retrieved from https://acadigia.eu

ACADIGIA Results. (2022, 08 15). Retrieved from ACADIGIA Project Website: https://acadigia.eu/results/

European Commission, Directorate-General for Education, Youth, Sport and Culture, Farnell, T., Skledar Matijević, A., Šćukanec Schmidt, N. (2021). *The impact of COVID-19 on higher education: a review of emerging evidence : analytical report,* Publications Office. https://data.europa.eu/doi/10.2766/069216

Mozelius, P., & Rydell, C. (2017). *Problems Affecting Successful Implementation of Blended Learning in Higher Education: the Teacher Perspective*. International Journal of Information and Communication Technologies in Education, 6(1), 4-13. doi:10.1515/ijicte-2017-0001

Peres, P., Silva, C., & Silva, S. (2021). *ACADIGIA–Accelerating aCAdemia's DIGItal: potencialidades educativas do Kahoot e do MsForms*. IX Encontro de Instituições e Unidades de eLearning do Ensino Superior–eL@ IES 2021, (pp. 1-3).

Reimers, F., Schleicher, A., Saavedra, J., & Tuominen, S. (2020). *Supporting the continuation of teaching and learning during the COVID-19 Pandemic*. OECD, 1(1), 1-38.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

AN INTEGRATIVE MODEL OF INSTRUCTORS' ICT USE IN HIGHER EDUCATION IN DEVELOPING COUNTRIES

Bekalu Ferede Tefera, Centre for Instructional Psychology and Technology, KU Leuven, Belgium

Jan Elen, Centre for Instructional Psychology and Technology, KU Leuven, Belgium

Wim Van Petegem, Faculty of Engineering Technology, KU Leuven, Belgium

Adula Bekele Hunde, College of Education and Behavioural Sciences, Jimma University, Ethiopia

Katie Goeman, Teacher Training, Faculty of Business and Economics, KU Leuven, Campus Brussels, Centre for Instructional Psychology and Technology, KU Leuven, Belgium

Abstract

Scholars have exerted efforts to develop models that inform the use of technology in higher education. However, the models largely disregard the context of developing countries. In this paper, a model that is responsive to contexts of higher education in developing countries is presented. The model is developed by integrating the findings of a mixed-method study in Ethiopia and a further review of the literature. It consists of determinants in six categories, namely: institution, instructor, student, technology, culture and academic discipline. It is suggested that future researchers might be focused on testing the proposed model.

Keywords: Integrative model, developing countries, instructors, ICT use, higher education

Background

ICT is known to transform higher education (HE) by promoting innovative teaching methods (Albayrak & Yildirim, 2015). However, it is yet to be an integral part of HE teaching (Gamage, 2018) and hence the search for factors that influence successful ICT integration remains to be an important area for scientific investigations. Though scholars have dedicated their research to developing models and theories that inform the use of technology, the models largely disregard the context of developing countries. Hence, researchers need to consider developing models that suit the local contexts of countries. Between 2018 and 2022, a mixed-method study was conducted to develop an ICT use model tailored to the context of HE in developing countries (see. Ferede, Elen, Van Petegem, Hunde & Goeman, 2021; Ferede et al., 2022). The study ultimately showed that only instructors' ICT competence and attitude are direct significant predictors of their ICT use. Since the two determinants together explain only 35% variation in instructors' ICT use, the need for further investigation of a holistic (with additional variables) and at the same time powerful model of instructors' ICT use is crystal clear. In this paper, therefore, an integrative model of instructors' ICT use is proposed.

Constituent categories and distinct factors of the integrative model

The integrative instructors' ICT use model consists of both empirical and conceptual components. The empirical part consists of determinants that are supported by the two prior studies that involved qualitative (focus groups) and quantitative (survey) studies consecutively. It encompasses factors in four categories namely, institutional characteristics, instructors' characteristics, students' characteristics and academic discipline. Determinants in the institutional and instructors' categories resulted from the structural equation model analysis whereas students' characteristics and academic discipline are supported by the qualitative study. The conceptual part of the model consists of variables in three categories namely; instructors' characteristics (pedagogical beliefs), technological attributes and culture and language (Figure Error! **No text of specified style in document.**:2).

Institutional characteristics

At a university level, four variables are hypothesised as determinants of instructors' ICT use (see Figure 1). These determinants are selected based on evidence from prior qualitative (Ferede et al., 2021) and quantitative (Ferede et al., 2022) studies. The determinants are;

ICT vision and plan: Refers to what a university aspires to realise using ICT use. ICT vision and plan have a direct influence on infrastructure, support and professional development.
ICT support: Encompasses both technical and management support necessary for ICT integration. Support has a direct influence on infrastructure and professional development.
ICT infrastructure: Relates to physical resources (e.g., computer and internet) needed for ICT use.
Professional development: Refers to capacity-building interventions organised by universities and instructors' self-training. Professional development has a direct and indirect influence on attitude and ICT use respectively.

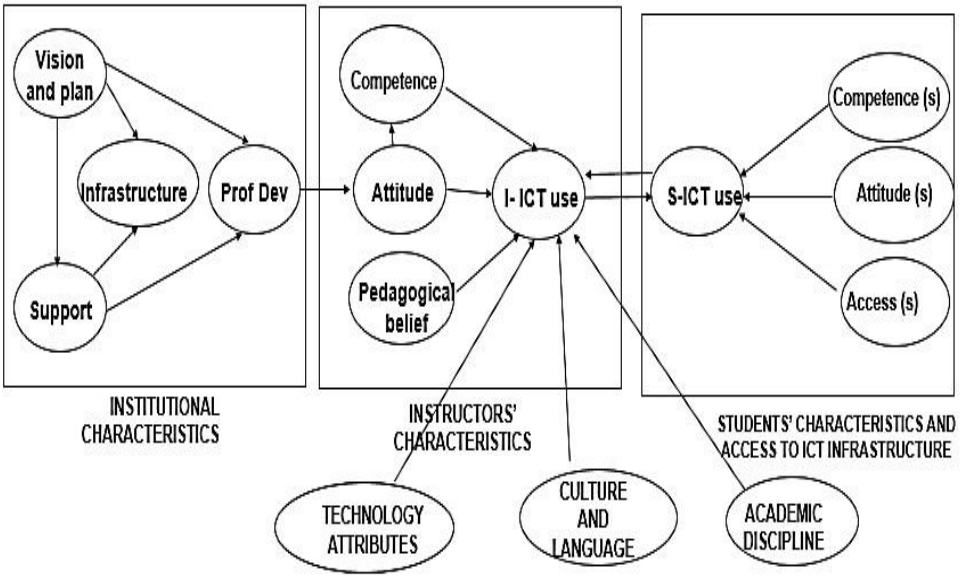

Figure **Error! No text of specified style in document.**:2 An integrative model of instructors' ICT use

Instructors' characteristics

Instructors' characteristics encompass ICT competence, ICT attitude and pedagogical beliefs. In the quantitative analysis, ICT competence and attitude were found to be significant predictors of instructors' ICT use (Ferede et al., 2022). Pedagogical belief is proposed in the integrative model as an additional determinant as studies indicate that it is a significant predictor of instructors' ICT use (e.g., Knezek & Christensen, 2015).

ICT competence encompasses both technical ICT competence and skill needed to integrate ICT into teaching. ICT competence has a direct influence on ICT use.
ICT attitude refers to the *i*nclination of instructors toward ICT and its use. ICT attitude has a direct influence on ICT competence and attitude.
Pedagogical beliefs refer to the degree to which learning technologies are aligned to instructors' understanding, premises, or propositions about teaching and learning (Ertmer, 2005). Teachers' pedagogical belief has a direct influence on their ICT use (Knezek & Christensen, 2015). Despite its relevance, there is a dearth of scientific evidence regarding the influence of pedagogical beliefs on instructors' ICT use in the context of developing countries like Ethiopia.

Students' characteristics and access to ICT infrastructure

Students' characteristics encompass ICT competence, ICT attitude, and access to ICT infrastructures. Instructors only use ICT meaningfully when their students can use ICT and students' ICT use may in turn be determined by the extent to which they have access to ICT infrastructure and possess the required ICT competence and attitude.

Students' ICT competence encompasses knowledge and skills of ICT. students' ICT competence significantly influences their ICT use (e.g., Gasaymeh, 2018). In our qualitative study, students in Ethiopian HE are reported to have limited ICT competence (Ferede et al., 2021).
Students' ICT attitude refers to their predisposition to respond favourably or unfavourably to ICT use in learning (Ajzen, 1991). Users' (students') attitude towards ICT influences their level of ICT adoption (Bullock, 2004). In developing countries, students' negative attitude is reported to be one of the critical barriers to ICT use in HE even during COVID 19 crisis (e.g., Olum et al., 2020).
Students' access to ICT infrastructure refers to the extent to which the internet, computers and various applications are easy for students to access. In developing countries, students rarely have access to ICT facilities (see e.g., Ferede et al., 2021) with a negative consequence on their ICT use. Instructors' ICT use is directly influenced by students' ICT use which in turn is influenced by students' competence, attitude and access to infrastructure.

Technological attributes

Perceived technological attributes relate to the qualities of technology that determine its use as perceived by instructors. Individuals or a social unit will adopt an innovation if they perceive it to have particular attributes namely, relative advantage, compatibility, complexity, trialability and observability (see Rogers, 2003). If instructors perceive ICT as compatible, simple, relatively advantageous, trialable and its result is demonstrable, they quickly and frequently adopt it. The five perceived technological attributes determine up to 87% of the variations in technology adoption (Ibrahim et al., 2015). The concept of compatibility substantially relates to two other determinants (pedagogical beliefs and culture) in the integrative model and hence is excluded from attributes of technology in the integrative model.

Culture and language

Culture is defined as ''the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede, 1997, p. 21). Hofstede's definition of culture stresses that culture is shared values, norms and understanding within the society that shape members' behavior (Johns, Murphy Smith, & Strand, 2003). According to Hofstede, culture has six dimensions: Power Distance, Individualism/Collectivism, Uncertainty Avoidance, Masculinity/Femininity, Long versus Short-term orientation, and Indulgence versus Restraint (see Hofstede, 1997). However, Long versus Short term orientation and Indulgence versus Restraint dimensions are usually excluded from the framework as Hofstede does not provide sufficient theoretical and empirical claims regarding the influence of the two dimensions on education (Alnosiaan, 2018). Thus, in the integrative model, only the first four dimensions of national culture (power distance, individualism vs. collectivism, uncertainty avoidance and masculinity vs. femininity) are recommended to be considered in the analysis of the influence of culture on instructors' ICT use. Generally, ICT use is high in culture with low power distance (Al-Hujran & Al-dalahmeh, 2011), individualistic (Sánchez-Franco, Martínez-López & Martín-Velicia, 2009), low uncertainty avoidance (Leidner & Kayworth,2006) and femininity (Osman & Köhler, 2013). Ethiopian national culture is characterized by a high power distance, collectivism, masculinity and high avoidance of uncertainty (Yewondwosen, 2020). In such a context, there is less space to integrate ICT (see e.g., Aoki, 2010). However, the impact of culture on instructors' ICT use is not examined in developing countries such as Ethiopia.

Language *refers to* proficiency in the English language, which is a *de facto* language of technology (Grazzi & Vergara, 2012). This dominance of the English language in ICT means that ICT favors only the English language speakers. In Ethiopia, the use of foreign languages (e.g. English) is limited to schools, NGOs, and rarely in federal offices. In countries where the English language is not well understood (except for those who can adapt technology to their own local language), the use of ICT is very limited (Ali, 2011) and Ethiopia is not an exception to this.

Students and instructors in Ethiopian HE have a deficiency in their English language proficiency (Birbirso, 2014) that may hamper their ICT use.

Academic discipline

Academic discipline refers to a specific area of study, a branch of knowledge recognised by a certain distinctness it reveals in its content and methodology (Yadav & Lakshmi, 1995). Some academic disciplines such as SEM are perceived to be more suitable for ICT use than social sciences (Zubković et al., 2017). In our qualitative study mentioned above, the instructors perceive ICT uptake to vary across various academic disciplines because of their characteristics (see Ferede, Elen, Van Petegem, Hunde, & Goeman, 2021). While the finding of the above study indicates the potential of academic discipline in influencing instructors' ICT use, such studies need to be conducted on a large scale and supported with quantitative analysis in order to arrive at more conclusive findings.

Limitations of the model

The proposed integrative model has limitations in that all variables included in the empirical component except for ICT attitude were measured using a self-report questionnaire which means that they are prone to response and social desirability (Demetriou & Uzun, 2014) and common method (Karahanna & Agarwal, 2000) biases. Another limitation is that not every relationship (e.g. the bidirectional relationship between students and instructors' ICT use) hypothesized in the conceptual part of the proposed model is equally supported by empirical evidence.

Conclusion and direction for future studies

In this paper, an integrative model of instructors' ICT use that consists of determinants categorised under institution, instructors, students, technological attributes, culture and language, and academic discipline is proposed. In this model, a new perspective of ICT use determinants (e.g., the linkage between instructors' and students' ICT use is rarely discussed in the literature) is brought to the model in view of a holistic model with generic viability. The current integrative model can be taken as a good starting point to arrive at a model that is tailored to the context of HE in developing countries. The proposed integrative model is yet to be tested empirically in its totality. Researchers are, therefore, encouraged to test the proposed model based on representative samples. Finally, to address the limitations of self-reported data, future studies need to consider the use of actual data or multiple data collection methods such as observation and time-use diaries to triangulate with self-reported data.

References

Periodicals

Ajzen, I. (1991). The Theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.

Al-Hujran, O., & Al-dalahmeh, M. (2011). The role of national culture on citizen adoption of eGovernment web sites. *Proceedings of the European Conference on E-Government, ECEG*, *9*(2), 17–26.

Albayrak, D., & Yildirim, Z. (2015). Using social networking sites for teaching and learning : Students ' involvement in and acceptance of Facebook as acourse management system. *Journal of Educational Computing Research*, *52*(2), 155–179. https://doi.org/10.1177/0735633115571299

Ali, A. H. (2011). The power of social media in developing nations : New tools for closing the global digital divide and beyond. *Harvard Human Rights Journal*, *24*, 120–133.

Alnosiaan, A. S. A. (2018). *Socio-cultural factors influencing the use of ICT in intermediate schools in Saudi Arabia* [Unpublished doctoral dissertation], University of Exter

Aoki, K. (2010). The use of ICT and e-learning in higher education in Japan. *World Academy of Science, Engineering and Technology*, *66*(6), 868–872.

Birbirso, D. T. (2014). Crises in EFL proficiency and teacher development in the context of international donation and transformation discourses. *Australian Journal of Teacher Education*, *39*(2).

Bullock, D. (2004). Moving from theory to practice: An examination of the factors Tthat preservice teachers encounter as the attempt to gain experience teaching with technology during field placement experiencese. *Journal of Technology and Teacher Education*, *12*(2), 211–237.

Demetriou, C., & Uzun, B. (2014). Self - report Questionnaires. In *The encyclopedia of clinical psychology* (pp. 1–6). https://doi.org/10.1002/9781118625392.wbecp507

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology System*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, *53*(4), 25–39.

Ferede, B., Elen, J., Petegem, W. van, Hunde, A. B., & Goeman, K. (2022). A structural equation model for determinants of instructors' educational ICT use in higher education in developing countries: Evidence from Ethiopia. *Computers and Education*, *188*(January), 104566. https://doi.org/10.1016/j.compedu.2022.104566

Ferede, B., Elen, J., Van Petegem, W., Hunde, A. B., & Goeman, K. (2021). Determinants of instructors' educational ICT use in Ethiopian higher education. *Education and Information Technologies*, (0123456789). https://doi.org/10.1007/s10639-021-10606-z

Gamage, S. N. (2018). Factors Aaffecting Tteachers' Uuse of ICTs in the Classroom: A systematic review of the literature. *Information Technologies & International Development, 14*, 105–115.

Gasaymeh, A. M. (2018). A study of undergraduate students' use of Information and Communication Technology (ICT) and the factors affecting their use: A developing country perspective. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(5), 1731–1746. https://doi.org/10.29333/EJMSTE/85118

Grazzi, M., & Vergara, S. (2012). ICT in developing countries: Are language barriers relevant? Evidence from Paraguay. *Information Economics and Policy*, *24*(2), 161–171. https://doi.org/10.1016/j.infoecopol.2011.11.001

Ibrahim, A. M., Gbaje, E., & Monsurat, M. F. (2015). Perceived attributes of diffusion of innovation theory as a theoretical framework for understanding the non-use of digital library services. *Information and Knowledge Management*, *5*(9).

Johns, S. K., Murphy Smith, L., & Strand, C. A. (2003). How culture affects the use of information technology. *Accounting Forum*, *27*(1), 84–109. https://doi.org/10.1111/1467-6303.00097

Karahanna, Ritu Agarwal, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about Information Technology Usage. *MIS Quarterly*, *24*(4), 665–694.

Knezek, G., & Christensen, R. (2015). The will, skill, tool model of technology integration: Adding pedagogy as a new model. *Journal of Computing in Higher Education*, 84–91.

Leidner, D. E., & Kayworth, T. (2006). A review of culture in information systems research: Toward a theory of information technology culture conflict. *MIS Quarterly*, *30*(2), 357–399.

Olum, R., Atulinda, L., Kigozi, E., Nassozi, D. R., Mulekwa, A., Bongomin, F., & Kiguli, S. (2020). Medical education and e-Learning during COVID-19 pandemic: Awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda. *Journal of Medical Education and Curricular Development*, *7*, 238212052097321. https://doi.org/10.1177/2382120520973212

Osman, N., & Köhler, T. (2013). Does community matter? Social and cultural influences on acceptance and use of collaborative educational technologies. *Online Communities: Enterprise Networks, Open Education and Global Communication - 16. Workshop GeNeMe 2013*.

Sánchez-Franco, M. J., Martínez-López, F. J., & Martín-Velicia, F. A. (2009). Exploring the impact of individualism and uncertainty avoidance in Web-based electronic learning: An empirical analysis in European higher education. *Computers and Education*, *52*(3), 588–598. https://doi.org/10.1016/j.compedu.2008.11.006

Yadav, M. S., & Lakshmi, T. K. S. (1995). Education: its disciplinary identity. *Journal of Indian Education, 21*, 1–21.

Yewondwosen, E. (2020). *The Role of National Culture on International Development Projects Performance : Evidence from GIZ and JICA Projects in Ethiopia [Master's thesis]*. Addis Ababa University.

Zubković, B. R., Pahljina-Reinić, R., & Kolić-Vehovec, S. (2017). Predictors of ICT use in teaching in different educational

domains. *European Journal of Social Sciences Education and Research*, *11*(2), 145. https://doi.org/10.26417/ejser.v11i2.p145-154.

Books

Hofstede, G. (1997). *Cultures and Organizations: Software of the Mind*. McGraw-Hill,.

Hofstede, G., Hofstede, G. J., & Michael Minkov. (2010). *Cultures and Organizations (intercultural communication and its importance for survival): Software of the mind* (3rd ed.). New York: Mc Graw Hill.

Rogers, E. (2003). *Diffusion of innovations* (5th ed). Free Press.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

MEANINGFUL DIGITAL TRANSFORMATION: THE ROLE OF DIGITAL MATURITY AND EDUCATIONAL LEADERSHIP IN SUPPORTING TRANSFORMATIVE, INCLUSIVE, VISIONARY, EFFECTIVE AND ACCOUNTABLE EDUCATION

Dragana Kupres, Universitat Oberta de Catalunya, Spain

Nati Cabrera Lanzo, Universitat Oberta de Catalunya, Spain

Albert Sangra Morer, Universitat Oberta de Catalunya, Spain

Abstract

In this paper, we describe the theoretical framework of educational leadership for meaningful digital transformation of schools, supported by digital maturity improvement and reflection framework. We propose a transformative, inclusive, visionary, effective and accountable perspective on education. We argue that the same perspective should be taken when thinking about digital transformation and the purpose of using digital technology in education. We define digital maturity as an institutional improvement and reflection framework serving the proposed vision of education. We describe our understanding of educational leadership needed to support both the transformative and inclusive perspective on education as well as the digital maturation of schools. We claim that two leadership approaches should be combined to influence the meaningful digital transformation: transformational leadership and distributed leadership. We conclude with the need for further research in understanding digital maturity and the role educational leadership plays in digital maturation of schools.

Keywords:

Educational leadership, school leadership, digital maturity, digital transformation.

Introduction

This theoretical article can be characterized as a theory synthesis and a theory adaptation (Jakkola, 2020). It synthesises two major theories of educational leadership, transformational and distributed leadership, and it adapts those theories to the context of technology integration in education, relating them to the concept of digital maturity, an organisational improvement and reflective framework designed to guide meaningful digital transformation (Marshal, 2010, 2012; Teichert, 2019; Volungevičienė et al., 2021). This article will propose three claims about how to conceptualize school leadership for meaningful digital transformation and support the claims with argumentations based on literature review, while answering three main research questions.

In the first section, based on literature review and in the context of this paper, we claim that education is a transformative, inclusive, visionary, effective and accountable process of cognitive and social development of a person and her community, aware of the wider global, environmental and digital changes (Anderson and Boyle, 2020; Daniels et al., 2019; Freire, 1970; Peters and Jandrić, 2017; Townsend, 2011; Underwood and Dillon, 2004).

In the second section, we claim that digital transformation should serve this vision of education, and not take its separate course. Digital technology should support cognitive and social development of individuals and community in transformative, inclusive, effective and accountable ways. We propose to use digital maturity as an organisational improvement and reflective framework designed to guide this kind of meaningful digital transformation (Marshal, 2010, 2012; Teichert, 2019; Volungevičienė et al., 2021).

In the third section, we claim that two leadership approaches should be combined to influence the described meaningful digital transformation: transformational leadership and distributed leadership.

This paper is set to answer the following research question

1. What is the role of education when considering global, environmental and digital transformations our societies are experiencing and how can education be part of them? (addressed in section 1)
2. What kind of meaningful digital transformation can support educational processes to become more transformative, inclusive, visionary, effective and accountable and in the same time support a cognitive and social development of a person and of her community? (addressed in section 2)
3. What kind of leadership schools need for continuous organisational improvements towards meaningful digital transformation, having in mind the transformative, inclusive, visionary, effective and accountable characteristics of education and related digital maturity? (addressed in section 3)

Role of education in global, environmental and digital transformations

The following section discusses the role of education in the present global, environmental and digital turmoils we all are experiencing as global citizens.

Individual growth and transformation are deeply interrelated with social growth and social transformation, and both should be considered as the goals of education (Anderson and Boyle, 2020; Brosio, 2006; Dewey, 1915/2016; Freire, 1970). In this sense, the aim of education is to support the development of both cognitive and social abilities of learners (Underwood and Dillon, 2004:213). This is reflected in what Anderson and Boyle understand as 'good' education, "the growth and development of the whole person" (Anderson and Boyle, 2020: page 16). Individual growth is inextricably related to social growth, reflected primarily in the community in which we live. Education provides "opportunity to become contributing and content members of a healthy society". (Anderson and Boyle, 2020: page 16). Critical educational theory understood education as an altruistic and caring path to social and individual transformation, to democratic empowerment, socioeconomic justice, respect for diversity (Brosio, 2006). Dewey understood education as a vital force in forming democracy and civil society (Dewey, 1915/2016). Using the words of George Bernard Shaw, education is the process of "continual becoming" (St. John, 1931) in cognitive and social sphere. Learner is an active and dynamic participant in her education, a creator of her own future self. This thinking is in line with Freire's liberating potential of a person (Freire, 1970). The knowledge is the person who knows - in terms of Aristotle's "Knowledge [epistēmē], in its being-at-work, is the same as the thing it knows" (Aristoteles, 2001).

The role of education is changing and is influenced by the global, environmental and digital turn (Peters and Jandrić, 2017) of our societies. These shifts are not just negative or just positive but are complex and interrelated. Education is a living organism influenced by its environment, co-created by it and forms part of the wider "ecological system" (Harrison et al., 2014). Education has shifted towards a global market approach, including answering the accountability demands (among others Daniels, 2019; Gumus, 2018; Townsend, 2011). Education is a crucial part of sustainability, and both sustainable thinking and long-term visions should form part of changing the education to respond to the needs of environmental and societal transformations (Michelsen and Fischer, 2017). The digital shift in education is pushed more mainstream after pandemic of covid-19, sometimes with vested interest of commercial solutions in education (Teräs et al., 2020).

We cannot expect education to remain intact when the world is in flux. Education needs to change together with society and respond to the global, environmental and digital challenges we are all facing. In this response education should not be replaced by commodified, global enterprise, but needs to be:

- *liberative and transformative*, with strong mission to prepare students to be critical thinkers, global thinkers, active citizens (Anderson and Boyle, 2020; Freire, 1970; Townsend, 2011; Underwood and Dillon, 2004)
- *inclusive* of to the social needs of all citizens, both elites and marginalised groups, co-creating present and future democratic societies (Anderson and Boyle, 2020; Freire, 1970)
- *visionary*, aware of the challenges of the future job markets, climate change and social impact of digital technologies (Peters and Jandrić, 2017)
- *effective*, striving to achieve the educational outcomes (the school intends to achieve) (Daniels et al., 2019)

- *accountable* to the public that provides finances, by using public resources responsibly to provide the best quality service back to the citizens (Townsend, 2011).

Based on the presented arguments we claim that education should be understood as a transformative, inclusive, visionary, effective and accountable process of cognitive and social development of a person, which contributes to both the achievement of the full potential of a person and of her community (Anderson and Boyle, 2020, Brosio, 2006, Dewey, 1915/2016, Freire; Underwood and Dillon, 2004). This process should be accountable to the public it serves, public resources it uses, and mindful of the wider global, environmental and digital transformations (Peters and Jandrić, 2017).

Digital maturity as transformative, inclusive, visionary, effective and accountable framework and a reflective tool for digital transformation of education

This second section reflects on the nature of digital transformation needed to support the transformative, inclusive, visionary, effective and accountable vision of education.

We acknowledge that digital turn (Peters and Jandrić, 2017) in education is becoming increasingly important with government-led national initiatives trying to use technology as a lever supporting various educational reforms (Hakansson Lindquist et al., 2019; Kampylis et all, 2016; Toh and So, 2011). However, there is a need for a "radical change" of how technology is exploited in teaching and learning (European Schoolnet, University of Liege, 2013), taking an approach that is "both gradually accepting and sceptical" (OECD, 2015).

We also acknowledge that the digital shift in education is pushed more mainstream after pandemic of covid-19. Closing educational institutions down during pandemic years in many ways transferred the responsibility for education to families of various social and educational backgrounds. This exposed latent social and educational inequalities and reinforced them even further, and brought about "economic, social, cultural, emotional and digital divides" (Tarabini, 2021:6). If not considered carefully, digital technology can be easily used to perpetuate and reinforce the same inequalities and can contribute to what Tarabini calls the crisis of meaning of the schools in the sense of "crisis of the very process of socialisation and cultural transmission" (Tarabini, 2021:10).

Therefore, to follow in the same path as education we want to witness, we claim that digital transformation should take the system-wide ecological perspective (Harrison et al., 2014) and also be transformative, inclusive, visionary, effective and accountable process, mindful of the social changes, having in mind the cognitive and social development education is aimed to achieve. This is especially relevant to school education, if the purpose of schools in the 21st century is still, if not even more, to ensure socialising and teaching of children and young people (Tarabini, 2021).

Digital maturity is a concept capable of having a holistic view on technology in education because it brings the "social aspects of technology acceptance" (Harrison et al., 2014: p. 1). Digital maturity supports and reflects upon digital transformation of educational institutions across a range of organisational, infrastructural, teaching and learning, competency and cultural issues. It is a "valuable proxy for indicating the extent of technology adoption across the whole eco-system of a school." (Harrison et al., 2014: page 346). It can and indeed should reflect and warn about unequal and insufficient resources schools have in using digital technologies for meaningful instructional and learning activities, both in terms of infrastructure and competencies, but also leadership capacities, to name only the most relevant for the topic of this article.

Digital maturity models serve as a roadmap, a guideline, support for institutional planning, organisational change and benchmarking, support continuous improvement and open space for reflection and understanding of the wider, system context (Marshal, 2010, 2012; Volungevičienė et al., 2021). Digital maturity models connect the complex variables and provide complex narratives of interventions over specific duration, by capturing complexity of evidencing the effects of ICT in educational settings including activities, processes, technologies and skills (Sanchez-Puchol et al., 2018; Underwood et al., 2004, 2010). It has been seen as a potent opportunity for a long-term assessment of digital transformation of institutions as well as large-scale national technology investments, seeking the evidence of the benefits of technological investments across educational systems. See for example

Framework for Digitally Mature Schools in Croatia (Balaban et al., 2018) or Framework for Digitally Competent Organisations (Kampylis et al., 2016).

Educational leadership for meaningful digital transformation and digital maturity of schools

The last section proposes the kind of leadership schools need for making meaningful digital transformation and for growing towards digitally mature organisations.

We start from a classical definition of leadership as "the process of influencing the activities of an organised group in its efforts toward goal setting and goal achievement" (Stogdill, 1950). We acknowledge that the very general meaning of leadership is the process of influence. If the goal we seek is digital transformation that support the school's vision of education, than what kind of leadership schools should practice?

We argue that (1) the distribution of leadership authority (Dexter, 2018; Gumus et al, 2016; Leithwood et al., 2008; Voogt et al., 2018) is one of the major prerequisites for the influence towards meaningful digital transformation to happen in schools, motivated by (2) a transformational vision for self-actualisation and achievement (Daniëls et al, 2019; Leithwood and Jantzi, 2005) of the individuals, schools, community and the wider system. This claim is supported by Joke Voogt and a group of authors in stating that distributed leadership perspective, together with transformative and instructional leadership actions, are framing main functions of leading technology innovations: developing vision, supporting integration, ensuring the accountability of technology initiatives (Voogt et al., 2018). Distributed and transformational leadership perspectives support the vision of education (described in the first section) in a number of ways:

- To be able to support the variety of paths in which any person and/or community could develop, the leadership influence should be inclusive and participatory. When leadership influence and power are distributed to several individuals, groups and teams without formal leadership positions (usually teachers) individual capacities are enhanced through social interactions. In this distribution the meaning, knowledge and leadership practice are socially constructed and are co-performed (Dexter, 2018; Harris, 2009).
- To be able to transform, this influence should be able to guide and motivate all to strive for individual, school and system improvements. The main role of transformational leaders is to motivate followers to open to self-actualisation and lead to a vision for the school (Leithwood and Jantzi, 2005; Bush and Glover 2003).
- To be able to be effective, this influence should have a strong vision on teaching and learning and students' engagement and achievements in the core of these processes, and distributed leadership has positive effects on teacher effectiveness, student outcomes and student engagement (Harris, 2009; Leithwood et al., 2008).
- To be able to be accountable, this influence should have strong responsibility towards the public good it serves and the public resources it uses, "ensuring the accountability of technology initiatives in terms of ownership and outcomes" (Voogt et al., 2018).
- Finally, to be able to consider the larger context of a global, environmental and digital transformations (Peters and Jandrić, 2017), this influence should take into account the visions of many different people and open the space for their opinions to be exchanged and new meanings and knowledge created in this exchange, but from the perspective of *interactions* rather than actions and states (Harris and De Flaminis, 2016).

To support the liberating and transformative process of a person's development, we claim that less directive and more bottom-up approach to educational leadership is needed, the one that can support different paths of personal and social transformation and goals achievements. We argue that two leadership approaches should be combined if this influence is to bring fruits: transformational and distributed leadership.

Distributive leadership offers the co-created inclusive methodology while transformational leadership inspires, guides and motivates all to strive for individual and school improvements through cognitive and social development of a person and of a community. In this distributed process of influencing, which is not a directive but inclusive, two-way process, different visions are shared and common meanings transformed through co-creation. This co-created

school vision is mindful about both personal and community's potential and is adjusted to changing needs and environment and co-created by school staff, students and community stakeholders.

Conclusion

We have asked ourselves what the role of education is when considering global, environmental and digital transformations happening today. We acknowledge that education should be mindful of the wider transformations but should always continue to support cognitive and social development of a person who is then able to become active and contributing citizen of the same changing and troubled world.

We acknowledge digital transformation as an important lever for supporting the aforementioned vision of education. We ask what kind of meaningful digital transformation can support a cognitive and social development of a person and her community? We propose to use digital maturity as an organisational improvement framework and a reflective tool designed to guide meaningful digital transformation (Marshal, 2010, 2012; Volungevičienė et al., 2021; Teichert, 2019) of education from the system-wide ecological perspective (Harrison et al., 2014) into transformative, inclusive, visionary, effective and accountable process of cognitive and social development of individuals and communities (Underwood and Dillon, 2004).

Lastly, we asked what kind of leadership schools need to digitally mature in a way that is meaningful for them and their community? We argue that if this process is to be meaningful, we need educational leadership that is a n exchanging process of influence and relationship leading to a shared vision and a common purpose for the school, that is mindful about personal and community's potential and is adjusted to changing needs and environment and co-created by school staff, students and community stakeholders. To be able to support the variety of paths in which any person and/or community could develop, the leadership influence should be inclusive and distributed. To be able to transform, this influence should be able to guide and motivate all to strive for individual, school and system improvements.

We conclude with the idea that distributing leadership to all stakeholders (including teachers and students) in reflecting and devising meaningful digital transformation using digital maturity concept should move schools and educational systems closer towards digitally mature (school) education, in which shared transformative and inclusive vision of education, mindful of wider global, environmental and digital changes, leads to cognitive and social development of a person and of a community.

We propose further research that will improve positioning of digital maturity as an improvement and a reflective framework for meaningful digital transformation of education towards transformative, inclusive, visionary, effective and accountable process of cognitive and social development. In doing this, the further research should aim at better understanding the role of leadership in digital maturation of (school) education.

References

Anderson, J., & Boyle, C. (2020). "Good" Education in A Neo-Liberal Paradigm: Challenges, Contradictions and Consternations. In C. Boyle, J. Anderson, A. Page, & S. Mavropoulou (Eds.), *Inclusive Education: Global Issues and Controversies*. Leiden ; Boston Brill Sense. https://doi.org/10.1163/9789004431171_003

Aristoteles. (2001). *On the soul and On memory and recollection* (J. Sachs, Trans.). Green Lion Press.

Balaban, I., Redjep, N. B., & Čalopa, M. K. (2018). The analysis of digital maturity of schools in Croatia. *International Journal of Emerging Technologies in Learning*, 13(6), 4–15. https://doi.org/10.3991/ijet.v13i06.7844

Bush, T., & Glover, D. (2014). School leadership models: What do we know? *School Leadership and Management*, 34(5), 553–571. https://doi.org/10.1080/13632434.2014.928680

Bush, T., & Glover, D. (2003). School Leadership: Concepts and Evidence. National College for School Leadership, (Spring), 1–42.

Daniëls, E., Hondeghem, A., & Dochy, F. (2019). A review on leadership and leadership development in educational settings. *Educational Research Review*, 27(March), 110–125. https://doi.org/10.1016/j.edurev.2019.02.003

Dewey, John (1916). *Democracy and Education: An Introduction to the Philosophy of Education*. New York: Macmillan. Retrieved from https://archive.org/details/democracyandedu00dewegoog/page/n6/mode/2up?view=theater

Dexter, S. (2018). The Role of Leadership for Information Technology in Education: Systems of Practices. In J. Voogt, G. Knezek, R. Christensen, K-W. Lai (Eds.), *Second Handbook of Information Technology in Primary and Secondary Education*. Springer International Handbooks of Education.

Freire, Paulo (1970). Pedagogy of the oppressed. New York: Herder and Herder.

Gumus, S., Bellibas, M. S., Esen, M., & Gumus, E. (2018). A systematic review of studies on leadership models in educational research from 1980 to 2014. *Educational Management Administration and Leadership*, 46(1), 25–48. https://doi.org/10.1177/1741143216659296

Harris, A. (Ed.). (2009). *Distributed Leadership: Different Perspectives* (Studies in Educational Leadership, Vol. 7). Springer Science+Business Media B.V. 2009.

Harrison, C., Tomás, C., & Crook, C. (2014). An e-maturity analysis explains intention-behavior disjunctions in technology adoption in UK schools. *Computers in Human Behavior,* 34, 345–351. https://doi.org/10.1016/j.chb.2013.10.042

Jaakkola, E. (2020). Designing conceptual articles: four approaches. *AMS Review*, 10(1–2), 18–26. https://doi.org/10.1007/s13162-020-00161-0

Kampylis, P., Devine, J., Punie, Y., & Newman, T. (2016). *Supporting school to go digital: From a conceptual model towards the design of a self-assessment tool for digital-age learning*. ICERI2016 Proceedings. 9th International Conference of Education, Research and Innovation. November, 4–16. 2017. Seville, Spain.

Leithwood, K., & Jantzi, D. (2005). A review of transformational school leadership research 1996–2005. Leadership & Policy in Schools, 4(3), 177–199. https://doi.org/10.1080/15700760500244769

Leithwood, K., Harris, A., & Hopkins, D. (2008). Seven strong claims about successful school leadership. School Leadership & Management, 28(1), 27–42. https://doi.org/10.1080/13632430701800060

Marshall, S. (2012). Improving the quality of e-learning: Lessons from the eMM. *Journal of Computer Assisted Learning*, *28*(1), 65–78. https://doi.org/10.1111/j.1365-2729.2011.00443.x

Marshall, S. (2010). A Quality Framework for Continuous Improvement of E-learning: The E-learning Maturity Model. *Journal of Distance Education Revue De L'Éducation À Distance*, 24(1), 143–166.

Michelsen, G., Fischer, D. (2017). Sustainability and Education. In M.V.Hauff and C. Kuhnke (Eds.), *Sustainable Development Policy. A European perspective* (pp. 135-158). London: Routlege. Retrieved June 13, 2022 from https://www.routledge.com/Sustainable-Development-Policy-A-European-Perspective/Hauff-Kuhnke/p/book/9781138284999

Peters, M. A., & Jandrić, P. (2017). Dewey's Democracy and Education in the age of digital reason: the global, ecological and digital turns. *Open Review of Educational Research,* 4(1), 205–218. https://doi.org/10.1080/23265507.2017.1395290

St. John, C. (Ed.). (1931). *Ellen Terry and Bernard Shaw: A Correspondence.* G.P.Putnam's Sons, Ltd.

Stogdill, R. M. (1950). Leadership, membership and organization. *Psychological Bulletin*, 47, 1-14

Tarabini, A. (2021). The role of schooling in times of global pandemic: a sociological approach. *International Studies in Sociology of Education*, *00*(00), 1–19. https://doi.org/10.1080/09620214.2021.1966825

Teräs, M., Suoranta, J., Teräs, H., Curcher M. (2020). Post-Covid-19 Education and Education Technology 'Solutionism': a Seller's Market. *Postdigit Sci Educ 2*, 863–878 (2020). https://doi.org/10.1007/s42438-020-00164-x

Toh, Y., & So, H. J. (2011). ICT reform initiatives in Singapore schools: A complexity theory perspective. *Asia Pacific Education Review*, 12(3), 349–357. https://doi.org/10.1007/s12564-010-9130-0

Townsend, T. (2011). School leadership in the twenty-first century: Different approaches to common problems? *School Leadership and Management*, 31(2), 93–103. https://doi.org/10.1080/13632434.2011.572419

Volungevičienė, A., Brown, M., Greenspon, R., Gaebel, M. & Morrisroe, A. (2021). *Developing a High-Performance Digital Education System: Institutional Self-Assessment Instruments*. European University Association absl. Retrieved from https://eua.eu/downloads/publications/digi-he desk research report.pdf

Voogt, J., Knezek, G., Christensen, R., & Lai, K.-W. (2018). Developing an Understanding of the Impact of Digital Technologies on Teaching and Learning in an Ever-Changing Landscape. In J. Voogt, G. Knezek, R. Christensen, & K.-W. Lai (Eds.), *Second Handbook of Information Technology in Primary and Secondary Education*. Springer International Handbooks of Education.

Underwood, J., & Dillon, G. (2004). Capturing complexity through maturity modelling. *Technology, Pedagogy and Education*, *13*(2), 213–225. https://doi.org/10.1080/14759390400200181

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

DEVELOPING A HIGH PERFORMANCE DIGITAL EDUCATION ECOSYSTEM FOR HE

Airina Volungevičienė, Vytautas Magnus University, Lithuania

Mark Brown, Dublin City University, Ireland

Michael Gaebel, European University Association, Belgium

Alison Morrisroe, European University Association, Belgium

Rasa Greenspon, Vytautas Magnus University, Lithuania

Abstract

The use of digitally enhanced learning and teaching (DELT) has increased a lot at European higher education institutions since 2020. Different strategies were applied to meet immediate needs of higher education institutions to move online during the pandemic period, while new perspectives were reported by institutions and needs considered to revisit existing models and frameworks of institutional prepared for DELT after gradual coming back to normal life. The European University Associations in partnership with four universities implemented the desk research on existing institutional self-assessment instruments that support institutional preparation to digitally enhanced learning and teaching at higher education institutions. The research has been implemented in the framework of Erasmus+ co-funded project DIGI – HE, with the aim of supporting higher education institutions to engage in self-review to develop and enhance their strategic approaches to digitalization.

The paper presents the main summary of outcomes of this research, following the report published by EUA in 2021 "Developing a High Performance Digital Education Ecosystem: Institutional Self-assessment Instruments".

To Guide and Lead the Way

Despite of the fact that the use of DELT at European higher education institutions has been increasing, systematic adoption and integration of technologies on institutional level are still on the way. Institutional leadership confirms there are too many challenges to develop and implement institutional strategy for DELT, to use the best of the potential of digital transformation.

Evidently, holistic institutional approaches to digitalisation are required in order to ensure the development of DELT. This is also emphasised at policy level, for example, in the "Digital Education Action Plan" 2021 -2027 (European Commission, 2020) which sets the goal of developing a high performing digital education ecosystem. Despite these challenges and differences, in view of the increasing strategic focus on DELT, all higher education institutions have to consider many of the same key issues, including: strategy and policy development, investment and maintenance of digital infrastructure, capacity and professional development of staff, along with the provision of learning support services for students. To date, evidence suggests that much provision for digitalisation has occurred through experimental, bottom-up developments, but often in islands of innovation. While there is a trend towards more dedicated strategies and centralised services, the question remains: What does DELT look like from an institution-wide perspective when successfully implemented in a mature way?

To answer this question and tackle at least some of the challenges of digitalisation, DIGI-HE, an Erasmus+ co-funded project, was launched with the goal of stimulating reflection and exchange on the strategic development of DELT among European higher education institutions. For this purpose, the project originally intended to develop a self-assessment tool: Higher education institutions would engage in self-review to enhance their strategic approaches to digitalisation in the context of teaching, learning and assessment. A related intention was to use this tool as a platform for institutional benchmarking and knowledge exchange. The initiative hoped to build on lessons learnt from the European Commission's Self-reflection on Effective Learning by the use of Innovative Education

Technologies (SELFIE) tool launched in 2018 for schools which has a strong basis in research and was developed based on the "European Framework for Digitally-Competent Educational Organisations" (Kampylis et al., 2015).

While benchmarking tools for DELT are not new, and the project team was already aware of a number of existing ones, none of them appeared to be widely used in Europe or entirely fit for the intended purpose. A more thorough review of existing instruments for DELT development was expected to help confirm this assumption and provide a firmer basis anchored in research for the next phase of the project. As an outcome of this review, the project decided to change its approach: desk research found an unexpected wealth of existing instruments, with more instruments likely to emerge due to the emphasis on DELT during the Covid-19 pandemic. Their analysis confirmed that they respond to diverse needs, but also that they tend to present some common challenges, among them the need to address a considerable number of users.

Methodology applied

Initially, between March and April 2020, the project team sought to identify as many relevant self-assessment instruments as possible. This desk research phase drew on the existing knowledge of the project team and a search of both published and grey literature using relevant keywords. Three publications provided a useful synthesis of existing instruments designed specifically to promote quality in online distance learning contexts (Ossiannilsson, et al., 2015; Uvalić-Trumbić & Daniel, 2015; Esfijani, 2018). Several other instruments were located through relevant professional bodies, namely the Australasian Council on Open, Distance and e-Learning (ACODE), and some through government-funded agencies, namely the European Association for Quality Assurance (ENQA), the Joint Information Systems Committee (JISC) and Quality and Qualifications Ireland (QQI).

A common template was developed to collect relevant information about each instrument (see Fig. 1):

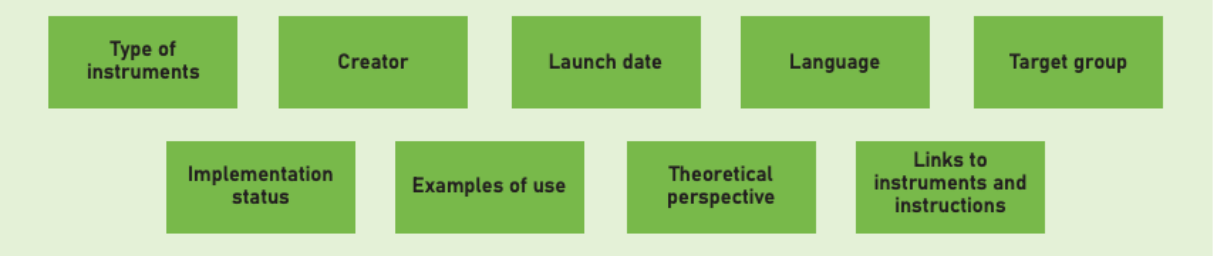

Figure 3. Template for instrument analysis.

The template was initially piloted by the project team based on a smaller sample of instruments chosen to test a variety of different formats, and then revised based on feedback. A Google form designed around the template was created to manage the data collection and analysis of each instrument. Importantly, to enhance the reliability and validity of the review process each instrument was independently reviewed between May and September 2020 by two members of the project team. The desk research for the present report was led by Vytautas Magnus University (VMU) and EUA, with all other partners contributing to the reviews and the analysis. Finally, a further peer review of the analysis and key observations arising from the desk research was undertaken between October and November 2020 by two members of the project team from Dublin City University (DCU) and Duale Hochschule Baden-Wurttemberg (DHBW).

Finally, 20 instruments were selected that directly focused on DELT development for higher education from a critical self-assessment perspective. This included SELFIE for useful comparative purposes. Some were designed as assessment tools (n=3) that can be completed in order to collate a response, obtain a score or measure their institutional performance, whereas others are more like frameworks (n=7), whose main purpose is to define some principles, set standards or benchmarks, and provide guidance. However, there was a certain amount of overlap between the two categories, with several tools (n=10) being based on a concrete framework and several frameworks being accompanied by a tool, sometimes available as a purchasable service. Figure 2 indicates the category that best fits the description of each instrument:

Tool only	Framework only	Combination of tool and framework
SELFIE	DigCompOrg	DigCompEdu
Leibniz Benchmarking Tool	JISC- Digitally Capable Organisation	JISC (tools available on project website as a commercial service)
HEInnovate	QQI Blended Learning Guidelines	UNESCO Blended Learning Assessment Tool

Figure 4. Classification of instruments by type.

The project team, judging from experience in institutional change and transformation, sees this as an essential point: The effective use of such instruments would depend to a large extent on critical reflection, which beyond merely identifying current strengths and shortcomings, would depend on active dialogue and genuine collaboration among institutional stakeholders, including senior leadership, those in middle management roles, administrative staff, faculty instructors, students, and possibly also with external groups. While using a self-assessment instrument can play this role within institutions, obviously it should also facilitate this reflection among them. But actual evidence of frequent use of the instruments or of a supporting community is limited, at least outside a commercial client-customer relationship, which some of the instruments offer.

What is inside and how useful the self-assessment instruments can be?

The instruments cover a wide range of key themes, with the most common being:

- policy and governance, including strategy, leadership, vision and philosophy, digital transformation, organisational digital culture, administration, legal framework;
- financing and funding, including sustainability;
- IT infrastructure including systems, platforms, tools and their application, along with digital resources;
- course, programme and curriculum design, including assessment practices;
- professional development, digital skills and staff support;
- student training, development and support, including digital identity and well-being, digital citizenship, and integrity;
- accessibility and usability of digitally enhanced learning resources and environments;
- collaboration and networking;
- research and innovation;
- quality management;
- measurement of Impact.

These key themes do not feature in every instrument. However, a significant amount of overlap was observed among instruments in terms of the key themes. For example, strategy, governance, infrastructure and resources are addressed in most instruments, while staff and student support, curriculum and assessment are in almost half.

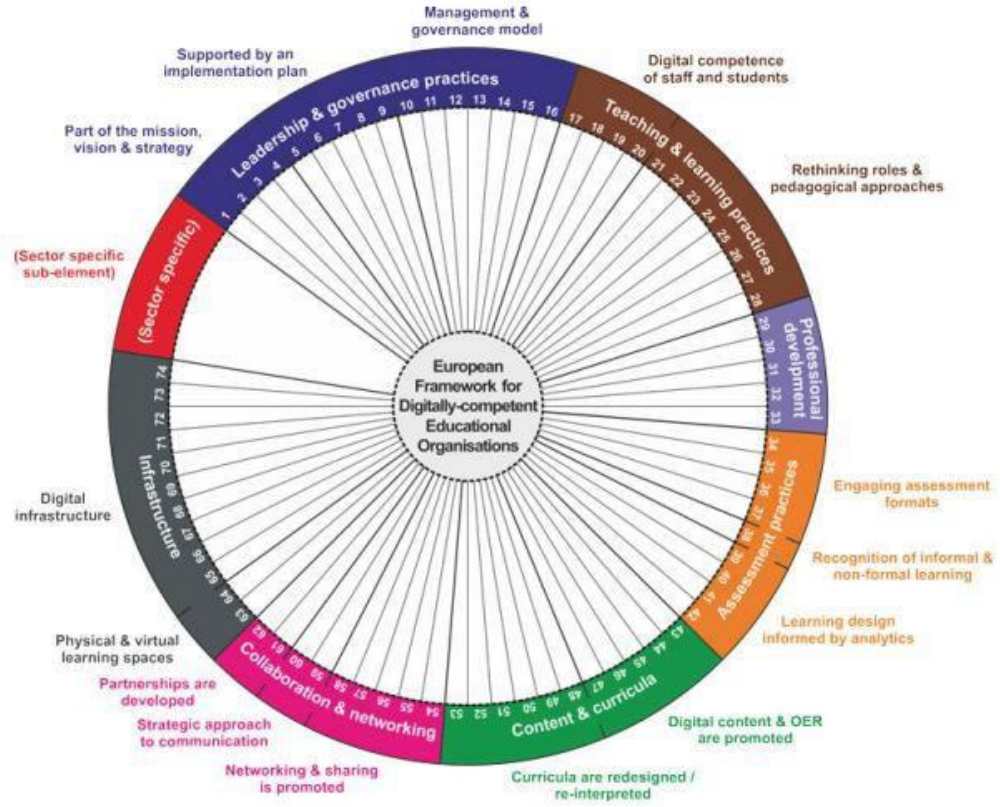

Figure 5. The different elements of DigCompOrg framework.

Leadership and organisational culture as key themes run through many of the instruments, but the Commonwealth of Learning (CoL) Benchmarking Toolkit for Technology Enabled Learning is notable as it provides separate and quite detailed benchmarks to each of them. Organisational culture also permeates through JISC's model of the digitally capable organisation. Leadership is one of the key themes included in SELFIE and DigCompOrg (Figure 2) along with the value of collaboration and networking, with the latter not as obvious in other instruments designed for higher education. With the exception of HEInnovate, few of the instruments have explicit key themes that self-assess the wider research and innovation culture supporting DELT, which could be seen as yet another important gap.

Most instruments are quite recent, with the oldest launched in 2003 and the most recent launched in 2020. However, there is evidence in the literature dating back before this period that a DELT benchmarking project was first underway in the UK as early as 2001. An archive documenting this initiative, including several presentations (Bacsich, 2005a) and a comprehensive literature review on the theory of benchmarking (Bacsich, 2005b) is still available on the project website. At the time there appears to have been a preference towards a "pick and mix" approach.

The instruments can, technically speaking, be exploited by a wide audience, as all of them are online and most of them are free of charge, at least at an initial stage. Furthermore, the vast majority of instruments are available in English. However, whether an educator or higher education institution would want to use an instrument from a different country or continent is another question, as it may not encapsulate local cultural or contextual differences. For example, the National Standards for Quality Online Programs (NSQ), supported by standards for both teaching and courses, have a United States target audience, with some of the language and terminology less appropriate in a European context.

Strength and Limitations

By and large, the reviewers found most of the instruments useful in terms of fostering critical reflection and relatively easy and practical to implement. Indeed, most have instructions, coming in various forms such as user guides, video tutorials, manuals, or a simple explanatory section on their website, that are sufficient for people to get started.

For several of the more straightforward or less multi-dimensional instruments, such as the UNESCO Blended Learning Self-Assessment Tool, detailed instructions with an underlying philosophy are probably not crucial to their high-level implementation by higher education institutions as their strength is their simplicity. Almost a half of the instruments reviewed can be used for both internal and external review and this versatility is considered to be one of the key strengths. Likewise, the fact that certain instruments provide feedback in the form of a report is highly appreciated, especially those that present the results in a visual, and in an easy-to-interpret way, and allow opportunities for comparison with other institutions. This comparative feature is rare in terms of the instrument itself, but where there is a supporting community for wider sharing and reflection, this is considered a particular strength

One of the major criticisms is that some of the instruments are too narrow, in that they focus on a specific area, such as blended learning, entrepreneurship, quality assurance, educators' skills or are only relevant for course-level. Although this is not a weakness per se, it does potentially limit the transferability of the instrument to wider institutional reflections with a diverse range of stakeholders. Likewise, certain instruments are primarily intended for a senior-level audience within and sometimes beyond the institution. Again, although this may not be a weakness, it may limit the potential to engage a wider range of stakeholders in reflective conversations for self-improvement at the micro- and meso-levels of the institution, including both educators and students, but also external stakeholders.

Concise explanation and examples of strengths and weaknesses, as well as report examples produced by self-assessment instruments available are described in the report of this desk research "Developing a High Performance Digital Education Ecosystem: Institutional Self-assessment Instruments" available at DIGI – HE project website at EUA. Annexes of this report include data about each instrument (model or framework) that was included in this research. It allows institutions to select the instrument or two for their "pick and mix" mode of use to initiate and guide higher education institutions in the journey of self-assessment.

Conclusions

This report began with the question: What does DELT look like from an institution-wide perspective when successfully implemented in a mature way? This question was set in the wider context of the European Commission's new "Digital Education Action Plan" (2021–2027) and the strategic priority of "fostering the development of a high-performing digital education ecosystem" (2020, p. 10). After locating and reviewing a number of self-assessment instruments developed around the globe over the past decade or so, the answer to this question is complex. There are many different dimensions of DELT and many different ways that higher education institutions can choose to harness the potential of digitalisation to achieve their goals. Although at risk of borrowing a cliché, there is no one-size-fits-all model of DELT as institutional context is crucial. Accordingly, the report does not advocate for the use of a particular instrument even if on initial impressions they look good and appear fit for purpose; nor does the review team see much value to be gained from developing yet another instrument for the higher education sector. Indeed, the report comes to the conclusion that a dialogical, "pick and mix" approach may be more productive in terms of future efforts to support and scaffold critical self-assessments that lead to real and transformative change in higher education institutions. Such an approach recognises that the process of continuous development in DELT needs to be infused throughout institutional culture, as well as part of a wider ecosystem that promotes critical self-assessment as a shared ethos and collective responsibility of European educators.

Acknowledgement

The research has been implemented in the framework of Erasmus+ co-funded project DIGI – HE, with the aim of supporting higher education institutions to engage in self-review to develop and enhance their strategic approaches to digitalization. The report "Developing a High Performance Digital Education Ecosystem: Institutional Self-assessment Instruments" has been published and is available at DIGI – HE project website at EUA.

References

Bacsich, P. (2005a). Evaluating impact of eLearning: Benchmarking. Paper presented at EU eLearning Conference, May. Available at http://www.maticmedia.co.uk/benchmarking.htm

Bacsich, P. (2005b). Theory of benchmarking for elearning: A top level literature review. Available at http://www.matic-media.co.uk/benchmarking.htm

European Association for Quality Assurance in Higher Education. (2018). Considerations for quality assurance of e-learning provision. Occasional Papers 26. Available at https://enqa. eu/indirme/papers-and-reports/occasionalpapers/Considerations%20for%20QA%20of%20 e-learning%20provision.pdf

European Commission. (2020). Digital Education Action Plan 2021-2027. Available at: https:// ec.europa.eu/education/sites/education/files/ document-library-docs/deap-communicationsept2020_en.pdf

Gaebel, M., Zhang, T., Stoeber, H. & Morrisroe, A. (2021). Digitally enhanced learning and teaching in European higher education institutions. European University Association absl.

Kampylis, P., Punie, Y., & Devine, J. (2015). Promoting effective digital-age learning - A European framework for digitally-competent educational organisations, EUR 27599 EN; doi:10.2791/54070

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

DIGITOOLS PROJECT – USERS PERSPECTIVE ON THE CURRENT STATE OF DIGITAL EDUCATION

Mihaela Banek Zorica, University of Zagreb, Faculty of Humanities and Social Sciences, Croatia

Abstract

The project DIGITOOLS – Innovative Tools for Enhancing E-Learning Solutions in Universities (the Erasmus+ KA 226 Partnerships for Digital Education Readiness Project. Project Number: 2020-1-IE02-KA226-HE-000781) is a project aimed at introducing enhanced digital tools and methods to help university staff deliver quality education through online means. The project supports and cultivates innovative pedagogies and methods for teaching, learning and assessment, encouraging educators and learners to use digital technologies in creative, collaborative and efficient ways to help them to quickly adapt to this fast evolving and complex situation caused by this global pandemic. One of the outcomes of the project is the research of the current state of the digital education in the partner countries. The results of the preliminary research from Croatia are presented in this paper. The research is focused on the perception of online learning from all the stakeholders: students, teacher and librarians. The results show positive attitudes towards e-learning and identify the need for further investment into digital competences of both teachers and students.

Introduction

The crisis generated by the COVID 19 pandemic has forced European universities to move their teaching activities to the online environment. Although most universities have implemented e-Learning platforms years ago and developed blended learning courses and programs, the teaching staff has experiencing difficulties in using these platforms and in creating and adapting the course content, as it needed to be quickly adapted to a fast evolving and complex situation. The problem that arose is that previous implementations were either e-learning or blended learning but pandemics brought another type of teaching and learning called emergency remote teaching. There is a huge difference between those two concepts but they are unfortunately not understood and the term e-learning is often used for the emergency remote teaching. As Muthuprasad et al. (2021) emphasise that the questions about the preparedness, designing and effectiveness of e-learning is still not clearly understood. And we are still puzzled by the question: are teachers and students ready for the e-learning to take place? Readiness from student's perspective, according to Werner et al. (1998) is based on three aspects: student's preference for online delivery; student's confidence in the utilizing the electronic communication for learning, and capability to engage in autonomous learning. If we transfer these to today's competency setting than our students need to have two competences: digital competence and learn how to learn. The majority of the current research found in the body of literature is focused on the student's perspectives on learning during pandemics (Ismaili, 2021; Nikou 2021). Although there are positive and negative aspects of e-learning the majority of the research identifies that students like the flexibility of the e-learning environment but lack full teachers' support that they receive in the traditional environment. Still, we should not ignore the negative aspects that the pandemic has brought such as the issues of deepening of the digital divide (Bordoloi, 2021) which are rarely discussed. On the other hand, the attitudes towards e-learning from teachers are also divided. Researchers such as Joshi et al. (2021) are reporting that teachers have experienced "that lack of technical infrastructure, limited awareness of online teaching platforms and security concerns" which were mainly due to the lack of technical knowledge or the negative attitude towards ICT. So, these were of more subjective than the objective nature. This raises the question of the technology acceptance in education as a prerequisite to the full digital transformation of higher education. Adoption of new technology is known to be a major contributor to the self-efficacy of both students and teachers, so it is important to avoid the unintended consequence of increased anxiety when selecting the number and nature of technological tools to be used with students" (Eutsler, 2021). There is a great need for teacher's update of competences especially their digital competences. Although, EU has proposed the Digital Competence Framework there is still a lot of work to be done in developing the digital competences in teachers. Another segment that is still a bit ignored is the role of

the supporters of the learning – libraries and librarians. In the traditional education environment, they had a central role. The question that arises now is how they have adapted to the new environment overnight and how they can be integrated into the new digital educational environment. Still, there is a need for further research and development of the topic of development of teachers digital competences as well as the role of university libraries in digital education. Crucial in the electronic environment and thus one of the focuses of the DIGITOOLS project.

The DIGITOOLS project

The project DIGITOOLS - Innovative Tools for Enhancing E-Learning Solutions in Universities (the Erasmus+ KA 226 Partnerships for Digital Education Readiness Project. Project Number: 2020-1-IE02-KA226-HE-000781) (DIGITOOLS, 2022) is run by Technological University of the Shannon (TUS): Midlands Midwest, Ireland as a project coordinator. Partners on the project are: MB Think Tank, SRL (Romania), Universitatea Transilvania din Brasov (Romania), Instituto Politécnico do Porto (Portugal), University of Zagreb (Croatia), Universitat Politecnica de Valencia (Spain) and University of Crete (Greece). The project is aimed at introducing enhanced digital tools and methods to help university staff deliver quality education through online means. It supports and cultivates innovative pedagogies and methods for teaching, learning and assessment, encouraging educators and learners to use digital technologies in creative, collaborative and efficient ways to help them to quickly adapt to this fast evolving and complex situation caused by this global pandemic. In particular, the project promotes effective digital-age learning and digitally competent educational organisations actively building on the European Framework for Digitally Competent Educational Organisations. Digital technologies are enablers of a step change in learning and teaching practices. The DIGITOOLS project helps to consolidate progress and ensure scale and sustainability, helping education institutions in the EU to review their organisational strategies, in order to enhance their capacity for innovation and to exploit the full potential of digital technologies and content. The DIGITOOLS project promotes and rewards excellence in teaching and skills development, including through encouraging training of academics and exchange of good practices and collaborative platforms, developing new and innovative pedagogies, including multi-disciplinary approaches, new curriculum design, delivery and assessment methods. The project enables partners in Ireland, Romania, Greece, Croatia, Portugal and Spain to provide a wider variety of (online) courses to full-time, part-time or lifelong learning students, linking education with research and innovation, fostering an entrepreneurial, open and innovative higher education sector and promoting learning and teaching partnerships actively supporting the implementation of the Erasmus+ in the EU. The project is effectively tackling skills gaps and mismatches particularly with regard to preparedness to teach in an online environment promoting more flexible and innovative learning. The project supports the Commission's renewed EU agenda for higher education ensuring that higher education equips graduates with the right skills for today's economy, builds inclusive higher education systems, bridging the innovation gap between higher education, research and business and ensures that different parts of higher education systems e.g. libraries and academic departments work together effectively and efficiently. the main objective of DIGITOOLS Project is to provide the teaching and support staff from HEIs with the opportunity to improve and adapt their teaching curricula and to create high quality digital content for education purposes. Last but not least, DIGITOOLS aims to involve librarians in the project, in order to develop Resource Centres in the field. The library staff will be trained to deliver both information on the documentation resources and initial training for students. The DIGITOOLS project will develop five Intellectual Outputs which will support the teaching staff and librarians to acquire the skills and competencies needed to create and deliver high quality online courses, including blended teaching.

Current state of digital education in higher education institutions

Prior to developing educational programs, the analysis of the current state at each country had to be done. The research on the current state of digital education in HEIs was done in each of the partner countries (Ireland, Portugal, Spain, Croatia, Greece and Romania) and results presented in the National Reports. These reports gave insight into perceptions of online learning from three stakeholders: students, teacher and librarians. Each partner has researched the current state of digital education in HEI and prepared a presentation of their research. In the following chapters some results from the Croatian study will be presented.

Methodology

The goal of the research was to investigate students and teachers' perceptions and future attitudes towards e-learning and thus digital transformation. The questionnaire was prepared by project partner Instituto Politécnico do Porto (Portugal) and translated into Croatian language. It was distributed via Limesurvey and invitation e-mail sent via institutions (Faculty of Humanities and Social Sciences, University of Zagreb) mailing list. The results were processed in SPSS and presented in the template that was provided by the partner responsible for the questionnaire. Data from country survey was exported to IBM SPSS (using the syntax file provided by Limesurvey when exporting data to SPSS). Qualitative variables Q00 and Q02 were automatically recoded into numerical form. All string variables with Likert scales were transformed into numerical variables, using the "automatic recode" feature of IBM SPSS. Cronbach's Alpha for each construct was computed, to check the reliability of the questions measuring these concepts. The correlations between constructs were analysed and linear regressions were estimated to evaluate the research hypotheses. Originally, 121 responses from students, teacher and librarians were received but during data analysis 40 responses were found to be partial so they were excluded from the analysis. The survey was filled by 34 students, 44 teachers and 3 librarians of which 57 female and 23 male respondents.

Results

First question was about the technology they used during distant learning. An array of typical electronic devices was offered, such as: smartphone, tablet or IPad, laptop and desktop. The most widely used by all three groups was the laptop (Figure 1). Out of these three groups, teachers were the only ones that were using all four devices while librarians were using only computers (equally laptop and desktop). For students the second choice was smartphone which shows that they are easily shifting devices and environments according to the situation

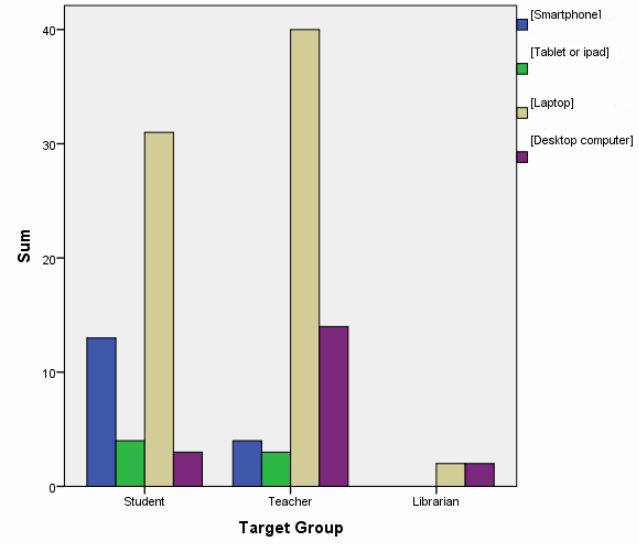

Figure 1. Usage of devices to access e-learning

This result showed that there is a great need to focus on accessibility of both e-learning platforms and learning materials. When developing learning materials teachers should be aware that the final product should be accessible on both mobile devices and computers.

Experience with e-learning – student's perspective

When asked about their experience with the distance education, future interactions with the e-learning environments and perceived benefits students have mainly positive remarks (Figure2). We have to keep in mind that some students did not have any prior experiences with e-learning or have been using blended learning as a support to traditional learning. With the pandemics, the have only experienced emergency remote teaching that was and ad hoc solution.

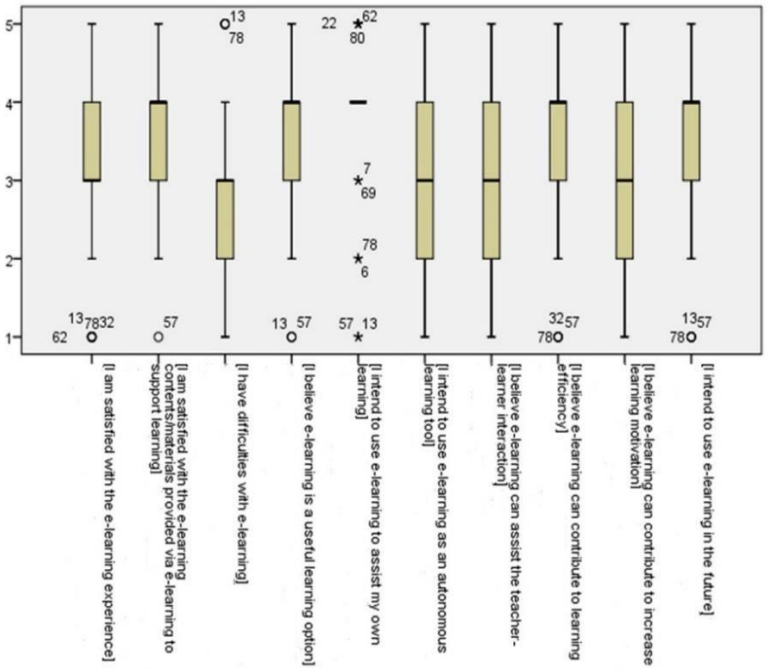

Figure 2. Students' perception of e-learning

Looking at the students' perceptions of the whole e-learning experience we should look closer at the two elements: their belief that e-learning will enhance learning and their future intentions to use it. We approached this issue using two constructs of technology acceptance model (Davis 1989) – perceived ease of use and perceived usefulness. The results (Figure 3.) again show that situation is far from perfect but we have to take into account all the circumstances.

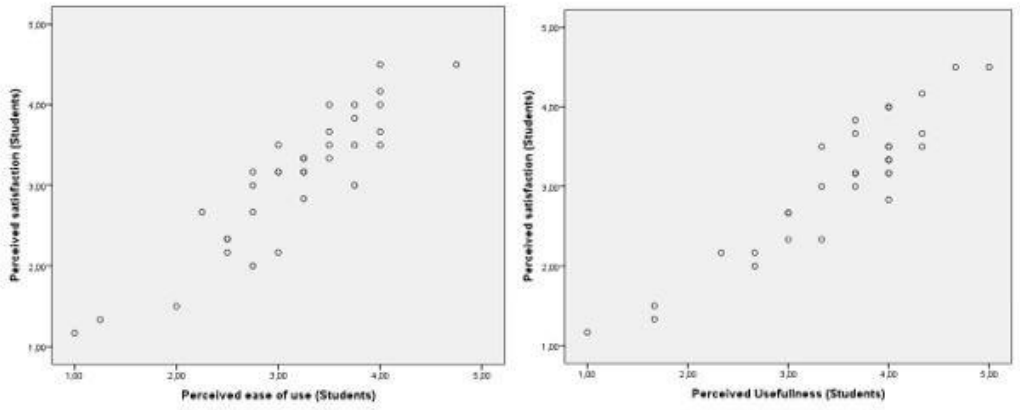

Figure 3. Perceived ease of use and usefulness

Experience with e-learning – teacher's perspective

Teachers were asked to give their insight into perceived benefits of e-learning responding in the scale where 5 is Strongly agree and 1 Strongly disagree (Figure 4). The statement offered was:
As a teacher, I am pleased to use e-learning environment due to 1) flexibility; 2) wide range of tools; 3) ease of use; 4) increases engagement and enjoyment for students; 5) an improved relationship with students; 6) increased autonomy, motivation, self-determination and self-regulation.

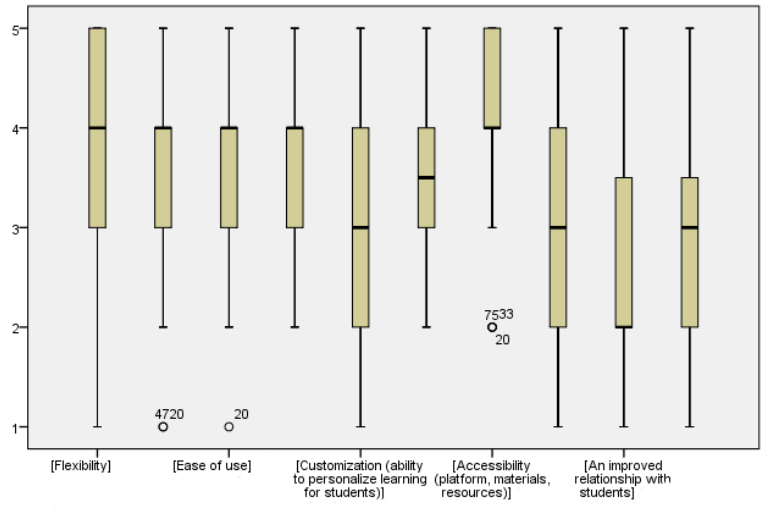

Figure 4. benefits of e-learning environment

The results show that teachers value almost all of these aspects but the flexibility and increased autonomy, motivation, self-determination and self-regulation are evaluated the highest.

The next question was about the main challenges switching to online/e-learning. They were offered the following statements: 1. Teachers' access to technology (computers, software, stable internet connection, 2. Lack of training to deliver education in an online environment, 3. Students' access to technology, 4. Communicating with students, 5. Involving students, 6. Keeping students motivated and engaged, 7. Supporting students with special needs or disabilities, 8. Converting activities and content for use in e-learning. 9. Authentically assessing students' progress, 10. Availability of clear guidelines regarding online learning from the school board, 11. Increased workload and stress working from home, 12. Time management and organization, 13. There have been no challenges. The results (Figure 5) show that teachers are unite in the disagreement with the statement that there have been no challenges. What they perceive as major obstacles are students access to technology, involving students, and keeping them motivated and engaged.

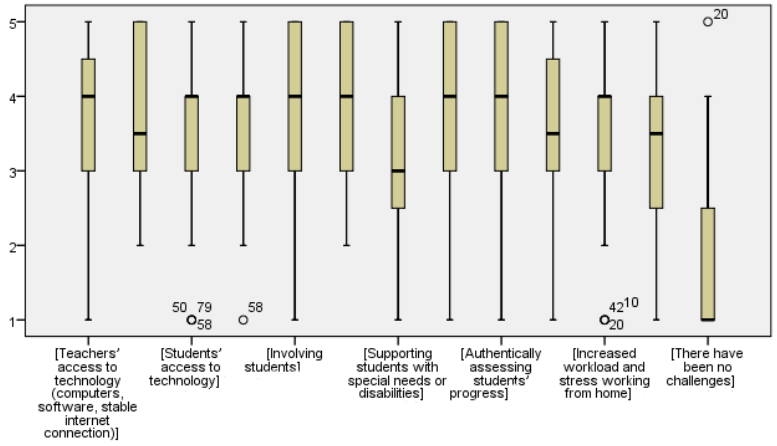

Figure 5. obstacles in e-learning

Experience with e-learning – librarians' perspective

The one aspect that was not heavily investigate due to the small response rate is the librarian's perspective in e-learning. We feel that this needs to be addressed through interviews and not survey, as qualitative results will give better insight into this problem. This needs to be further investigated in order to draw some conclusions and investigate the position of the library in e-learning.

Discussion

Both students and teachers see the advantages in the implementation of the e-learning but there is a lack of systematic support. The results indicate need of another more systematic approach to educational environment if we are to have a successful digital transformation and respond to the need of all the stakeholders. The results from this survey show that as biggest obstacles teachers perceive the lack of training to deliver education in an online environment; converting activities and content for use in e-learning; and authentically assessing students' progress. Interestingly, as obstacles they see the conversion of activities to e-learning and assessing students' progress. As these obstacles can be connected to the lack of education and training in both digital competences and e-learning these results identify necessity to provide teachers with training programs. Similar comments can be found in the survey done by Agency for science and higher education (2020) where teacher have identified following problems with e-learning: the organization of personal workspace at home, lack of communication and socialization with colleagues and students, and variety of technological issues. Regarding technological issues, apart from identified infrastructural problems the complexity of different platforms and software was seen as an obstacle and source of frustration. The question of developing digital competences and continuous teacher training is long discussed. In the pandemic time and under the emergency remote teaching this has been identified as one of the solutions to better acceptance e-learning. We could say that it is a prerequisite of a successful e-learning or even blended learning. This research shows that the time teachers spent very little time in ICT training. The results showed that only 5 respondents had training while 39 did not participate in any training. When asked about the hours spent on the training the number are equally distributed between 6 hours to up to 20 hours. When asked to specify where was this training offered the responses again vary from in house to webinar. The need for further training and development of teachers' digital competences to enhance e-learning can be found in several studies. Cabero-Almenara (2021) identified that basic-intermediate level of digital competences is no longer enough for complex environments. Pongsakdi et al. (2021) showed that educating teachers in developing digital competences lower their negative perception of e-learning. Using a pre-training and post-training tests he identified a positive change in teacher perceptions of the usefulness of technology.

The results of this survey show that there is a need to fully transform the whole educational environment. Therefore, we need to work on systematic approach to digital transformation of educational environment starting form education of teachers and then moving to all other stakeholders. The training in digital competence in higher education teachers is a key piece to a quality education (Cabero Almenara, 2021)

Future work

What this research proves is there is definitely no coming back to the traditional way of teaching. We have shifted into the middle of digital transformation, not by our choice but due to the global crisis. What our next steps need to be is creation of an environment that will enable future growth of both students and teachers. This is certainly not an easy task and need a lot of energy from the individual but also from the management and politics in order to support an easy transition.

References

AZVO. (2020). Izazovi u visokom obrazovanju za vrijeme pandemije bolesti COVID-19 i socijalne izolacije: iskustva i potrebe studenata i djelatnika visokih učilišta. AZVO. https://www.azvo.hr/images/stories/publikacije/Rezultati_istra%C5%BEivanja_Izazovi_u_visokom_obrazovanju_za_vrijeme_pandemije_bolesti_COVID19_i_socijalne_izolacije.pdf

Bordoloi, R. D. (2021). Perception towards online/blended learning at the time of Covid-19 pandemic: an academic analytics in the Indian context. *Asian Association of Open Universities Journal, 16*(1), 41-60.

Cabero-Almenara, J. G.-G.-P.-R. (2021). Digital competence of higher education professor according to DigCompEdu. Statistical resaerch metods with ANOVA between fields of knowledge in different age ranges. *Education and Information Technologies*.

DIGITOOLS. (2022). Retrieved from DIGITOOLS project: https://www.digi-tools.eu/

Eutsler, L. A. (2021). Initial response to COVID-19: a mixed-methods analysis of media and school communications to identify pedagogical implications for remote teaching. *Interactive Technology and Smart Education, 18*.

Ismaili, Y. (2021). Evaluation of students' attitude toward distance learning during the pandemic (Covid-19): a case study of ELTE university. *On the Horizon, 29*(1), 17-30.

Joshi, A. V. (2021). Impact of coronavirus pandemic on the Indian education sector: perspectives of teachers on online teaching and assessments. *Interactive Technology and Smart Education, 18*(2), 205-226.

Muthuprasad, T. A. (2021). Students' perception and preference for online education in India during COVID -19 pandemic. *Social Sciences & Humanities Open, 3*(1).

Nikou, S. a. (2021). An analysis of students' perspectives on e-learning participation – the case of COVID-19 pandemic. *International Journal of Information and Learning Technology, 38*(3), 299-315.

Pongsakdi, N. K. (2021). The impact of digital pedagogy training on in-service teachers' attitudes towards digital technologies. *Education and Information technologies, 26*, 5041–5054.

Terra, A. L. (2021, December). Guide for best practices: subject-specific teaching in digital education. DIGITOOLS project.

Warner, D. C. (1998). Readiness of VET clients for flexible delivery including on-line learning. Brisbane: Australian National Training Authority.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

DEVELOPMENT OF VOCATIONAL LEARNING SCENARIOS WITH APPLICATION OF DIGITALISED RESOURCES IN THE INITIAL VET LESSONS

Gedvilienė Genutė, Vytautas Magnus University, Lithuania

Tūtlys Vidmantas, Vytautas Magnus University, Lithuania

Stancikas Egidijus, Vytautas Magnus University, Lithuania

Abstract

The paper presents teaching scenarios for application of the digitalised tools in developing of vocational and technical skills in the field of metalworking and engineering in a VET centre from Lithuania. These scenarios have been developed in the framework of the Erasmus+ strategic partnership project IDC-VET aiming to develop a series of resources for professional development for teachers and trainers in VET for planning and delivering professional development for effective digital and innovative education and pedagogies.

Keywords:

Vocational education and training, digitalised tools for vocational learning, development of vocational knowledge and skills

Introduction. Erasmus+ project IDC-VET

Digitalization and 4th industrial revolution has made profound changes in the skills needs and the ways these skills are provided in the vocational education and training (VET) processes (Spöttl and Windelband 2021). Technological and organizational changes of the work processes require VET providers to prepare for the different possible change scenarios having specific implications for the skills needs (Lee and Pfeiffer 2019). Digitalization also impacts the change of vocational qualifications and the processes of their design and provision (Spöttl and Tūtlys 2021).Digitalization and the 4th industrial revolution open new opportunities for the development of the provision of training through provision of new channels of communication, technological platforms for the transfer of the knowledge and skills, space for the design and elaboration of the innovative training and learning methods (Spöttl and Windelband 2019; Spöttl and Tūtlys 2020).

This paper discusses development of the educational scenarios for vocational education and training (VET) aiming to help VET teachers to apply digitalization technologies in dealing with the different didactic and organisational issues of training provision. Presented scenarios have been developed by the VET teachers from the Alytus VET centre (Lithuania) together with experts from the Academy of Education at Vytautas Magnus University in the framework of the Erasmus+ project IDC-VET. This project seeks to develop a series of resources for professional development for teachers and trainers in VET for planning and delivering professional development for effective digital, open and innovative education and pedagogies. It focuses on the three key areas of the European Framework for the Digital Competence of Educators (DigiCompEdu) – digital resources, pedagogy and assessment introducing systematic approaches to, and opportunities for, the initial and continuous professional development of VET teachers, trainers and mentors in both school and work-based settings, with a focus on developing effective digital, open and innovative education and pedagogies.

The project aims to support the development of innovative practices in a digital era. The need for such practices has been starkly demonstrated by the COVID 19 crisis, which has both speeded up digtalisation in enterprises but also demonstrated both the potential and the need for online learning. The project also aims to support educators, both VET teachers and trainers, in developing and implementing the use of technology for learning in VET. During the first stage of the project from October 2020 to November 2021 there has been developed an online tool for mapping and assessing teacher digital competencies to help VET teachers to understand their personal strengths and weaknesses, by assessing their level of digital competence development and bridge the gap between school

assessment (SELFIE) and individual assessment. The tool contains sets of descriptors for 22 competences that are organised over six stages of the progression model of DIGICOMPEDU. The second state of the project deals with the development of learning scenarios for different sectors in VET and to testing these scenarios and associated technologies within VET schools or the workplace. Afterwards there will be prepared a digital repository of Open Educational Resources and best practice exemplars of using technology for teaching and training in VET in school and workplace settings. The project focuses on three key sectors in VET: metalworking and machinery production, social care and hospitality. Through the focus on pedagogy, assessment and the development of digital learning materials the project team seeks to develop new models and programmes which can support teachers and trainers in the use of technology in all sectors of VET practice.

In this paper we will introduce and discuss the learning scenarios with the application of open and digital resources for the VET teaching in the field of metalworking and engineering prepared by the team of VET teachers from Alytus VET centre and researchers from the Vytautas Magnus University (Lithuania).

Idea, structure and content of learning scenarios

The learning scenarios provide structured information for the VET teachers and trainers, which helps them to plan and implement the units of training – lesson, session of the practical training by providing the targeted competences. In the case of this project the learning scenarios aim to facilitate the application of the digital and open resources in the processes of learning and training.

Development of learning scenarios is based on the structured discussions with the VET teachers and trainers aiming to discover and to codify their innovative and effective training (educational) experience of using open and digital resources and tools for the solution of concrete didactic problems occurring in the theoretical or [practical training.

The scenarios provide the following structured information: 1) scenario title, 2) target audience (VET teachers and trainers), brief description of the educational problem to solve, or learning situation, 3) targeted level of qualification according to the European Qualification Framework, indication of the competencies from DigCompEdu covered by the scenario and corresponding curriculum constructs, 4) scenario objectives, 5) description of the requirements for training and learning (infrastructure, materials etc.), 6) description of the involved learning activities by outlining activity, timing, applied training methods, responsibilities of VET teacher or trainer, activities of learners, needed equipment and support, reference to DigiCompEdu, requirements for assessment of learning outcomes and relevant resources (references).

Development and content of learning scenarios for applying digitalised and open educational resources in the VET programmes of metalworking and engineering

After the brainstorming sessions and discussions with the VET teachers there have been developed 4 learning scenarios: 1) digital visualization for understand the principles of operating mechatronic systems; 2) facilitating the understanding and reading of technical drawings with the help of digital equipment and devices; 3) use of digital design software in developing the abilities of students to read and understand technical drawings, 4) teaching circular economy skills in the VET programmes related to welding.

Here we briefly present these scenarios.

1. *Digital visualization for understand the principles of operating mechatronic systems.*

This scenario is developed for VET teachers working in the field of mechatronics. It seeks to solve the didactic problem, which occurs for VET teachers in mechatronic when the VET students at the beginning of the course struggle in understanding the principles of functioning and operating of the mechatronic system. In seeking to solve this problem, it is recommended to apply simulators, microcontrollers and electro-pneumatical control equipment with visualization of the control process. It deals with the didactic problem of how to fill in the gaps of VET students' abilities and skills to understand the principles of functioning and operating of the mechatronic system. Drawing and design of electrical control circuits, control systems and other elements of mechatronic and electronic systems

is important part of training in the VET programmes of mechatronics and electronics. Here VET teachers often face the problem of the lack of basic knowledge and skills of VET students in dealing with these tasks. Traditional training methods, like lectures, learning from the books and other written resources, are not sufficiently effective and attractive for the students. Here the approach of work-based learning with usage of digital resources can provide optimal solution. This scenario helps VET teachers and trainers in developing the design skills of students by applying:

- task analysis and development of possible algorithm for the operation of the circuit;
- autonomous designing an electrical control circuit by working in teams;
- design of an electronic control system using a microcontroller.

Implementation of this scenario requires equipped mechatronics laboratory with computers, CAD-CAM or equivalent software, platforms for programming/controlling the microcontroller and monitoring its processes, simulators Festo FluidSIM Pneumatics, Cade SIMU or equivalent. The learning scenario consists of three parts (activities):

1 - Task analysis, in which students analyse the devices used in the circuit, learn about the design requirements and develop a possible algorithm for the operation of the circuit.

2 - Designing an electrical control circuit. After familiarising themselves with the requirements of the task, the students design an electrical control circuit (creating a sequence of operation (algorithm) for the devices to be triggered), create the principle electrical control circuit and check its operation using a simulator. One of the students is responsible for designing the algorithm and the other is responsible for designing the control scheme.

3 - Design of an electronic control system using a microcontroller. One of the students programs the microcontroller (generates the code and loads it into the microcontroller's memory) based on the electrical control scheme designed by the other student and the similarity between the LD language and the principle electrical scheme.

Students are assessed on their independent work or part of their work according to criteria set by the teacher. The algorithm must be designed to be executed in a consistent and logical manner. The electrical control scheme designed and tested in the simulator must be operational and constructed using a minimum number of components. The program code shall be verified and tested. This scenario encourages students to think analytically, solve problems, communicate and cooperate (students can consult with each other and solve the problems related to the tasks together).

2. *Facilitating the understanding and reading of technical drawings with the help of digital equipment and devices.*

This scenario is developed for VET teachers working in the field of engineering – installation of renewable energy devices. VET teachers in the field of engineering very often face situations when VET students at the beginning of a course struggle in understanding and reading technical drawings, schedules and specifications. Using digital technologies and devices can be very helpful in coping with this problem. Lack of the ability of VET students to understand and read electric installation drawings, schedules and specifications present a major obstacle for successful learning of vocational subjects in the fields of electronics and requires a lot of teaching time for teachers to deal with this. Therefore, VET schools very often face the didactic challenge on how to ensure fast, effective and sustainable acquisition of this knowledge and skills, especially, when the traditional “classroom” teaching methods from the books are not so effective and attractive for the students. Here the orientation of teaching and learning to the work practice and usage of digital solutions can create a real difference and provide a trustful measure to deal with this deficit of knowledge and skills. The VET teachers of Alytus VET centre successfully and effectively use the digital solutions for developing of skills needed to understand and read electric circuit drawings, schedules and technical specifications. This approach can be effectively used both in the school-based and work-based learning environments.

At the beginning of the training activity information is provided on the management and operation of electrical equipment and controls. This is followed by the task of using the principal diagram to design a working electrical circuit according to the requirements, in accordance with the next activities.

Activity 1. After receiving the task, the students analyse the task by identifying, either orally or in writing, the devices and their connections in the diagram, distinguishing the controlled device and the power circuit from the control circuit and describing the operation of the whole system.

Activity 2: After the analysis of the scheme, the scheme shall be further modelled in the simulator. The student accurately redraws the scheme on the computer and runs the simulation. During the simulation, the circuit, if connected correctly, will operate in the right way and the algorithm of the circuit (i.e. the sequence in which the devices must operate) becomes clear. The student checks that he/she has analysed the circuit well in Activity 1.

Activity 3: Once the student has worked out how the circuit works in the simulator, he/she needs to build a real circuit by selecting real components, connecting them, checking the quality of the connections with a multimeter, and then, after connecting the power supply, checking that the circuit is working properly. When the circuit is not working properly, the student performs it‘s diagnostics.

The student is assessed in this scenario on - neatly describing the circuit diagram for the task; - creating the circuit in the simulator, checking it; - constructing and operating a real circuit.

This scenario encourages analytical thinking, problem solving, communication and cooperation (students can consult with each other and solve the problems related to the tasks together).

3. *Use of digital design software in developing the abilities of students to read and understand technical drawings.*

Lack of the ability of VET students to understand and read technical drawings present a major obstacle for successful learning of vocational subjects and requires a lot of teaching time for teachers to deal with this. Therefore, VET schools very often face the didactic challenge on how to ensure fast, effective and sustainable acquisition of the knowledge and skills of reading technical drawings, especially, when the traditional “classroom” teaching methods from the books are not so effective and attractive for the students.

Here the orientation of teaching and learning to the work practice and usage of digital solutions can create a real difference and provide a trustful measure to deal with this deficit of knowledge and skills. The VET teachers of Alytus VET centre successfully and effectively use the digital design software and 3D printing for developing of skills needed to understand and read technical drawings. This scenario is based on their experience and didactic approaches and seeks to disseminate effective practice in the different contexts of training and learning. This approach can be effectively used both in the school-based and work-based learning environments. This scenario aims to develop the subject and methodological competences of vocational teachers to teach students how to read and understand technical drawings using design software (SolidWorks, AutoCAD and similar programmes) and 3D printers. Before working with digitised drawing software, students should already be able to explain simple drawings. It is very important that students are able to distinguish between lines in drawings and know what they mean (contour line, axial line, dimension lines, etc.). This activity can be carried out using both printed drawings on paper and digital drawings displayed on a whiteboard using a beamer. Once the students are able to understand the drawing of the part, the next step of the training is to design the part in 3D in a CAD environment, for example, using Solid works. It is not practical or efficient to use 3D design for simple parts, but it is very useful for more complex parts, where more complex geometric shapes intersect and the intersection points are not straight lines. Therefore, 3D design helps pupils with weaker spatial thinking. With the ability to design a part in CAD and availability of a 3D printer, it is easy to print a prototype and have it before machining or welding operations begin.

These tools are not compulsory for learning how to read drawings, but they greatly facilitate the acquisition of knowledge and, above all, compensate for the lack of spatial thinking. With a model of the part in hand, students can visually check that they have understood and done everything well. If not, they correct their mistakes, if so, they start machining the part. Most machining machines, like computer-aided CAM systems, have simulations of

the machining of the part. This is another tool to make sure that the part will be manufactured according to the drawing. For example, there can be used a milling simulator with a simulation of a milling operation on the screen. This allows a visual assessment of whether all operations have been carried out correctly and whether the part to be produced will conform to the drawing.

4. *Teaching circular economy skills in the VET programmes related to welding.*

VET teachers today deal with important changes of curricula and training processes related to the provision of knowledge, skills and competencies needed for the "circular" handling of the work processes, in applying the principles of circular economy by saving materials and consumables, reducing the consumption of energy and resulting emissions, minimizing the volume of rests and their re-usage or recycling. These competencies include both theoretical knowledge and practical know-how, highly developed practical skills which ensure smooth and flawless production process (avoiding of non-conformities), good understanding of the circulation of materials and consumables in the work processes, as well as holistic view to the whole production process and profound understanding of the role and place of concrete workplace in this process. Besides, it requires active engagement and motivation of the operator to follow the 'circular' approach of working. Implementation of 'circular' approach to work in the field of welding is highly important, when considering the environmental impacts of metalworking and metal production industry (including the huge impact to the climate change), as well as fast depletion of the main raw materials used in this sector. The role of welder and welding operator in implementing and following 'circular' principles of work is significant, despite very intensive regulation, prescriptiveness, and standardization of this occupational field. Including of circular economy related knowledge and skills in the training programmes of welding could be challenging for VET teachers because of the strict regulation and prescriptiveness of the technological processes of welding and strong attachment to the traditional work methods oriented to the maximization of the output and productivity, especially in the practical training. Digital solutions, especially digital simulations of the welding processes can be highly effective measures in such training.

This scenario seeks to develop the subject and methodological competences of vocational teachers needed to teach the "circular" performance knowledge and skills in the field of welding:

- explaining the principles of "circular" performance in the different work processes of welding;
- helping to notice and to understand the environmental and economic impact of the application of 'circular' principles in welding;
- preparing and implementation of digital teaching and training materials for the development of 'circular' performance skills and competencies in welding.

Conclusions

Application of the digitalised tools and measures significantly facilitates solution of learning problems of the VET students and can become a basis for the development of innovative learning scenarios in this field. This is particularly relevant for the VET teaching in the areas of metalworking and engineering.

Such learning scenarios can target provision of vocational knowledge, as well as development of vocational skills needed for handling of digitalized technologies at the workplaces.

References

Erasmus+ Strategic Partnership Project "Improve Digital Competences of VET Teachers and Trainers" (IDC-VET)

(2020-22). Retrieved from https://idcvet.eu/

Lee, H. and Pfeiffer, S. (2019), "Industrie 4.0 – szenarios zur facharbeiterqualifizierung und ihrer betrieblicher gestaltung", Spöttl, G. and Windelband, L. (Eds), Industrie 4.0 – Risiken Und Chancen Für Die Berufsbildung, W. Bertelsmann Verlag, pp. 171-186.

Spöttl, G., Tūtlys, V. (2020), "Education and Training for the Fourth Industrial Revolution", Journal of Technical and Vocational Education, Vol. 26 No.1, pp. 83-93. Technical and Vocational Education, Vol. 26 No.1, pp. 83-93.

Spöttl, G. and Windelband, L. (2019), "Industrie 4.0 – neugestaltung industrieller prozesse und konsequenzen für die berufsausbildung", Spöttl, G. and Windelband, L. (Eds), Industrie 4.0 – Risiken Und Chancen Für Die Berufsbildung, W. Bertelsmann Verlag, pp. 239-254.

Spöttl, G. and Windelband, L. (2021) The 4th industrial revolution – its impact on vocational skills, Journal of Education and Work, 34:1, 29-52, DOI: 10.1080/13639080.2020.1858230

Tūtlys, V. and Spöttl, G. (2021), "Disruption of qualifications in manufacturing: challenges and prospects", *European Journal of Training and Development*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/EJTD-07-2020-0121

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

ABC METHOD FOR ONLINE COURSE DESIGN- FROM F2F TO ONLINE WORKSHOP IN CROATIAN PERSPECTIVE

Sandra Kučina Softić, University of Zagreb University Computing Centre SRCE, Croatia

Tona Radobolja, University of Zagreb University Computing Centre SRCE, Croatia

Abstract

Implementation of digital technologies into the educational process is not new but has significantly increased with the pandemic of COVID-19 because of the lockdown and sudden move to the online environment. The majority of teachers do not have the knowledge and skills to know how to properly implement digital technologies into teaching and learning, and neither they have time to search for digital technologies or to learn how to use them. Therefore, organized support and training in the use of digital technologies are very important, enabling teachers to focus on the course subject and with help of trained support staff find the proper way how to implement them into their teaching. A number of training courses and workshops related to digital education are available to teachers, and one of them that has proven to be of high value is the ABC LD Workshop designed by University College London colleagues. Based on Diane Laurillards' Conversational Framework, this engaging, hands-on curriculum development workshop enables teachers to get a new perception and understanding of what an e-course could look like. Based on participation in the Erasmus+ project the ABCtoVLE and gained experience, the E-learning Centre at SRCE team adapted this workshop for the Croatian educational environment and later designed it to be held online aiming to provide teachers with hands-on, just what they need training so they can easier get around the online environment and provide a high-quality learning experience to students.

Keywords: course design, ABC learning design method, online courses, digital technologies, support to teachers

ABC to VLE project

Erasmus+ ABCtoVLE project (https://abc-ld.org/abctovle/) started in autumn 2018 and lasted for two years. The project was initiated by University College London (UCL) and brought together 12 European universities to further develop, localise and evaluate the ABC LD learning design method. The partners on the project were University College Absalon, University of Amsterdam, Dublin City University, University of Helsinki, KU Leuven, University of Milan, Sorbonne University, Tallinn University, Polytechnic University of Timişoara, VIVES University of Applied Sciences, University of Zagreb University Computing Centre SRCE and University of Oxford (associate partner). The project was coordinated by University College London. The project aimed to develop support structures to help teaching teams to implement their ABC learning designs within the local Virtual Learning Environment (VLE) or Learning Management System (LMS). The project focused on institutional adoptions of ABC Learning Design (LD), user experiences and how the designs could link to the local technical environment, particularly their Virtual Learning Environment (VLE) such as Moodle, Canvas or Blackboard.

The goal of the project was to adapt the ABC method, which will help teachers to improve their courses/modules by applying new technologies and setting them up as partially (mixed) or completely online courses while considering a whole range of aspects from pedagogical, technological, quality and support issues to cross-cultural and strategic ones. The approach generates high levels of engagement, creative informed dialogue, and group reflection about curriculum design among even time-poor academics. Extensive testing at UCL and other institutions has shown high levels of academic enthusiasm and satisfaction with the method, although it is recognised that educational effectiveness can only be determined through evaluation. Today the ABC LD method is worldwide known and implemented in higher education institutions' course design.

ABC method and ABC workshop

ABC Learning Design (https://abc-ld.org/) is a high-energy, hands-on curriculum development workshop developed at the University College London. In just 90 minutes teaching teams work together to create a visual 'storyboard'. The

storyboard is made up of pre-printed cards representing the type and sequence of learning activities (both online and offline) required to meet the module or programme learning outcomes. ABC workshop is prepared for the face-to-face environment and has proven to be highly transferable and works well to engage teachers in a large range of disciplines, and educational contexts in multiple countries. One of the outputs of the project was to further test, refine and expand this rapid-design format in partners' institutions, taking into account cultural issues, localisation and language, alignment with local institutional strategies, alignment with quality and other policies, diverse delivery and evaluation approaches, transfer to the local VLE and localised support capacity. ABC has been particularly useful for new programmes or those changing to an online or blended format. The ABC workshop was recognized as a useful way to provide teacher training on new teaching methods. The approach generates high levels of engagement and stimulates creative informed dialogue and group reflection about curriculum design among even time-poor academics. ABC was developed by Clive Young and Nataša Perović from University College London in 2014. It builds on the six learning types concept from Prof Diana Laurillard's hugely respected model of how students learn, 'Conversational Framework', described in Teaching as a Design Science (2012).

Role of SRCE in the e-learning implementation in higher education

University of Zagreb University Computing Centre - SRCE (www.srce.hr) is the oldest infrastructural institution of the academic and research community in the area of application of information and communication technologies (ICT) in Croatia. Established in 1971, SRCE is today the key institution in planning, designing, constructing, and maintenance of the computing, data and information infrastructure, the e-infrastructure for the Croatian academic and research community. SRCE is also the competence centre for information and communication technologies as well as the centre for education and support in the area of ICT application. The E-learning Centre at SRCE (www.srce.hr/ceu) is the national centre for e-learning implementation support in higher education in Croatia. Established in 2007, the E-learning Centre started its work first as the central unit at the University of Zagreb for support in the systematic implementation of e-learning. Through the years the E-learning Centre expanded its work to other higher education institutions confirming its role as the national centre. The main focus of the E-learning Centre at SRCE (ELC) is to provide accessible and sustainable support to higher education institutions, teachers and students in the use and application of new technologies into teaching and learning, ensuring and providing a generally accessible e-learning platform and joint/centralized resources required for application of e-learning and finally, but not less important, promotion and dissemination of information about e-learning. One of the first activities of the Centre was the establishment and maintenance of a university platform for e-learning. The platform is based on the Moodle open source software and is continuously upgraded according to user needs. Today, it is a virtual learning environment called Merlin, which consists of an e-learning platform, a videoconferencing system and an e-portfolio system plus it is connected to the Information System of Higher Education Institutions in Croatia (ISVU). More than 30.000 e-courses held by 10.000 teachers for almost 100.000 students per academic year are on the e- learning platform Merlin. The ELC supports users in the process of the implementation of e-learning technologies in the educational process. The team provides help for teachers in the preparation and maintenance of e-courses (blended mode or fully online), organizes training for teaching staff in e-learning technologies and course design and supports students in the virtual environment. The Centre today has 12 full-time employees who ensure continuous, innovative and efficient work of the Centre. Participation in the Erasmus+ project ABCtoVLE was a great opportunity for the ELC team to gain new insights into teachers' support in course design and to ensure the best possible support to Croatian teachers using digital technologies in the educational process.

Localisation of ABC Workshop for the Croatian Education Environment

One of the first tasks in the ABCtoVLE project, for each project partner, was the localisation of the ABC Learning Design Workshop to the native language and adaptation to the country's education environment. ABC workshop is based on the storyboard with cards representing the type and sequence of learning activities (both online and offline) required to meet the module or programme learning outcomes. One of the first activities for the ELC team, in order to translate the workshop into the Croatian language and to adapt it to the Croatian education environment, was to pass training and familiarise with a workshop as such. The training trainers were held by authors Clive Young and Nataša Perović at SRCE in December 2018. The next step was to translate all materials and documentation related to the workshop. The ELC team adapted the workshop to the Croatian environment, educational policies and practices. In preparation for the workshop, attention was paid to different groups of teachers (school teachers, higher education teachers and adult learner teachers) who could attend the workshop. The ELC team translated all workshop materials to Croatian but to ensure that the original message was kept, the cards consisted of Croatian text and in smaller print English version. All translated materials related to the ABC workshop are available on the project web pages prepared

in the Croatian language. ABC workshop was included in the portfolio of the E-learning Centre training activities for teachers (courses and workshops) in February 2019.

In order to provide additional information to teachers and all interested in the ABCtoVLE project, ELC has prepared a webpage in Croatian with all translated materials related to the ABC workshop and there regularly published the information related to the project (https://www.srce.unizg.hr/centar-za-e-ucenje/medunarodna-suradnja/abc-vle.

Figure 1. ABC cards with learning types in Croatian

Issues arising from local adoption of ABC workshop

In the translation of the workshop materials, special attention was given to learning types. In order to preserve full clarity, the English version was left on the card along (in a smaller print) with the Croatian version. Also, translated cards were distributed to several teachers to get feedback on an understanding of each learning type definition in Croatian. Along with that, during the first few workshops held by the ELC, participants were asked to give comments on the description of learning types in cards. As a result, some smaller adjustments to learning types definitions were made. For the majority of the materials, several adjustments were made that were necessary to adapt to the Croatian education environment and policies. One of the materials that had some significant changes was the Course Information Sheet (Fig 2.). As teachers in Croatia rarely use Twitter, it was changed to the course's short description (in Croatian- sažetak kolegija). Moreover, ECTS points or the number of course hours were added so that teachers have a better overview of the organization of the course and planned student workload as teachers sometimes lose the idea of student workload on the course and make it more demanding than it should be based on the set ECTS points. One more addition to the Course Information Sheet was list of learning outcomes (in Croatian- ishodi učenja) with the aim to help teachers make better Learning Outcomes definition and, secondly, to easier align them with learning activities and assignments, especially those designed in online learning environments (Gil-Jaurena, Kucina Softic, 2016).

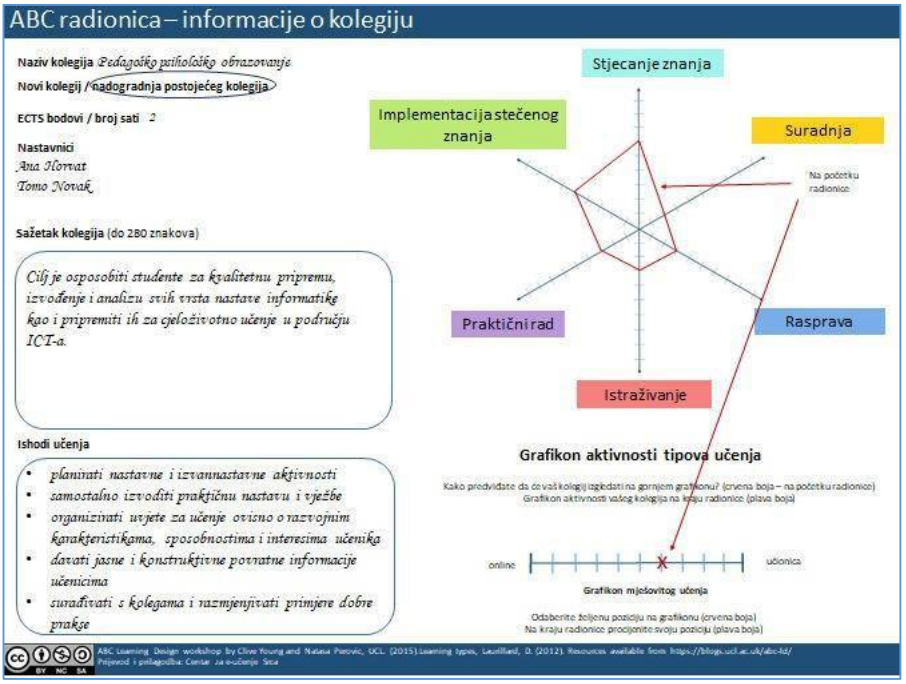

Figure 2. Course Information Sheet adopted for Croatian version of ABC workshop

In the end, the duration of the workshop was extended to 120 hours instead of 90 minutes as originally planned for the workshop. Based on participants' feedback it was the appropriate time (only a few teachers considered the workshop to be too short). Some slight changes were made in a presentation held at the beginning of the workshop in order to adapt it to our environment. The ELC has been working with teachers, providing consultations and support in the development of e-courses, so the workshop leaders made these adjustments to tailor the workshop in order to better meet the needs of the teachers.

ABC workshop

The first ABC LD workshops in the Croatian language started in February 2019. These were face-to-face workshops at the SRCE premises for 25-30 people. Each workshop was held by two workshop leaders for such a number of participants. Participants are divided into 5-6 groups, each group working on the design of a course, either an existing one or an imaginary one. Workshops were organised in two ways:

- Workshop with an open invitation: teachers from different institutions and with different subject backgrounds can enroll (quite heterogeneous groups)
- Workshop upon invitation by the institution: teachers are from the same institution but from different subject areas (more homogenous groups)

Students participated in some workshops as well, and they preferred to be working as a student group, not mixing with teachers. Participants at workshops were dominantly working on existing courses, but the groups were too heterogeneous, workshop leaders provided examples of courses that would be of interest to all participants like academic integrity, research methods or some other general topic. ABC workshop was really well received, and during 2019 and at the beginning of 2020 eight workshops were held with 167 participants. The average grade of the lecturer`s presentation quality and engagement for these workshops was 4,83 out of 5 and the average grade for workshops, in general, was 4,63 out of 5. Information about the ABC workshop was soon disseminated outside the Croatian border, so the workshop was held very successfully in Slovenia and Bosnia and Herzegovina as well. Then in March 2020, all planned workshops were cancelled due to the pandemic and lockdown.

Moving online with workshop due to the pandemic

When the pandemic hit, the first task of the ELC team was to ensure high-quality and easily accessible support to users – higher education institutions, teachers and students. It was of utmost importance to ensure the continuation of the learning process and the end of the academic year 2019/2020. In July 2020, the ELC team started to think about how to design the ABC Workshop for the online environment. Several attempts were already in progress by ABCtoVLE project partners and the idea of the Dublin City University (using Microsoft Excel as Storyboard) was chosen as suitable, and then further designed and developed. For the learning environment in the online ABC Workshop, the ELC team chose the videoconferencing system Adobe Connect as it was available at the SRCE, Microsoft Excel for Storyboard, learning cards and the Course Information Sheet. All course materials were put in the ABC e-course in Moodle and was available to participants before the workshop, so they can familiarize themselves with the topic and could have clearer expectations of the workshop. The number of participants in an online environment was reduced to 12-15 with two workshop leaders. Adobe Connect has breakout rooms so participants were divided into two groups, one led by each workshop leader after the first part of the workshop with an introduction presentation (Fig 3). The duration of the workshop was extended to 3 hours with one break for 15 minutes. This is an interactive online workshop as teachers are working on the design of the course, like in the f2f workshop, but now online. Workshop leaders work with participants in each breakout room, ensuring that all participants are engaged, supporting them in their discussion and ensuring that they are not passive and silent participants, but active and engaged in collaboration with others to design a course. This is highly demanding for the workshop leaders as they have to be fully engaged and concentrated for 3 hours. It is not easy to engage participants online for such a long period of time. Participants' feedback on the duration of the workshop is that is of appropriate length with about 5% of replies that it is too short.

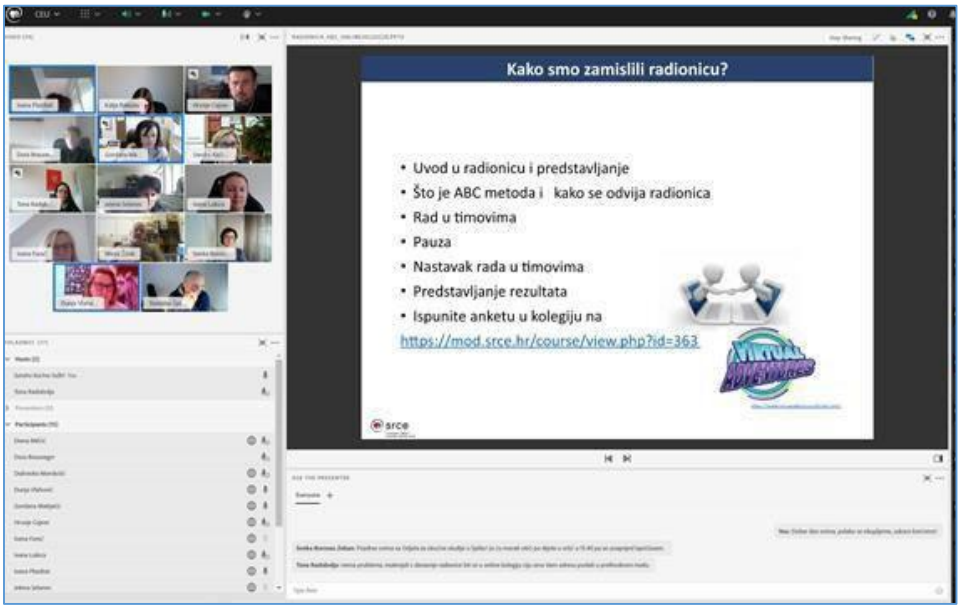

Figure 3. Online ABC workshop

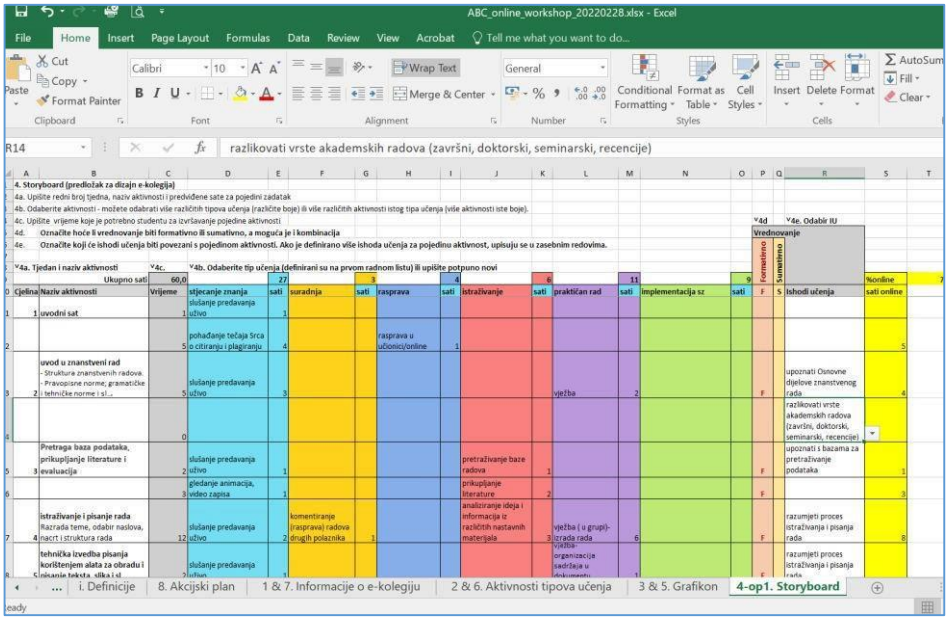

Figure 4. Storyboard in the Excel in online ABC workshop

As the storyboard is developed in MS Excel, it was decided that workshop leaders fill in the excel sheets with information dictated by participants (Fig 4). After the workshop, the excel sheet is added to the ABC e-course in Moodle and all participants can access it and use it further for their purposes. In order to avoid technical problems in the use of videoconferencing systems, participants got instructions in advance on how to make tests to ensure that there are no technical issues so technical problems were minimised. At the beginning and at the end of the workshop participants were asked to turn on their cameras so that they can familiarise with each other. Project leaders have cameras on all the time. Also at the beginning of the workshop, all participants introduce themselves in a way that they say their name, institution, subject they teach, and the reason why they chose to attend the workshop. This is something that was introduced to the online workshop in order that participants better acquaint with each other and with workshop leaders and to provide a collaborative atmosphere. During the workshop participants can leave on or turn off their cameras, as often they do not have high-quality equipment or a good Internet connection. The preferred way of communication in the workshop is oral communication, but sometimes participants had issues with a microphone so they used the chat, or some participants preferred chat as a way of communication and could better express themselves in that way. The first online ABC workshops started in September 2020. It was tremendous stress for workshop leaders to hold the first few online workshops, as teachers already have been stressed by moving to the online environment and being online all the time. The biggest issue was would online workshops ensure their collaboration and engagement as in a physical environment. But positive feedback and growing interest in the workshop, outgrow the stress and fear, and with some fine-tuning, it was a great success. Another positive outcome was that with the online workshop teachers and educators from all over Croatia could attend it. Along with that, higher education institutions asked for the ABC workshop as a part of training in digital skills for their teachers. After each workshop teachers were invited to fill in the survey which is in the ABC e-course, it is on a voluntary base and this feedback is important for workshop leaders for further improvement of the workshop. A certificate of attendance and digital badge is also available in the ABC e-course. The average grade of the lecturer`s presentation quality and engagement for these workshops was 4,91 out of 5 and the average grade for workshops, in general, was 4,83 out of 5. Up till April 2022, 22 online ABC workshops were held for 290 participants.

Some of the comments from participants in the survey:

Only praise, I will implement the acquired knowledge in existing courses. Thank you!

Excellent workshop, very useful and interesting, well prepared and done!

Thanks for the new perspective on course planning.

This should be mandatory education for teachers at UNIZG

Practical and focused. And I hope to have the opportunity to repeat the workshop together with some of my colleagues in the group so that we can work together on the redesign of the existing courses.

It was interesting for me to see how the exercises from the lectures can be done just as successfully online.

There are some comments referring to the technical issues as sometimes participants' camera or microphone did not work as they did not do the testing before the workshop so they had difficulties in getting around Adobe Connect or they had issues with an Internet connection.

ABC workshop face-to-face or online- conclusion

There is no question that the ABC workshop developed by Young and Perović is well designed and just what teacher needs when implementing digital technologies into the education process. ABC workshop is originally designed for a face-to-face environment engaging participants in designing courses with a different perspective than they are accustomed to. Working in groups participants discuss among themselves how to design courses using cards for learning types and that is a big plus as usually, teachers are working on their own on the development of courses. Workshop leaders are facilitators enhancing participants' discussion and answering the participants' questions. Communication is easier as this is a physical environment, and it is left to participants to decide how much they will engage during the workshop. The online ABC workshop has been designed a little bit differently. Based on experience in working with teachers, the ELC team decided to work jointly with teachers on course design full-time. It may seem unnecessary but teachers do not have much time and when they decide to find 3 hours for a workshop, they want a full package covering all topics and workshop leaders ready to answer all their questions and doubts and help them with their courses. Yes, it is more demanding and requires full-time attention, but feedback from teachers is very positive and surveys are showing even better results than for the ABC face-to-face workshop. In October 2021, as the situation with COVID-19 was better, one face-to-face workshop was held again. Having experience with both forms of the workshop, it can be concluded that the ABC workshop is certainly well received and just the right workshop for teachers and educators wishing to set new learning designs for their courses. Nevertheless, the form of delivery, the ABC workshop can help teachers and it should be part of compulsory training activities for all those engaged in the design of the teaching and learning process. At this moment, workshop leaders find the online version more appropriate and accessible for Croatian teachers although more demanding for performing.

References

ABC LD (2020). ABC LD Toolkit. Retrieved from (https://abc-ld.org/)

Erasmus + ABC to VLE (2018). Erasmus+ Project site retrieved from (http://ab c-ld.org/abc-to-vle/)

Erasmus + ABC to VLE (2018). Erasmus+ Project site in Croatian retrieved from (https://www.srce.unizg.hr/centar-za-e-ucenje/medunarodna-suradnja/abc-vle)

E-learning Centre at SRCE (2022). Retrieved from (https://www.srce.unizg.hr/ceu)

Gil-Jaurena, I., Kucina Softic, S. (2016). Aligning learning outcomes and assessment methods: a web tool for e- learning courses. *Int J Educ Technol High Educ* 13, 17. https://doi.org/10.1186/s41239-016-0016-z

Laurillard, D. (2002). *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies*. 2nd edition. London: RoutledgeFalmer.

Laurillard, D. (2012) *Teaching as a design science: Building pedagogical patterns for learning and technology*. London: Routledge.

University of Zagreb University Computing Centre. Retrieved from (https://www.srce.hr)

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

CREATIVE AND CULTURAL ENTREPRENEURSHIP CURRICULA AND LEARNING FRAMEWORK

Vlad Mihaescu, Politehnica University of Timisoara, Romania,

Diana Andone, Politehnica University of Timisoara, Romania,

Nicolae Bibu, West University of Timisoara, Romania,

Mihai Lisetchi, West University of Timisoara, Romania,

Sabine Vareta-Pekarz, incorporate future KG, Austria,

Anastasios Ntabizas, South-East European Research Centre, Greece,

Adrian Solomon, South-East European Research Centre, Greece

Abstract

This paper describes a work in progress where we present parts of the outputs of the TraCCE project, mainly the training needs analysis results, the curricula development and the learning framework and methodology. There is a clear lack in educational programs and courses related to creative and cultural entrepreneurship, identified by previous European studies, and previous training needs analyses. Therefore, the results of this project are bridging these gaps, offering potential solutions to professionals in the CCE field. The TraCCE project is aligned with the goals of Strategic Partnerships for academia-market-society collaboration and the promotion of innovation and best practices, of providing open education and innovative practices in a digital era, with the Headline Education Target and with the EU Higher Education Modernisation Agenda by providing incentives for higher education internationalization, market-oriented curriculum development, and co-creation with business through integrated features that will lead on the long term to better involvement and support from the market side to academia.

Keywords:

Creative Industries; Creative and Cultural Entrepreneurship; Learning framework; Learning methodology.

Introduction

Creative and cultural entrepreneurship (CCE) is deemed to innovate the traditional outdated startups with new models, new practices, and new governance structures in which the role of society will be enhanced in order to boost social cohesion, mitigate groups at risk and create new job opportunities. On top of this, CCE brings direct added value to promoting culture, cities, places and thus tourism, with an imminent impact on active citizenship and inclusive societies (Abbing, 2016). Nevertheless, there is limited evidence of emphasis being put on CCE in Europe overall. Training and education are crucial determinants of strong competitive advantage and profitability, influencing entrepreneurship and innovation in the creative and cultural industries in European and developing countries, too. Higher education institutions (HEIs) are playing a key role in shaping the next generation of CCE by providing the necessary training aimed at building the proper skills of potential cultural and creative entrepreneurs to achieve a proper startup and scale up with their idea, not being limited only to the startup stage. This is of critical importance within the European Union as most startups do not achieve a proper scale-up stage, widely due to lack of proper training to access the required resources and networks that would ensure the scale up. At this stage, in the field of CCE, such co-creation is widely absent – justifying thus, firstly, the limited CCE course offerings within European HEIs, and secondly, the lack of effectiveness of the existing (few) courses in terms of yielding successful CCE.

Therefore, the Community Enabled Open Training on Creative & Cultural Entrepreneurship (TraCCE) project adopts a transnational and multi-stakeholder approach in order to build a think-tank in CCE through a cross-country blending of complementary expertise towards developing (through open innovation and quadruple/quintuple helix co-creation): a higher education CCE Curriculum and a CCE Train the Trainers Toolkit that will be offered to the

CCE community (open access) through a virtual learning environment and piloted through four international workshops.

The TraCCE project builds upon the following CCE skills in order to mitigate the confirmed skill-gap: CCE Opportunities and Idea Identification, including: CCE market opportunities identification, CCE pre-seed development, CCE business models for start-ups, developing partnerships/networks among creative and cultural entrepreneurs, sustainability and responsibility of creative and cultural entrepreneurs, CCE Scale-up and globalisation strategies (the notion of scale up is of top priority for the EU startup scene), next-generation trends for creative and cultural entrepreneurs, CCE case studies, including real life CCE examples, good and best practices. Such skills include also advanced digitalisation abilities.

Training needs analysis

One of the first activities of the project was to perform a large-scale training needs analysis (TNA) confirmation of the existing skill gaps in CCE among the quadruple helix stakeholders in each country. The reason for this was for the CCE curriculum to be tailored around those skill groups by considering the needs of students/graduates, academics, industries, entrepreneurs, and industry as well as of the quadruple helix.

An online questionnaire was created with 15 questions (both mandatory and optional) and an estimated completion time of 15 minutes. The questionnaire was distributed and disseminated by the project partners in their networks, particularly in their own countries. 205 answers were gathered in Spring 2021, most of them from the partners' countries: Romania (30.2%), Austria (24.9%), Germany (21%) and Greece (18.5%). The respondents were coming mainly from NGOs, companies, educational institutions (mainly HEIs) and public institutions. Participants were also asked in which area they work, focusing mainly on the creative industries sectors. 51.2% of respondents were coming from the education/research sector, 23.4% from music, dance and performing arts, 19.5% from advertising and marketing, 17.6% from design (product, graphic and fashion design), 15.1% from Film, TV, video, radio and photography and the rest have lower representations distributed amongst the remaining creative industries sectors.

Part of this questionnaire was related to finding out if several topics are useful in education and training for the Creative Industries today, and the results can be seen in Figure 1. With various degrees, most of the answers consider the CCE Opportunities and Idea Identification, CCE Start-up, CCE Scale-up and Exit strategies, CCE Case studies as useful or essential topics for CCE.
Among them, CCE Scale-up and Exit strategies is considered less important, which could be explained by lack of knowledge of the importance of these areas or lack of understanding of the concepts.

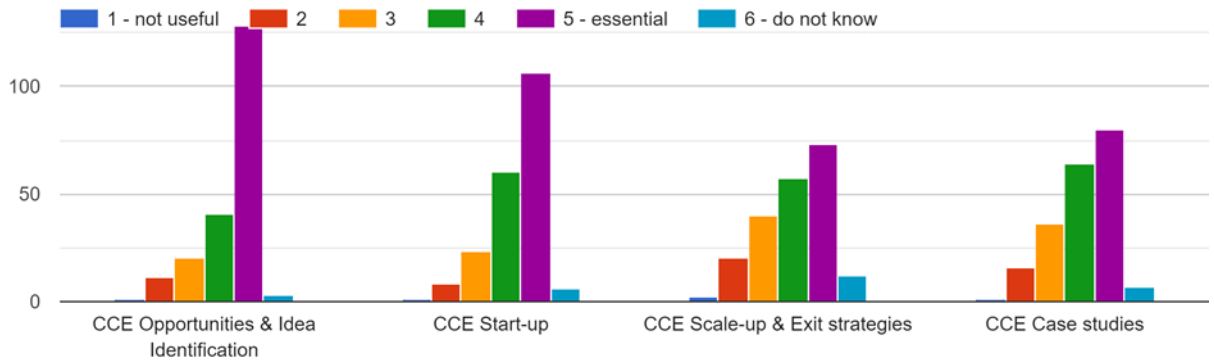

Figure 6. Evaluation of usefulness of several topics related to education and training in Creative Industries

Next, we analysed the usefulness of several subtopics of the 4 main ones, in order to further develop the curricula for the course developed inside the project. For CCE Opportunities and Idea Identification we evaluated CCE market opportunities identification and CCE pre-seed development, with results presented in Figure 2.

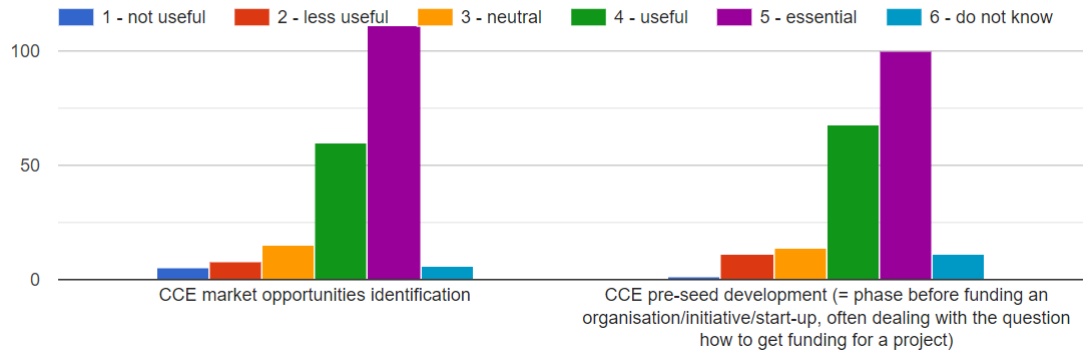

Figure 2. Evaluation of the relevance for different aspects of the subject "CCE Opportunities and Idea Identification"

For CCE Start-up we evaluated CCE business models for start-ups, CCE business models for developing partnerships/networks among creative and cultural entrepreneurs, funding and finance, risk management, organizational volatility, sustainability and responsibility of CCE. Results can be seen in Figure 3.

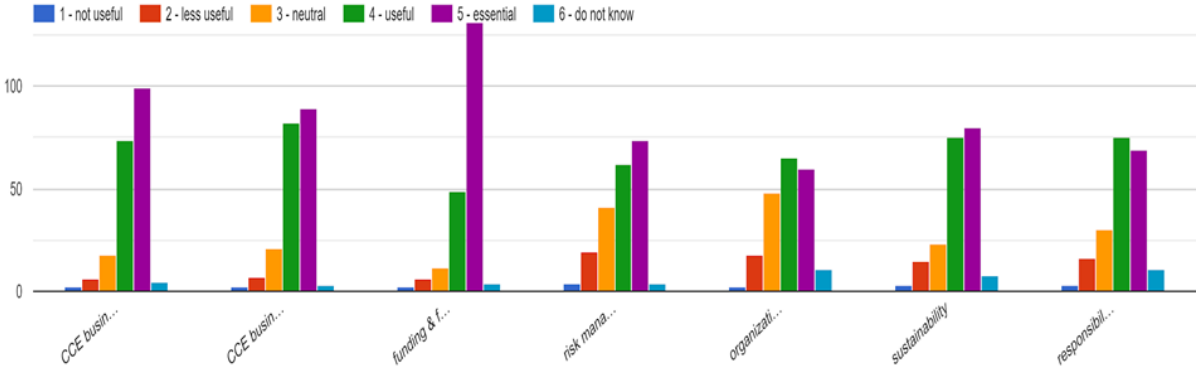

Figure 3. Evaluation of the relevance for different aspects of the subject "CCE Start-up"

For CCE Scale-up and Exit strategies we evaluated CCE scale-up, patenting, exit and globalisation strategies, scaling models and cycles and next-generation trends for CCE. Results can be seen in Figure 4.

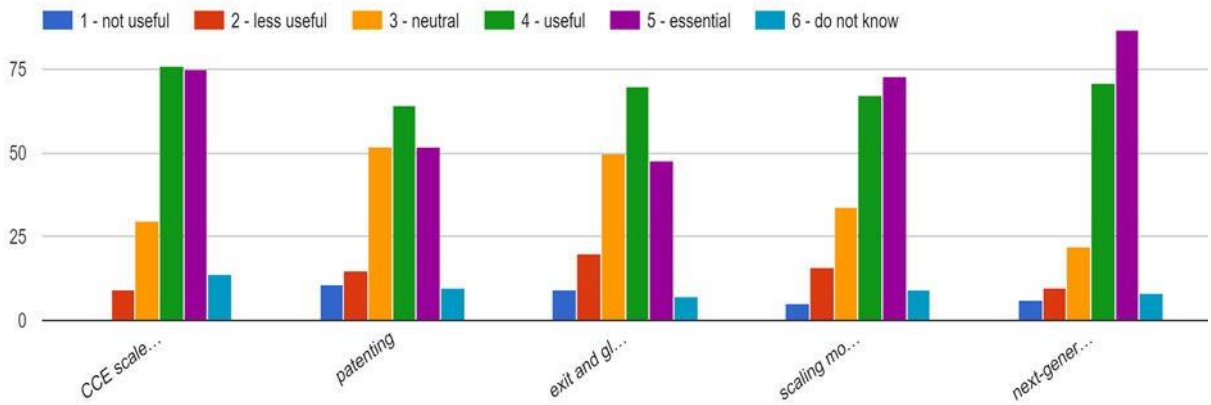

Figure 4. Evaluation of the relevance for different aspects of the subject "CCE Scale-up and Exit strategies"

Finally, for CCE Case Studies we evaluated real life CCE examples and good and best practices. Results can be seen in Figure 5.

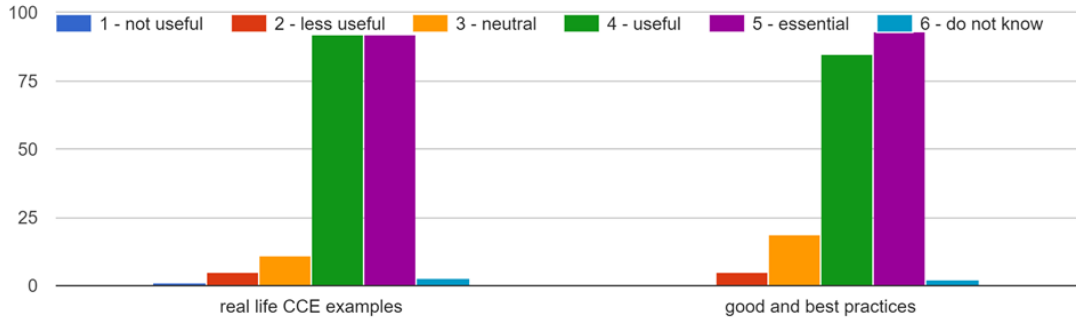

Figure 5. Evaluation of the relevance for different aspects of the subject "CCE Case Studies"

Most of the answers consider the relevance for different aspects related to CCE Opportunities and Idea Identification, CCE Start-up, CCE Scale-up and Exit strategies, CCE Case studies as useful or essential topics for CCE. “Funding and finance” and “CCE market opportunities identification” are considered the most important, “risk management” and “exit and globalisation strategies” are considered less important. Part of this finding is in line with one of the problems stated in the project: this is of critical importance within the European Union as the majority of start-ups do not achieve a proper scale-up stage and this is widely due to lack of proper training to access the required resources and networks that would ensure the scale up.

62.4% of respondents took part in at least one online course in a MOOC platform. Of these, 49% finished the course. The main reason for those not finishing the course was the lack of self-motivation (43.3%) followed by the fact they could not meet schedule or deadlines (33.3%). Other answers were lack of interaction (23.3%), content and quality of learning not good enough (21.7%), lack of personal support from tutors or teachers (13.3%), no/little relation to/ benefit for my real life challenges (13.3%), completion certificates not offered (10%), course content too difficult (10%), assessment and evaluation activities too difficult (8.3%), pre-course information unclear (5%), technical requirements too high (5%), and unclear how to use the course materials (3.3%).

78.5% of respondents do not know of any online courses specifically designed for creative industries professionals in their countries. Therefore, there is a big need/opportunity for online courses specifically designed for creative industries professionals.

Furthermore, the participants were asked if they think online courses can improve digital skills for creative industries professionals. 43.4% of them consider this to be true to a great extent, 49% believe online courses could somewhat improve digital skills, 5.6% think this is very little the case and 2.1% believe online courses do not improve at all digital skills for creative industries professionals.

Relevant advantages of online surveys include accessibility, design flexibility, presumed honest responses (due to anonymity), and simple data analysis. The two key disadvantages of online surveys concern the generality and validity of their results. The generality of the results is clearly restricted to those who are keyboard and Internet literate—currently only a third of the population. Meantime, online surveys commonly suffer from some serious methodological limitations: the population to which they are distributed cannot be described, and respondents with biases may select themselves into the sample. Research is of value only when the findings from a sample can be generalized to a meaningful population.

CCE Curriculum development

The CCE Curriculum contributes to shaping the next generation of CCE entrepreneurs and shaping the skills of existing ones.

Methodology of drafting the TraCCE Creative and cultural entrepreneurship curriculum proposal

The first draft (1.0) of the curriculum proposal was grounded in the results of the Benchmarking of CCE curricula/programmes study, developed by the members of the TraCCE project consortium. A second version of the draft (2.0) was created by calibrating the first draft with the TraCCE project partner entrepreneurship dedicated courses. A third version of the draft (3.0) was created by calibrating the second draft with the results of the CCE training needs analysis, presented in the previous chapter. A fourth version of the draft (4.0) was created by calibrating the third draft with EntreComp: The European Entrepreneurship Competence Framework (European Commission. Directorate-General for Employment & Inclusion, 2017), the most comprehensive model for the entrepreneurial education. The version 5.0 was created based on the comments of the members of the project consortium. The version 6.0 was created based on the revisions made during one transnational project meeting of the project consortium. The last version of the proposed syllabus is as follows:

1. **Introduction**	
Building up entrepreneurial attitudes and competences	2. Entrepreneurial personal motivation. 3. Entrepreneurial teams. 4. Entrepreneurial effective communication. 5. Cooperation and partnerships (Co-creation). 6. Creative problem solving
CCE Opportunities Identification and Business Idea Generation	7. Customer Discovery and Opportunity Identification. 8. Creative Business Idea Generation and Early Prototyping. 9. Business model generation
CCE Start-up	10. Business plan. 11. Testing the Minimum Viable Product. 12. Implementing the business plan. 13. Managing cultural organizations
CCE Scale-up and Exit strategies	14. Evaluating the "scaleup" perspective of CCE startups after the consolidation stage. 15. Scaleup process. 16. Entrepreneurial ethics

Table 1. Proposed syllabus

Approach to the training process: a hands-on approach through action and reflection, based on the theoretical knowledge on CCE. Learning by doing. Participants will develop the competency to think and act entrepreneurially in order to advance the development of their cultural enterprises.

Learning framework and methodology

Co-creation among quadruple helix stakeholders in the TraCCE project will be capitalized through transnational workshops. Many training programs teach the skills and knowledge that classic business economics provides. Whether it's financing, legal requirements, accounting, operations, marketing or sales - there are well-designed programs on these topics.

However, in our environment it can be observed that CCE oriented start-ups or even classical enterprises (crafts, gastronomy, classical services) access these programs much more naturally than the CCE sector does. Here is a gap to fill, because e.g. marketing and sales in the CCE area requires other approaches and strategies.

However, a generally less focused topic at the foundation is the development of an entrepreneurial mindset. But entrepreneurial thinking and acting (including scaling up) is of crucial importance in the founding and running of a company. Again, there is often a lack of sensitivity to the issue in CCE. The acquisition of this mindset supposes a willingness for personality development and needs a framework that allows reflection and feedback.

A quadruple helix oriented research design means a multi-dimensional orientation in terms of co-creation. All relevant stakeholders of the outlined project should be involved in the development process. In the case of our project this means:

Government (e.g. public cultural funding, cultural department);

Society (people who are interested in cultural offers);

Economy (people doing something actively in the field of CCE and think about doing it in an entrepreneurial way);

Education (knowledge transfer and state of the art support).

Co-Creation is a methodological principle of design processes which aims to develop stakeholder-centred solutions/prototypes. The central role is played by the input of relevant stakeholders regarding various process steps. Following a Co-Creation approach means to interact with relevant stakeholders' due interviews, workshops and other development setups. For the TraCCE project, a multidimensional Co-Creation approach is needed to involve all stakeholders of the outlined quadruple helix.

The methodology, presented in Figure 6 builds the guidline for developing a stakeholder-centred product following the Co-Creation principles. In terms of our project, the methodology covers three main phases including severeal steps within:

Phase I – Pre-Phase: (1) Comming up with an idea; (2) Analysing the current state; (3) Reflect and build a vision.

Phase II – Content Phase: (4) Prototyping; (5) CCE-Output Development; (6) Multi-Stakeholder-Reflection.

Phase III – Feasibility Phase: (7) Individual Feasibility Analysis for Rollout.

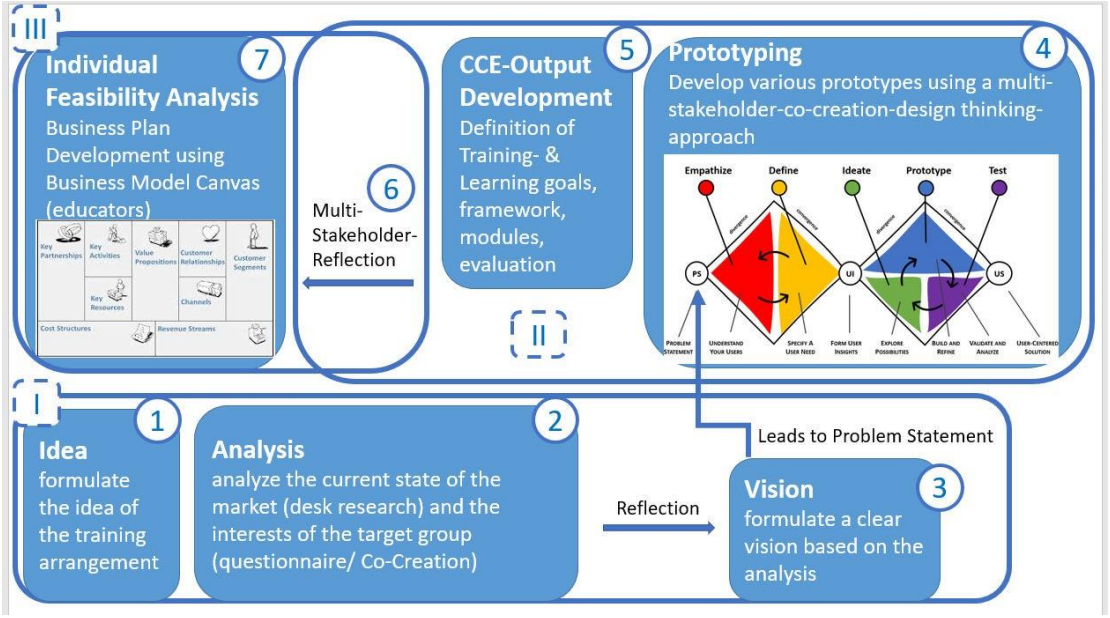

Figure 6. Methodology of the learning framework

Conclusions

After analyzing the results of the large-scale training needs analysis which confirmed the existing skill gaps in CCE among the quadruple helix stakeholders in each country, especially highlighting the lack in scale-up and exit notions, the project consortium developed the CCE curriculum tailored around those skill groups, also taking into account the benchmarking reports created by the consortium.

The CCE proposed syllabus consists of 5 main topics – Introduction, Building up entrepreneurial attitudes and competences, CCE Opportunities Identification and Business Idea Generation, CCE Start-up, and CCE Scale-up and Exit strategies and 16 subtopics.

Based on all these information, the consortium developed the learning framework and methodology which was used for the workshops in the project. Results of these workshops and final adjustments on the process will be presented in future work.

Acknowledgments

This study is partly financed by the Erasmus+ program, through the project Community Enabled Open Training on Creative & Cultural Entrepreneurship - TraCCE, ", ref. 2020-1-RO01-KA203-079950.

References

Abbing, H. (2016). *Rejection of commerce in the arts, draft of Part III of my forthcoming book the art period, on the changing*. Amsterdam: Amsterdam University Press.

European Commission. Directorate-General for Employment, S. A. & Inclusion. (2017). *EntreComp: The entrepreneurship competence framework*.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

THE PSYCHOLOGICAL, RELATIONAL, AND DIGITAL DIMENSIONS OF TEACHING AS FUNDAMENTAL 21-ST CENTURY EDUCATIONAL SKILLS: A PERSPECTIVE ARTICLE

Limone Pierpaolo, Learning Science Hub, Department of Human Sciences, University of Foggia, Italy

Ragni Benedetta, Learning Science Hub, Department of Human Sciences, University of Foggia, Italy

Toto Giusi Antonia, Learning Science Hub, Department of Human Sciences, University of Foggia, Italy

Abstract

Teachers are among the primary players in educational settings as they provide student-centered services and improve students' adjustment. While students might be skilled in different areas, they require the teachers' guidance to reach excellent results. Therefore, investing in teacher training and preparation is essential to sustain students' future development. Literature shows that learner achievements primarily rely on teacher motivation, sensitivity, and competence. Teachers with these skills are more likely to get better performance and academic goals and, consequently, foster the educational sector of their country. Research demonstrates that teachers' psychological and relational competencies are among the main and fundamental aspects that need to be considered when determining the successful implementation of education. In addition to this, initial teacher training should also foster teachers' digital competencies as opportunities not only to improve students' educational outcomes but also for sustained, learning-oriented interactions between teachers and students. The main aim of this perspective article is to explore the most recent literature that shed light on these fundamental 21st-century teaching skills, highlighting them as protective factors not only for students learning processes but also for their emotional wellbeing.

Keywords:

Teacher-student relationship; student psychological dimensions; pedagogical relational teacherships; teacher digital competencies.

Introduction

Although teachers are recognized for their capability to convey knowledge and skills to students, it is essential to realize that they must undergo a learning process to acquire the skills that will make them efficient in their educational work. Teacher education can be defined as a research, training, and education program that refers to how individuals are taught fundamental skills to become effective teachers. Today, teacher education encompasses three critical factors: teaching skills, professional skills, and sound pedagogical theory. Teaching skills are the different skills that teachers must possess to ensure the learning process is functioning correctly (Zhao, 2022). To help teachers acquire teaching skills, training provides them with various practical techniques to foster their planning and organizing abilities. Better teaching skills provide the necessary reinforcement to students, lead to an effective assessment, better classroom management, and a better understanding of the needs of different learners. They also enhance communication skills between teachers and their students, improving how information is disseminated. Appropriate instructional materials are also crucial while providing the required teaching skills. Sound pedagogical theory refers to the psychological, sociological, and philosophical aspects teachers must understand and consider when dealing with students. It promotes a clear understanding in teachers of how practicing the teaching skills promotes the educational development of students and how it relies on their specific needs and preferences related to the learning process. Finally, professional skills could be defined as approaches, techniques, and strategies that would ensure teachers grow as professionals and provide their appropriate influence skills and knowledge to the learners. Professional skills dictate the conduct of different teachers and the approaches they must take in different situations (Worrell, 2014). They include computer, digital, interpersonal, soft, counselling, management, knowledge, and, most importantly, lifelong learning skills. The merging of teaching skills, sound pedagogical theories, and professional skills would ensure an effective influence of teachers' appropriate knowledge and skills on students. While learning these skills, educators become more aware of their roles and responsibilities in guiding learners to be responsible

and productive future citizens. While on the one hand, effective educational training should also allow teachers to develop relational skills and to be empathic, reflective, and mindful of students' thoughts and behaviors because the psychological understanding of learners is the first step in providing a practical learning experience to students and discovering new ideas and ways of managing learning processes; on the other hand, initial teacher training should also foster teachers' digital competencies as opportunities not only to improve students' educational outcomes but also for sustained, learning-oriented interactions between teachers and students (Jin & Harron, 2022). The main aim of this perspective article is to explore the most recent literature that shed light on teachers' psychological, relational and digital skills, three fundamental 21st-century teaching skills, highlighting them as protective factors not only for students learning processes but also for their emotional wellbeing.

The psychological dimension of teaching

Understanding students' psychological dimensions is fundamental to know the best educational and relational approaches that can be implemented to guide them. According to the literature, highly skilled teachers can analyse and sensitively comprehend students' psychological dimensions and characteristics (Stamp, 2019), the management of classroom dynamics, students' self-determination, motivation, and peer relationship and collaboration. Therefore, psychology can assist teachers in refining instructional methods and creating learning environments that are rich and engaging. The central role of psychology in educational contexts is to give teachers a better understanding of their students' learning history, social and environmental contexts in which they live, motivation, and their strengths and weaknesses. Educational psychology informs teachers' strategies in the classroom, making the learning process easier and more interactive among students (Narciss & Zumbach, 2022). Thus, through educational psychology, teachers can better understand the vital principles of human behaviour that positively impact students' learning process. Moreover, they can acquire the ability to use assessments and measurements appropriately to align with students' different needs and preferences and, consequently, determine where students are in their learning, fostering the achievement of high academic outcomes. The American Psychological Association (APA) provided a report in 2015 that showed the most important principles of psychology in the teaching environment. The report revealed that students' perceptions of intelligence and abilities significantly impacted their cognitive functioning and learning (Stamp, 2019). The students' perceptions strongly affected their learning and performance: those who believed they were not good enough in the class had poor grades than those who showed higher motivation levels. Moreover, those that believed they were good enough had better grades and found the learning experience more fruitful than those who had negative perceptions of education (Stamp, 2019). The APA report also stated that the basis of fruitful learning was what students already knew. Before entering any classroom, students have already acquired knowledge from their interactions inside their proximal and distal developmental contexts. Thus, teachers must understand a student's learning history to adapt their educational strategies to the present (Stamp, 2019), determining what is more suitable or applicable in the learning environment before beginning the educational process. Another essential aspect that educational psychology underlines is that the general stage of development of students does not always correspond to their cognitive level. It is important to realize that the different life stages do not always determine a student's capability to grasp certain concepts (Stamp, 2019). When teachers understand this, they become more aware of what students are effectively capable of achieving and can support them in generalizing what they have learned. One of the most critical functions of educational psychology, indeed, is supporting teachers in fostering the generalization of learning processes in students; teachers must help students not only in acquiring new knowledge and skills but also in understanding how to use them in different contexts of their daily life (Narciss & Zumbach, 2022). The generalization of the learning processes happens only when supported by a high-skilled teacher who can guide and scaffold students in this. Another important aspect of learning is a clear, timely, and explanatory response to students from the teacher. Teachers' characteristics and beliefs can also impact students' performance. For example, teachers with positive expectations about their students are more likely to promote better performance than teachers with negative expectations (Çetin & Eren, 2022). Finally, it is of great importance to realize that the emotional well-being of students affects their learning outcomes. Students that face emotional challenges in their social and family lives might not perform as expected. Often, teachers are unaware of these difficulties, making it easy to think that a particular student has not studied and acquired the cognitive skills to perform well. Challenges and various emotional problems shape the learning process. Training should also help teachers to recognize the signs of a student undergoing emotional problems to formulate better ways of supporting them.

The relational dimension of teaching

Educational relations between teachers and students seem to be a major concern in the 21st century, mainly due to the changing times and trends in teaching. The relational perspective in teaching acknowledges that students are different from one another, and educational activities should be adjusted according to their capabilities. Thus, teacher training should inform future educators that learners are unique and possess different capabilities that might affect their academic performance (Ljungblad, 2021). Traditionally, educational knowledge and perspectives have mainly focused on a single individual or a collective group of people, but the relational teaching perspective offers a third alternative that seems to be more effective and fruitful: it shifts the spotlight from people, groups, and practices onto the different relationships that might help build the educational sector. Furthermore, this relational perspective could be seen as an integral part of the wider theoretical framework of inclusive education. Inclusive education recognizes the potentiality of differences among learners. Barriers like race, ethnicity, gender, and other cultural differences can negatively influence learning. By fostering a good relationship with their students, teachers can understand their varying needs and preferences and consequently, provide a student-centered approach to learning that can ensure these differences do not hinder a successful learning process (Bell, 2022). In this kind of teaching, educators ensure they focus on the unique attributes of different individuals to enable them to speak their own voices and emerge as unique persons. The relationships among individuals are fundamental to their lives. Scholars argue that the relationship between teachers and students is what determines academic success for most learners. Teacher-student relationships that are well balanced and monitored are likely to lead to greater academic performance (Ansari et al., 2020). Understanding the relationships between teachers and students is therefore critical for developing a fruitful learning experience. Teachers are required to undergo an extensive learning process before they can understand how to deal with different students. Once teachers better know their students, they can design instructions and change them according to students' interests and characteristics. For example, teachers can adopt a mix of group work, independent or pair-work to accomplish students' needs, they can use technology to enhance motivation further, or incorporate art. Students that are actively engaged by their teachers are likely to perform better. Teachers can also motivate by giving students ownership of their environment, involving them in developing the guiding principles of the classroom community, and in setting goals. From a developmental perspective, having teachers who are actively involved in students' academic work and their social lives leads to better performance and interactions in schools (Ljungblad, 2021). As students engage more with their teachers, they develop confidence and trust in them, which improves the learning process. It is also crucial to realize that teacher-student relationships should not only focus on academic success. Other aspects need to be well considered, like students' social lives and their interactions with other people. For example, it is critical to understand how students interact with other people. The relationships with others, including peers, are necessary for promoting high academic performance. The other effective way teachers can help develop students is by allowing them to explore, fostering their curiosity by choosing some of the things they prefer to work with. While teachers are meant to be guides, sometimes it is necessary to understand what students think or what they might prefer exploring as this would ultimately improve the relationship between teachers and the students, and in turn, the learning processes and outcomes. Therefore, the relational perspective of teaching is a wide area that is concerned with inclusivity. It recognizes that individuals have unique features that should be carefully observed to provide students with the best learning environment or conditions (Ljungblad, 2021).

References

Ansari, A., Hofkens, T. L., & Pianta, R. C. (2020). Teacher-student relationships across the first seven years of education and adolescent outcomes. Journal of Applied Developmental Psychology, 71, 101200.

Bell, K. (2022). Increasing undergraduate student satisfaction in Higher Education: the importance of relational pedagogy. Journal of Further and Higher Education, 46(4), 490-503.

Çetin, G., & Eren, A. (2022). Pre-service teachers' achievement goal orientations, teacher identity, and sense of personal responsibility: The moderated mediating effects of emotions about teaching. Educational Research for Policy and Practice, 21(2), 245-283.

Girelli, C. (2020), La scuola e la didattica a distanza nell'emergenza Covid-19: Primi esiti della ricerca nazionale condotta dalla SIRD (Società Italiana di Ricerca Didattica) in collaborazione con le associazioni degli insegnanti (AIMC, CIDI, FNISM, MCE, SALTAMURI, UCIIM). RicercAzione, 12(1), 203-208.

Harper, B. (2018). Technology and teacher–student interactions: A review of empirical research. Journal of Research on Technology in Education, 50(3), 214-225.

Jin, Y., & Harron, J. R. (2022). Maker education infusion in educator preparation programs: A 2025 vision for technology and teacher education. Journal of Technology and Teacher Education, 30(2), 265-274.

Ljungblad, A. L. (2021). Pedagogical Relational Teachership (PeRT)–a multi-relational perspective. International Journal of Inclusive Education, 25(7), 860-876. https://doi.org/10.1080/13603116.2019.1581280

Narciss, S., & Zumbach, J. (2022). Psychology in Teacher Education. In International Handbook of Psychology Learning and Teaching (pp. 1-42). Cham: Springer International Publishing.

Silva, J. S., Usart, M. U., Lázaro-Cantabrana, J. L. L. C., Silva, J., Usart, M., & Lázaro-Cantabrana, J. L. (2019). Teacher's digital competence among final year Pedagogy students in Chile and Uruguay. Comunicar. Media Education Research Journal, 27(2), 31–40. https://doi.org/10.3916/ C61-2019-03.

Stamp, C. (2019). How Are Teachers Using Psychology In The Classroom? - Online Psychology Degrees. Retrieved from https://www.online-psychology-degrees.org/study/teachers-using-classroom psychology/#:~:text=The%20principles%20of%20educational%20psychology,as%20their%20strengths%20and% 20weaknesses.&text=It%20teaches%20and%20examines%20essential,behavior%20that%20can%20shape%20l earning.

Toto, G. A. (2019), Expertise docente. Teorie, modelli didattici e strumenti innovativi, Milano: FrancoAngeli.

Worrell, F. C., Brabeck, M. M., Dwyer, C. A., Geisinger, K. F., Marx, R. W., Noell, G. H., & Pianta, R. C. (2014). Assessing and evaluating teacher education programs. Washington, DC: American Psychological Association.

Zhao, Y. (2022). New Context, New Teachers, and New Teacher Education. Journal of Technology and Teacher Education, 30(2), 127-133. Waynesville, NC USA: Society for Information Technology & Teacher Education. Retrieved August 24, 2022 from https://www.learntechlib.org/primary/p/221169/.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

MONITORING, SUPPORTING AND ENGAGING STUDENTS BASED ON THE EVIDENCE GENERATED BY DIGITAL TECHNOLOGIES

Giedre Tamoliune, Vytautas Magnus University, Lithuania

Airina Volungeviciene, Vytautas Magnus University, Lithuania

Elena Trepule, Vytautas Magnus University, Lithuania

Abstract

This paper introduces one of the intellectual outputs that have been developed in the DIGI-PROF project. The aim of DIGI-PROF project is to support higher education teachers and higher education institutions to design and implement transparent assessments for online learning and recognition of learning outcomes by proposing methodology, guidelines, practical tools, and training material to improve and develop their digital competences. The project outcome presented in this paper is oriented toward the development of a conceptual and methodological framework, and training material to develop higher education teachers' digital competences in Assessment (Area 4, DigCompEdu Framework), focusing on the competences to generate, select, and critically analyse and interpret digital evidence on learner activity, performance, and progress, in order to inform teaching, learning, and assessment, as stated in the DigCompEdu framework. Next to this, teachers will be able to make evidence-based solutions, using learning analytics data for timely and efficient feedback and support.

Keywords:

Learners' engagement, digital evidence, data monitoring, learning analytics, assessment, learning design, online teaching

Introduction

EUA survey proved that higher education institutions in Europe are not familiar well enough with European reference Frameworks for the Digitally Competent Organization (DigCompOrg) and Digital Competence of Educators (DigCompEdu), both scientifically sound and fully applicable to higher education (further – HE). If all HE teachers were equipped with the DigCompEdu competences, HEIs' moving online would be much better facilitated and HE teachers would be ready and competent to shift to online assessment. According to Davidson (2020), the processes of switching traditional face-to-face learning to online learning, and the development of skills that meet the changing economic, educational, and social environment are seen to be an integral strategy for a global recovery in the post-Covid period. Moreover, researchers argue that there is no possibility for learning to be the same as it was before the Covid-19 pandemic. As Moore et al. (2021) claim, "for those institutions that have already invested in online and blended learning, "normal" is not an idealized past but is a continuation, a process of learning into multimodal learning ecosystems to further expand access and opportunities". Therefore, higher education institutions and teachers need to develop and improve digital skills to keep up with the changes and the potential that online learning might bring to teaching and learning.

DIGI-PROF project addresses the challenges that teachers and students have encountered during the Covid-19 pandemic, related to the lack of digital competences of teachers to engage students and prepare for the online assessment, and aims to create innovative learning and teaching practices that lead to transparent assessment for online learning. Throughout the project implementation period, HE teachers will develop digital competences in assessment (following DigCompEdu framework) in order to be able to revise online courses with transparent assessment and lead to recognition of learning outcomes with micro-credentials. HE teachers will also gain competences to monitor, support, and engage students in online learning through evidence-based solutions, using learning analytics data for timely and efficient feedback and support. Assessment strategies established in DIGI-PROF project will integrate the schemes of micro-credentialisation to strengthen the role, capabilities, and flexibility

of HE, and modular learning opportunities from a lifelong learning perspective. Digitally competent professors in HE will integrate the evidence established during learning and assessment into the new form of digital and micro-credentials issued to the learners, to enable them to transfer their transparent achievements to new qualifications in the European arena and beyond through digital space.

The project outcome presented in this paper is oriented toward the development of a conceptual and methodological framework, and training material to develop higher education teachers' digital competencies in Assessment (Area 4, DigCompEdu Framework), focusing on the competencies to generate, select, and critically analyse and interpret digital evidence on learner activity, performance, and progress, in order to inform teaching, learning, and assessment, as stated in the DigCompEdu framework. Next to this, teachers will be able to make evidence-based solutions, using learning analytics data for timely and efficient feedback and support.

The use of digital technologies in education, whether for assessment, learning, or other purposes, results in a wide range of data being available on each individual learning behavior making a huge impact on teaching, learning, and assessment quality. Analysis and interpreting of data and using it to help make decisions is becoming more and more important in assessment for online learning. As a part of digital competencies for HE teachers, this strengthens teacher preparation and exploitation of digitally supported innovations in HE. Therefore, training material for HE teachers on how to monitor, support and engage students based on the evidence generated by digital technologies is a part of overall digital assessment competence development. It will consist of the methodological framework for student monitoring, supporting, and engaging processes during online learning and teaching, as well as practical tasks, illustrations, and examples of using learning analytics to inform teaching and learning. The training material will also contain a self-check tool for HE teachers to self-reflect on how they are prepared for student monitoring, support, and engagement. The need to have this result is highly supported by ENQA and EUA surveys in 2020, and national events organised by Quality Assessment Agencies, EDEN network events in 2020, where representatives from HE institutions claim that student monitoring, engagement, and support in online learning caused significant challenges for HE teachers.

The training material will be available as reference material, and in the form of a self-check tool for HE teachers, so they will have it at hand, and this will ensure the great potential for the impact of the tool on teacher practices. This tool will also guide teachers in preparation for timely and efficient feedback using a variety of virtual learning environment tools, automatic and manual selection of solutions to monitor and support students, keep the consistency of engagement, and secure teacher workload in gradual and meaningful supervision of learners. The tool will also have a great potential to be adapted to other levels of education and sectors as well. Consortium institutions need the training material as a resource themselves, but they are also addressed by outside institutions for consultations, training, and guidance to solve these emerging issues and to prepare for qualitative student engagement and monitoring processes. The need for such results is very high among HE and other professional communities in education.

Conceptual framework of the training material

Training material is based on the theoretical framework and collection of best / good practices on student engagement techniques based on digital evidence. Next to this, the training material will be innovative because the methodological framework will be based on the latest research in the application of learning analytics as a metacognitive tool to inform teaching and learning, as well as will suggest solutions for teacher reflections and online learning assessment challenges raised during pandemic Spring, 2020. There does not exist such a tool that would be based on student monitoring, support, and engagement process phases, including learning analytics, online learning, and metacognitive theories.

To support and enable teachers to design and deliver teaching and learning that enables students' monitoring, support, engagement, and assessment based on the data generated by digital technologies, the conceptual basis is needed to provide a clear basis for the collection of best practices and development of learning material. The conceptual framework is focusing on the following key themes: (1) self-regulated learning, (2) data literacy skills, (3) digital evidence on teaching and learning, (4) learning analytics as a metacognitive tool, and (5) learning

analytics dashboards (LAD) for data analysis. These themes are introduced and discussed as a basis for the training material and support the methodological framework and collection of the best practices.

DigCompEdu framework defines self-regulated learning competence as the ability "to use digital technologies to support learners' self-regulated learning, i.e. to enable learners to plan, monitor and reflect on their own learning, provide evidence of progress, share insights and come up with creative solutions" (Punie, 2017, p. 58). When talking about how self-regulated learning could be supported by learning analytics generated digital evidence, Lodge et al. (2019) suggest two ways how support could be effective: firstly, when different instruments are combined with data related to cognitive and affective processes, and, secondly, when design and learning analytics phases are integrated, allowing for a more contextualized and structured way of reading, and analysing the data.

While being aware of the possibilities that digital technologies may bring and what data they might generate, it is important for teachers to have a sufficient level of proficiency in digital literacy and know how to design the course in a way it would generate the expected digital evidence. Therefore, it is very important to design learning in a way it encompasses metacognitive activities. As claimed by Tseng and Walsh (2016), the process and success of learning and teaching, student engagement, and academic success largely depend upon learning design solutions and collaboration established, which requires much more than just the creation of space for engagement.

Another important element of the conceptual framework that supports teachers in monitoring, supporting, and engaging students based on the evidence generated by digital technologies, is digital evidence analysis. In DigCompEdu evidence analysis competence is defined as the ability "to generate, select, critically analyse and interpret digital evidence on learner activity, performance and progress, in order to inform teaching and learning" (Punie, 2017, p.21). To be more clear on what a teacher who is competent in analysing evidence is expected to do, the DigCompEdu framework distinguishes 6 activities, presented in figure 1.

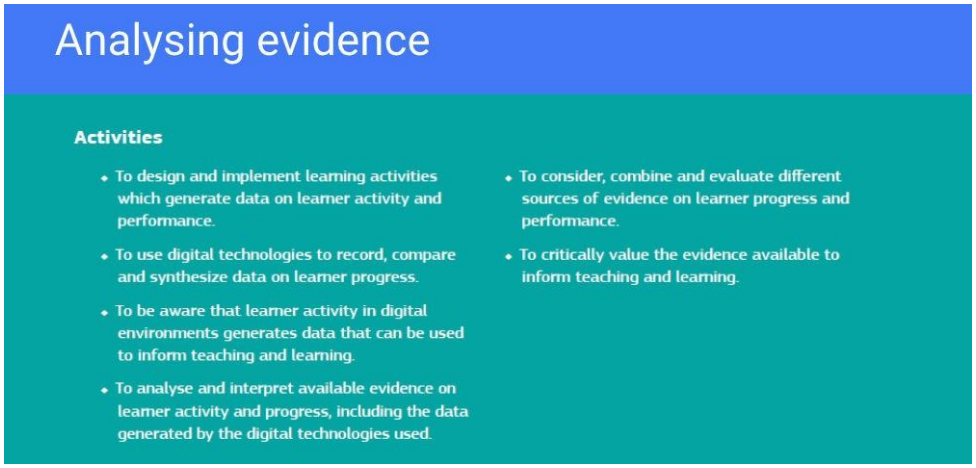

Figure 1. Activities defining 'Analysing evidence' competence (Punie, 2017, 64)

As it is discussed earlier, the use of digital technologies in education, whether for assessment, engagement, or other teaching and learning purposes, results in a wide range of data. The LA-generated data may inform both – the teacher and the student about teaching and learning processes, especially being useful for monitoring learners' behaviour, progress, and engagement with the learning material or activities. It is important to ensure that teachers have sufficient data-literacy skills and are able to analyse and interpret the data generated by learning analytics in a way so they could make evidence-based decisions and improve the teaching and learning process.

It is noted that learning analytics can provide teachers with a comprehensive understanding of the teaching and learning processes (Czerkawski, 2015) and strategies to improve them, and at the same time, raise their awareness of different educational practices (Siemens & Gasevic, 2012). Since learning analytics collect data about learners and their learning process in the online learning environment, they may be rather beneficial for teachers who are trying to improve a study course so that it corresponds to real-time learners' needs and, in this way, make their learning process more personalized. In such a way, LA fosters teachers to plan in advance what data needs to be

collected so that it would serve the need to think and make decisions regarding learning design and/or teaching and learning process.

Being aware of the possibilities that digital technologies may bring and what data they might generate, teachers need to know how to design the course in a way it would generate the expected digital evidence. Therefore, it is very important to plan learning design in a way that would encompass metacognitive activities. By creating metacognitive strategies for learners, teachers will be able to measure and monitor learners' awareness of themselves as learners, their learning process, and others. By applying learning analytics, teachers can adjust and adapt the curriculum so it would respond to learners' needs and abilities, and in such a way, raise awareness of learners' cognitive skills, and a stronger sense of community (Trespalacios & Perkins, 2016), and, at the same time, foster a more active learners' engagement. To achieve this, it is important for teachers to have knowledge and skills on how to make effective teaching decisions that would foster learners' metacognition. Metacognitive decision-making is about the identification, reflection, and evaluation of teaching decisions when the teacher is aware of specific teaching and learning design decisions and the reasons behind those decisions (Griffith et al., 2016). However, as research results show, while some higher education institutions have enough training and material for digital competence development, individual respondents noted that there is a conceptual issue, meaning that digital skills training should be organised by identifying approaches that are useful, applicable, and can be integrated into a specific field of study (Gaebel, Zhang, Stoeber & Morrisroe, 2021). This idea is supported by Bates (2022) who claims that digital skills "need to be embedded within the knowledge domain in which the activity takes place" and so it has to be context specific. Therefore, 20 best practice descriptions have been collected demonstrating how digital evidence can be used to support and inform teaching and learning practices at different levels. To ensure that multiple aspects of existing practices are covered, a methodological framework has been developed.

Methodological framework for desk research and best practice collection

The methodological framework is based on Volungeviciene et al. (2021) which focuses on teachers' metacognition and metacognitive decision making as well as the key concepts identified. It includes two phases when teachers can make evidence-based decisions and take actions to improve the course: (1) the learning design phase, and (2) the teaching and learning phase. This framework provides a taxonomy and the definition of a set of statements for the desk research that served as criteria for collecting the best practices on how teachers design and deliver teaching and learning and enable students' monitoring, support, engagement, and assessment based on the data generated by digital technologies (see table 1).

PHASES	TOPICS OF THE FRAMEWORK
Learning design phase when strategies for data collection are planned	**A - Metacognitive strategies to measure awareness of teaching and learning** *(e.g., Teachers plan activities for students to provide feedback on learning resources and learning design solutions; teachers adapt learning design to offer differentiation of tasks, individualisation and adaptation of learning)*
	B - Metacognitive strategies to measure students' academic success *(e.g., Discussions are organised to identify successful learning factors; learning activities facilitate students' perception of their role, self-concept and academic success)*
	C - Metacognitive strategies to measure awareness of learning design (e.g., l*earner / course guide indicates responsibilities of learners, learners track their progress on Moodle)*
	D - Learning activities which generate data on learner activity and performance *(e.g., Learning design allows conscious track of learning progress using Moodle tools; assignments are linked with competence descriptions in the course)*

	E - Digital tools used to record, compare and synthesise data on learner progress *(e.g., regular interventions and feedback is well planned; learning progress measuring tools are enabled in the course)*
Teaching and learning phase when teachers critically analyse and interpret data – based evidence on learner activity and performance	**F- Awareness of the evidence available to inform teaching and learning** (e.g., *Evaluation criteria are described in detail; teachers ask students to provide feedback on learning resources and learning design solutions)* **G - LA generate data on student behaviour** (e.g., *Activities for students are created to reflect on their progress of learning and strategies used for learning)* **H - LA generate data on student – teacher, student – student and student - content interventions** (e.g., *Learners are asked to provide feedback periodically using self-reflection questions on how they succeeded in their learning)* **I - Assessing the process of learning and learning results** (e.g., *Teacher implements analysis using Moodle learning analytics to think over which activities and resources succeeded to engage learners and if learners succeeded using them)* **J - Revising learning outcomes based on data generated by digital technologies** (e.g., *Teachers adapt learning design to offer differentiation of tasks, individualisation and adaptation of learning)* **K - Considering, combining and evaluating different sources of evidence on learner progress** (e.g., *Teachers use data from Moodle Learning analytics to reflect on learning behaviour in comparison with learning results)*

Table 1. Taxonomy and methodological framework for desk research

Thanks to the framework, we have collected multiple best practice descriptions addressing different scenarios, activities, geographical contexts, types of sources, and types of assessment. The aim was to have as much variety as possible. Each best practice attempts to cover one or more of the topics described in table 1, and many of the concepts explained in the previous sections of this document.

Examples of the best practices for data-generating learning design decisions

20 best practice examples have been collected presenting data visualisation tools for data analysis, institutional decisions or strategies on digital evidence analysis, or different learning design decisions, which are made either during the learning design phase, teaching and learning phase, or re-designing phases. All examples are focusing on how digital evidence informs teaching and learning. It is noticed that there are many teachers who are aware of the digital evidence that could be generated and know how to access, monitor, analysis this data, and use it when designing the course already. For example, as seen in figure 2, during a learning design phase, teachers might create metacognitive strategies that would help to measure awareness of learning design. To ensure that students are aware of their cognition, learning strategies, and management of their learning process, is related to a study guide, developed by the course teacher prior to the beginning of the course. In this study guide, next to other important information related to a course studying process, students are introduced to the sequence of tasks and assignments, as well as expectations of their performance. It is important to note that the study guide presents the sequence of assignments and their link with the theory and learning strategy planning. At the same time, students can see the time and place their attendance is needed.

4. Digitally competent organization.	Week 3	February 18 Adobe Connect - Lecture - Seminar 3. Application and comparison of Revive quality criteria with DigiCompOrg.	Presentation of Assignment 1. **Assignment 2** (Group or individual work). Analysis of strategic integration of technologies in different sectors of education. Case study of 1 organization.
5. Application of ICT in schools. 6. Application of ICT in adult learning and vocational education and training. 7. Application of ICT in higher education.	Week 4	February 25 Adobe Connect - Lecture - Seminar 4. Selecting the sector/ organization of education and case study development.	
7. Application of ICT in higher education. 8. Virtual learning environments	Week 5	March 4 Adobe Connect - Lecture - Seminar on the use of TEL curriculum QA	

Figure. 2. Excerpt from a study guide (Volungeviciene et al., 2021).

By knowing in advance how each theoretical presentation and topic relates to the assignments, learners are expected to become more aware of how they plan their learning to deliver assignments on time and keep up with the overall learning process in the course. As well, each assignment is described in detail in a study guide as well as in Moodle, indicating the time for submission and evaluation criteria, as well as the format expected (e.g., essay, presentation, video, mindmap).

Another example of LA-generated data that informs teaching and learning is the Activity reports. The data delivered by Activity reports allow teachers to reflect on which format of learning resources is mostly accessed by students, aiming to understand and learn about students' learning styles and preferred formats of learning resources. In this specific course, Activity reports helped to note that only a small number of students tend to rewatch class recordings, though they are keen on revising teaching slides (Fig. 3)

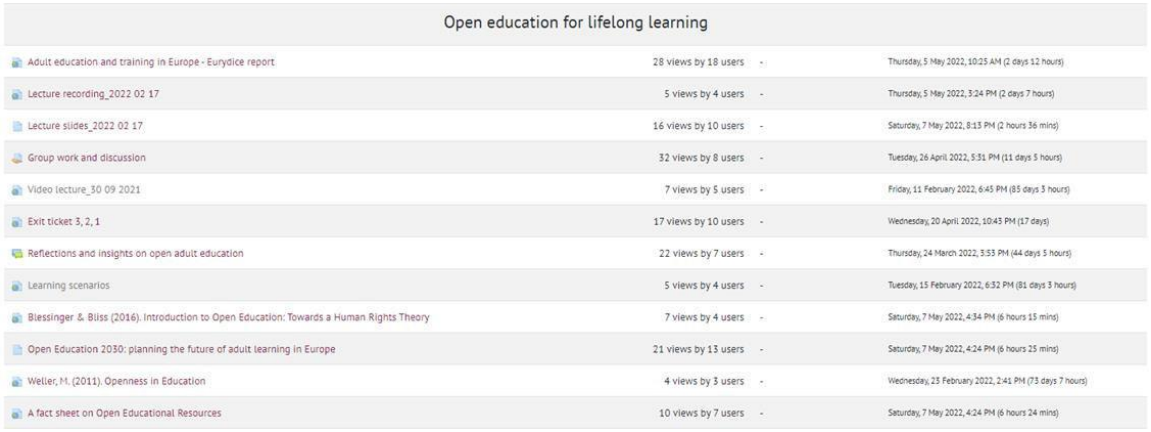

Figure 3. Moodle activity report on students' behavior when accessing course content

It is important to be aware that the report shows not only the number of times when the resource or activity was accessed but also the number of unique users who accessed the resource. Meaning, that it might be some students who tend to review learning material more often than others. And this is an important indicator for teachers as well, requiring a critical approach to observe what students are more actively engaged and which might not be accessing learning material.

When designing the online course, it is important to foresee the strategies and activities, which would help to collect digital evidence on how students interact with learning resources and activities, their social interactions, and overall

learning progress. As a result, this evidence-based data may help teachers to improve their day-to-day teaching practice by showing what resources are not accessed by students, what activities are less engaging, and what topics or concepts remain unclear and require more discussions or hands-on practices. Next to this, it might show teachers that some students do not interact with course content at all, and it might be a signal that students might be at risk of dropout therefore, it is important to get in touch with them and discuss the situation.

Further tasks and concluding remarks

Since the training material is meant to be created for self-regulated learning of HE teachers, at the moment, project researchers are focusing intensively on the development of the theoretical presentations, practical tasks, the introduction of best practice examples, and the self-check tools for HE teachers. To ensure the quality, the training material will be peer-reviewed and piloted by HE teachers, and afterward, translations into national languages will be made to ensure broad access to the training material.

To sum up, as it is seen from the examples presented above, it is crucial that before delivering the course the teacher reflects on and decides what data is important to be generated so that it would be important and useful for the later-on course improvement. Therefore, the training material developed in the Digi-Prof project 2nd output will empower teachers to monitor, support and engage students based on the evidence generated by digital technologies.

Acknowledgments

This research is being supported by the Erasmus+ Programme of the European Union (project “Transparent assessment for online learning by digitally competent professors”, No. 2021-1-LT01-KA220-HED-000031154).

References

Bates, T. (2022). *Teaching in a digital age: Guidelines for designing teaching and learning*, 3rd ed. https://pressbooks.bccampus.ca/teachinginadigitalagev3/front-matter/scenario-a/

Czerkawski, B.C. (2015). When learning analytics meet e-learning. *Online Journal of Distance Learning Administration*, 18(2). https://eric.ed.gov/?id=EJ1065386

Davidson, M. (2020). *The future of Ontario’s workers: How micro-credentials can be a vital part of the post-pandemic recovery*. Washington, DC: WilsonCenter. https://www.wilsoncenter.org/article/future-ontarios-workers-how-microcredentials-can-be-vital-part-post-pandemic-recovery

Gaebel, M., Zhang, T., Stoeber, H. & Morrisroe, A. (2021). *Digitally enhanced learning and teaching in European higher education institutions*. European University Association absl.

Griffith, R., Bauml, M., & Quebec-Fuentes, S. (2016). Promoting metacognitive decision-making in teacher education. *Theory Into Practice*, 55(3), 242–249. doi:10.1080/00405841.2016.11 73997

Lodge, J. M., Panadero, E., Broadbent, J., & de Barba, P. (2019). Supporting self-regulated learning with learning analytics. In *Learning analytics in the classroom: translating learning analytics research for teachers.* Edited by Jason M. Lodge, Jared Cooney Horvath, and Linda Corrin. Abingdon, Oxon, United Kingdom: Routledge. 45-55.

Moore, S., Trust, T., Lockee, B., Bond, A., and Hodges. C. (2021). One year later . . . and counting: Reflections on emergency remote teaching and online learning, *EDUCAUSE Review*, November 10, 1.9

Punie, Y., editor(s), Redecker, C., *European Framework for the Digital Competence of Educators: DigCompEdu*, EUR 28775 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-73718-3 (print),978-92-79-73494-6 (pdf), doi:10.2760/178382 (print),10.2760/159770 (online), JRC107466.

Siemens, G., & Gašević, D. (2012). Special Issue on Learning and Knowledge Analytics. *Educational Technology & Society*, 15(3), 1–163.

Trespalacios, J., & Perkins, R. (2016). Sense of community, perceived learning, and achievement relationships in an online graduate course. *Turkish Online Journal of Distance Education*, 17(3), 31–49. Retrieved from https://files.eric.ed.gov/fulltext/EJ1106347.pdf

Tseng, H., & Walsh, E.J. Jr. (2016). Blended versus Traditional Course Delivery: Comparing Students' Motivation, Learning Outcomes, and Preferences. *Quarterly Review of Distance Education*, 17(1), 43-52. https://eric.ed.gov/?id=EJ1142995

Volungeviciene, A., Tereseviciene, M., & Trepule, E. (2021). L*earning Analytics: a Metacognitive Tool to Engage Students*. Research study. Sciendo. https://doi.org/10.2478/9788366675643

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

FLIPPED CLASSROOM FOR ACTIVATING STUDENTS IN ONLINE CLASSES

Giedre Tamoliune, Vytautas Magnus University, Lithuania

Estela Dauksiene, Vytautas Magnus University, Lithuania

Abstract

Learners' engagement and active participation have been seen as important issues, especially when talking about teaching and learning in blended or online classes. After the Covid-19 pandemic started, online teaching had to be implemented on a massive scale worldwide, requesting innovative instructional design solutions that would support teachers, engage learners, and allow online learning to be learner-centered. The literal transfer of traditional face-to-face classes to online classes resulted in significantly fewer active learning activities compared to traditional meetings. Therefore, the Erasmus+ project "Activating students in online classes" aims to introduce the potential of flipped classroom methodology in online teaching. This paper presents the Active Class project, which aims to help academic teachers in their online classes, by suggesting methods, tools, and opportunities that improve their qualifications and build a new standard of blended and/or online teaching.

Keywords:

The flipped classroom, online teaching, students' engagement, online classes, higher education.

Introduction

Despite the challenging pandemic period, it is unnegotiable that this period had a significant impact on the establishment of online learning in higher education institutions. As researchers of the Active Class project noticed, while most of the HE teachers overcame technical challenges rather quickly and improved their digital competencies, the biggest challenge appeared to be the lack of knowledge on how to design and deliver the online course in a way that would be interesting and engaging for students. Next to the lack of didactic skills related to online teaching, Bates (2022) claims that HE teachers face new challenges when working with a higher number of students and bigger groups of learners, resulting in a more teacher-centered lecture with little interaction rather than learner-centered teaching and learning. Therefore, the Active Class project among other outputs aims to create teacher training materials and examples that would provide teachers with some inspiration and instructions on how to make their online classes better and activate students during these classes. Within the project framework, the flipped-classroom methodology is seen as an innovative way to design more engaging and student-centered learning experiences. As claimed by Cao and Swada (2020), the flipped classroom allows teachers to focus more on in-class peer collaboration activities rather than instruction delivery, and since learners analyzed pre-class learning material, they could focus more on discussions of unclear content while being in class. Next to this, learners' engagement and their learning depend on the active learning environment that should be designed to meet learners learning styles, needs, and expectations (Burke & Fedorek, 2017). Responding to these issues, the Active Class project, next to other results, aims to develop a training material that would support and empower teachers to reflect on their classes and search for new solutions to engage flipped classroom approach, by revising or redesigning the course or topic accordingly. The training for teachers is focusing on theoretical and practical aspects of the flipped classroom integration into online teaching practices, as well as recommendations for the use of digital tools that foster learners' engagement in learning and supports online teaching. An international group of experts from 3 European Universities has been working consistently to deliver high-quality results that would serve higher education teachers.

Another important aspect is that HE institutions involved in the project are also partners within the framework of the European University Transform4Europe – T4EU alliance. While T4EU among other activities assumed to create joint study programs in the areas of computer, environmental and social sciences, it does not focus on revision of

online teaching and learning methods. Therefore, such initiatives as the Active Class project may contribute to the quality of online teaching, bringing added value to all collaborative universities, as the courses that have been re-designed using flipped classroom approach would be introduced to students from the Alliance universities.

The overall goal of teachers, participating in the Active Class project, is the activation of students in online educational contexts. Thus, the innovative combination of didactic methods, good practices, and technological tools, to be used in online teaching and learning, were created and training for teachers was suggested. More importantly, HE teachers were fostered to reflect on their online teaching strategies and pre-design a course or a topic that would engage students more easily in the active learning process. The flipped classroom methodology was chosen as an innovative instructional approach to be applied in online teaching. The flipped classroom is understood as "…a set of pedagogical approaches that (1) move most of the information-transition teaching out of class, (2) use class time for learning activities that are active and social, and (3) require students to complete pre-class and/or post-class activities to fully benefit from in-class work" (Abeysekera & Dawason, 2015).

The scope and outputs

Even though flipped classroom instructional design is not innovative per se, the researchers in the Active Class project aim to introduce it with the components of gamification and various online tools that facilitate active learning. To ensure the consistent introduction of how to design, plan and deliver flipped learning in online classes so it activated students' participation, 5 intellectual outputs were planned to be delivered during the project implementation period:

1. Flipped classroom e-methodology,
2. Teachers' training material,
3. Demo scenarios,
4. Best practices package,
5. T4E tracks scenarios.

By now (September 2022) 4 outputs have already been developed, presented for HE teachers of participating institutions, and published online, while T4E tracks scenarios are in the development process.

Flipped classroom e-methodology

As the flipped class methodology is not new, teachers need guidance on how it may be used in online teaching, with a focus on active students. Thus, the researchers developed a document focusing on the online teaching and flipped class approached and called the methodology "Flipped classroom-based e-methodology". It is based on two teaching methods: flipped classroom method and gamification. It is important to note, that flipped classroom methodology turns Bloom's taxonomy pyramid upside down, where activities related to remembering and understanding happen outside of the class (individual studying) and then active learning activities focusing on knowledge application, analysis, evaluation, and creation are organized in class (see Fig. 1).

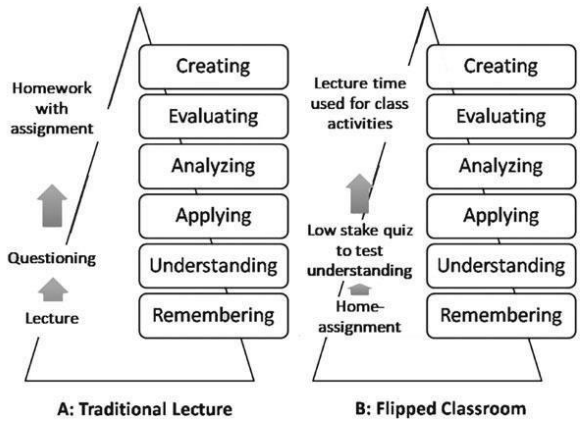

Figure 1. The process of a traditional classroom (A) vis-à-vis flipped classroom (B) is aligned with revised Bloom's taxonomy (Singh, Mahajan, Gupta & Singh, 2018)

As it is seen in the figure above, flipped classroom prompts the change of teacher's role, meaning that teacher-centered classes when theoretical input is presented by the teacher mainly, transform into student-centered learning, when students are actively engaged in learning and the teacher becomes a coordinator and moderator, providing support for students during their activity development.

The supporting method which is combined with the flipped classroom in this project is gamification, ready to use on every level of Bloom's taxonomy pyramid. Aiming to create an innovative and interactive methodology, and activate students' during online classes, all the cases and scenarios developed on the base of this methodology and presented in the outputs, are supported with various online teaching and learning tools.

To sum up, e-methodology introduces key artifacts of flipped classroom methodology, like student-centered learning, active learning, learning outcomes, and assessment principles, as well as presents key aspects of gamification, and provides recommendations for flipped learning design solutions, limitations, and weaknesses of this methodology.

Teachers' training material

The teacher training material is developed based on the "Flipped classroom-based e-methodology" presented above. This training material aims to help teachers improve their skills in the development of online classes, providing them not only with the main ideas of flipping the class but also with a list of tools and activities that guide teachers in improving their courses by revising of most complicated course topics and improving students' learning of these topics using more active learning methods. This also creates the possibility for teachers to improve their qualifications and build a new standard of online teaching. Next to this, training materials help teachers to start using flipped classroom methodology as lots of ready-to-use templates are provided and can be adapted.

As was mentioned, flipped classroom focuses on active learning and learners' engagement by removing the teacher itself from the center of attention and limiting the use of the lecture method (direct transition method), and, instead, creating conditions for active students' learning. In a flipped classroom students have to analyze and study learning materials and acquire knowledge independently, so that during the class, with the guidance of the teacher, students could build their cognitive schemas and knowledge. In such a case, the teacher no longer acts as a knowledge transmitter but as an architect of students' knowledge.

The main aim of the training material is to guide a teacher in flipping the class in online course delivery. The training material consists of 4 units, covering theoretical learning resources, 6 individual assignments, and questions for a self-assessment quiz or self-reflection. The topics of the training material are focusing on: (1) key features of a flipped classroom methodology, (2) defining learning outcomes in a flipped classroom, (3) guidance on organization and assignment planning in the flipped classroom, (4) guidance on choosing online tools, (5) assessment strategies of a flipped classroom activities, (6) open educational resources, ethical and legal issues, (7) presentation of best practices and demo scenarios, and (8) quality assurance and course assessment of the (re)designed online courses. The main assignment that is to be prepared during the training is a revised flipped classroom lesson/course plan, where teachers are recommended to revise the learning outcomes, activities, theoretical material, and assessment strategies, and with the support of tutors, search for the possibilities to flip one or several topics to be delivered in a flipped way. Each assignment was described in detail so that it would be easier for any teacher or education specialist to follow the course independently (see Fig. 2)

Day 1 Assignment No 1. Revision of course outcomes and activity planning

Aim of the assignment	to revise your course outcomes and select which outcome(s) require(s) more active learning methods and can be achieved using flipped classroom approach.
Steps to implement	1. Choose the course you would like to improve 2. Based on the presented theoretical guidance (see slides of Unit 1.1 and Unit 1.2) revise your course learning outcomes to select which may be improved if more active learning methods/flipped class activities were applied. Think of the activities that could support pre-class and in-class learning. 3. Start filling in the provided lesson/course plan (see *lesson/course plan in Annex 1*) and fill in part I.
Expected result	The learning outcome is described in a lesson/course plan template (Part I).
Self-assessment quiz	**To create active learning in a flipped classroom, teachers should:** ○ Have students work independently on writing assignments ○ Create quizzes and tests that require students to apply their knowledge (+) ○ Present theoretical material during the class and ask students to write an essay at home
	Which is not an active learning activity? ○ Analysis ○ Presentation ○ Lecture (+) ○ Discussion
	Which of the following does not show learners' engagement? ○ Questions raised in class ○ Participation in the discussion forum ○ High grades and test results (+)

Figure 2. Example of an assignment description and self-assessment quiz questions

Finally, to ensure the quality of flipped courses, teachers were introduced to a questionnaire helping to assess the course and at the same time stimulate teachers' self-reflection. It is constructed of 8 question blocks each of which encompasses more detailed criteria for a course evaluation:

1. Competences/learning outcomes and their consistency (5 criteria)
2. Learning methods (5 criteria)
3. Presentation of the theoretical material (10 criteria)
4. Assessment methods (5 methods)
5. Description and presentation of the assignment (7 criteria)
6. Learning organization (6 criteria)
7. Synchronous and asynchronous tools and support (5 criteria)
8. References, copyrights, and attribution (4 criteria)

The overall of 47 criteria are included in the questionnaire, so the assessment would be consistent and focus on key elements of the online classes. The questionnaire is developed in a way that would be easier to assess the course quality for both, the teacher, and the external expert or peer reviewer (Fig. 3).

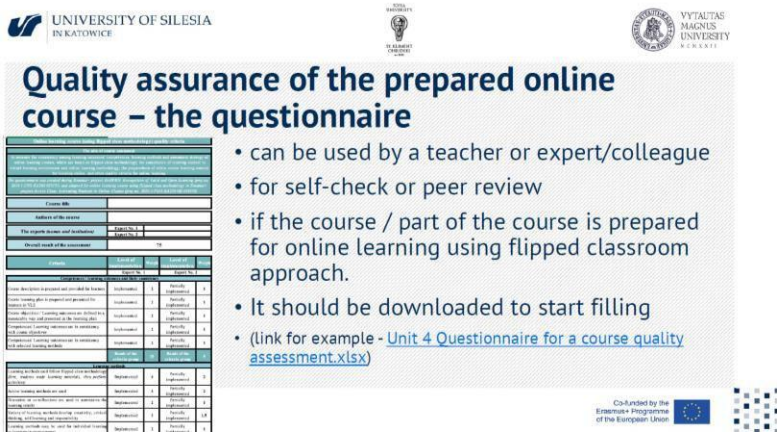

Figure 3. Extract from the training material - presentation on the quality assurance

Based on the developed teacher training material training for teachers may be organized, or self-learning by university teachers may be encouraged.

Demo scenarios

For the teachers to see some examples of courses, which were created using flipped classroom e-methodology, a collection of demo scenarios focusing on 3 study areas (computer, social, and environmental studies) was created. These demo scenarios aim to demonstrate the template or good structure of a well-developed online course, which follows flipped classroom e-methodology. They include some theoretical background and pre-class and post-class activities that engage and activate students. Teachers who prepared demo scenarios demonstrated different digital tools that help them to activate and engage students in online classes especially. For example, the presented case of the course from the environmental study field introduced an interactive decision-making game RuFOPOLY (Fig. 4) which received a lot of interest from other training participants.

Figure 4. Presentation of the RuFOPOLY interactive board game on a virtual learning environment Moodle

The demo scenarios help higher education teachers to understand and gain ideas on how to prepare their online classes so that they would be both, flipped and engaging. Therefore, 3 demo scenarios are developed in the study areas mentioned above responding to the specificity of the discipline and the specificity of the virtual learning environment for the online learning process. These demo scenarios of flipped teaching in online classes are also expected to become a model for teacher training as well as for the development of other online classes proposed to all students of the T4E Alliance.

Best practices package

To provide more examples for teachers, the presentations of some of the best practices for applying the flipped classroom methodology in higher education were also created. It is believed that this collection will serve as guidelines for academics, based on the tested modern digital teaching methods and containing descriptions and examples of practical application. One of the key reasons to develop these practices is the need for solutions and examples on how to make the teaching material more attractive to students for them to become active participants in the learning process. Best practices present different scenarios of how flipped learning might be designed and delivered in daily teaching practice, offering practical solutions on how to plan the time and distribute pre-class, in-class, and post-class activities, what digital tools to use, and similar. Figure 5 presents the possible flipped teaching and learning scenarios.

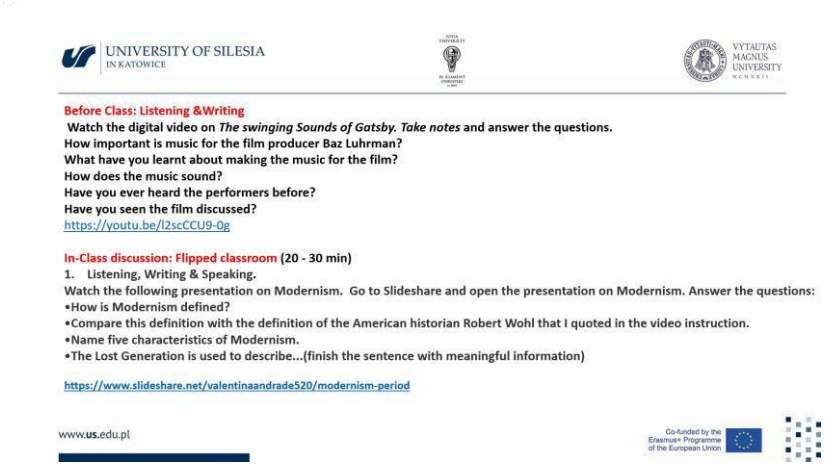

Figure 5. An example of the pre-class and in-class activity planning in language classes

Apart from knowing how to arrange and design the learning, teachers need to be aware of the new digital methods when applying flipped learning in online classes, e.g., recording presentations with a voice recording or short lectures in video format, dividing learners into smaller groups in video conferencing system, creating short and quick quizzes for assessment, and arranging collaborative group work using shared documents. An example of the teaching and learning design of a flipped class presented in Figure 6 demonstrates how multiple digital tools can be used to support pre-class, in-class, and post-class activities of only 1 online class aiming to activate and engage learners.

Pre-class Students are asked to: • watch 2 videos • watch a pre-recorded lecture • listen to extraction from a podcast • read a blog entry of a field expert • write down keywords that emerge as the most relevant and important when talking about open education • join the discussion forum on Moodle and answer 4 questions related to the content	**In-class** ✓ Q&A session (10 min.) ✓ Group work on questions answered before the class in Moodle (15 min) + presentation (15 min) ✓ Group work – creating concept map on what open education is (15 min) + presentation (15 min) ✓ Discussion (10 min) ✓ Exit ticket 3-2-1 ✓ All results developed by students are uploaded on a shared document so that all students could have access and analyse.
Post-class ✓ Short quiz ✓ Short essay on how open education may foster lifelong learning	**Online tools and platforms used:** • Mindmup (https://www.mindmup.com), • Mentimeter (www.mentimeter.com) • Padlet (www.padlet.com) • Google forms • GoogleDocs • MsTeams • Moodle

Figure 6. An example of a teaching and learning design supported by digital tools in the online class

Multiple tools can be used to support online learning, including the ones mentioned in Figure 6, as well as Prezi, Screenr, Kahoot, and others. It is up to a teacher to decide how their pedagogical goals could be supported with a digital tool. Nevertheless, teachers need to have a sufficient level of knowledge on how to use a specific tool to organize active learning successfully.

T4E tracks scenarios

It is the final output of the Active Class project, which is complementary to a Transform for Europe Project. Teachers who are participating in training about the flipped classroom e-methodology are asked to prepare scenarios in the crucial fields of the T4EU project: computer, environmental, and social sciences. The users of scenarios will be teachers of all T4EU consortium universities. These scenarios will help all the teachers from the Alliance in their online teaching practice by giving methods, and tools on how to make their online teaching more engaging and interactive using flipped classroom methodology. It is an ongoing output, and the results will be presented as soon as it is finished.

Concluding remarks

Higher education teachers involved in the development of best results, demo scenarios, or participating in the training, confirm that while the flipped classroom is seen to be a useful way to use in-class learning time for more active learning activities, the application of it is rather challenging. The challenges refer to the lack of knowledge about the possible digital tools that support online learning and the challenges to design and plan online learning activities and assessment strategies. At the same time, teachers notice that flipping the class is time-consuming since it requires extra time to pre-plan learning material that would be consistent with the in-class and post-class activities. Therefore, teachers need to be experts in their teaching content so they could organize active learning activities in online classes successfully.

The flipped classroom methodology is proved to be a useful way to activate learners in online classes. As it was noticed, flipped learning is not just about transferring more responsibility of the learning to students themselves. To succeed with flipped learning, teachers need to be experts in the learning content and the learning material that students are analysing before the class so that when needed, the teacher could give some recommendations and moderate the discussion easily by emphasizing the key points important for students to learn. Next to this, when planning flipped teaching and learning, teachers designed metacognitive strategies that helped students to reflect on their learning, apply their knowledge and make the learning that requires the highest level of cognitive load to be less stressful.

The results delivered within the Active Class project so far have confirmed that the flipped classroom methodology helps teachers to engage students in online classes easier. However, it is important to emphasize, that the success of flipped classroom application in teaching depends on the teacher's pedagogical, technological, and content knowledge, as well as on institutional and faculty support.

Acknowledgments

This research is being supported by the Erasmus+ Programme of the European Union "Activating students in online classes", no. 2020-1-PL01-KA226-HE-096358. All mentioned project results are available at https://studyonline.lt/en/active-class/.

References

Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. Higher education research & development, 34(1), 1-14.

Bates, T. (2022). Teaching in a digital age: Guidelines for designing teaching and learning, 3rd ed. https://pressbooks.bccampus.ca/teachinginadigitalagev3/front-matter/scenario-a/

Burke, A.S., & Fedorek, B. (2017). Does "flipping" promote engagement?: A comparison of a traditional, online, and flipped class. *Active Learning in Higher Education*, 18(*1*). https://doi.org/10.1177%2F1469787417693487

Cao, L.Th.Th., & Swada, J.G. (2020). Effects of implementing flipped classroom elements and dynamic in-class discussion on student performance. Journal of Food Science Education, 20(1), 48-56. https://doi.org/10.1111/1541-4329.12211

Singh, K., Mahajan, R., Gupta, P. & Singh, T. (2018). Flipped classroom: A concept for engaging medical students in learning. *Indian Pediatrics*, 55, 507-512. https://doi.org/10.1007/s13312-018-1342-0

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

EXPLORING STUDENT PERCEPTIONS OF EMPLOYABILITY SKILLS DEVELOPMENT USING RADAR CHARTS IN FIRST YEAR SCIENCE

Fiona J Aiken, The Open University, UK

Christopher Hutton, The Open University, UK

Abstract

Development of employability skills is globally expected in undergraduate students; this is frequently approached through Personal Development Planning (PDP). However, science graduates are often reported as lacking the skills necessary for graduate employment.

An online distance learning first-year science module required students to use radar charts for PDP in each assessment. An online questionnaire evaluated students' perceptions of their employability skills development, and the efficacy of radar charts as a means of recording this. The questionnaire was sent to 636 students and 115 responded; this report is a thematic analysis of the open text questions. Students recognised development of several employability skills, though some found difficulty due to lack of self-confidence and challenges participating in asynchronous group work. A proportion of students found radar charts easy to use, though the majority used them to gain marks. Students found benchmarking their skills at module start challenging, and would benefit from more support with this, as well as the option to use other means of recording PDP.

Introduction

Despite criticisms and limitations of Human Capital Theory (Marginson, 2019; Wheelahan, et al., 2022) the link between employability skills developed through Higher Education and economic growth has been recognised for over half a century (Gillies, 2015). For some time, there has been concern about the employability skills of graduates in certain science disciplines e.g., following a UK Government review, Biological, Earth and Environmental Sciences were among those identified as having relatively poor graduate employment outcomes (Wakeham, 2016). Problems highlighted were that graduates sometimes lacked the transferable skills necessary for employment, and/or awareness of when they had developed them (Wakeham, 2016).

Following the European Commission's (1996) identification of the need for a learning society, Delors (2013) recognised the global importance of this, linking it to the four pillars of education. This theoretical framework identifies four interlinked pillars (set against the backdrop of lifelong learning): learning to know, learning to do, learning to live together, and learning to be. Employability skills are most prominently situated in "learning to do", but the links to lifelong learning are also important in "learning to be", e.g. self-perception and confidence. While the model fails to account for learning by adaptation, it provides a theoretical framework within which to situate this study in the context of lifelong learning provided by the Open University.

Electronic Personal Development Planning (ePDP) is widely used as a means of helping students to develop and recognise employability skills. Through reflection, students identify their strengths and weaknesses, and plan for improvement, thus developing independent skills for future personal and professional development (Cowan and Peacock, 2017). While there is evidence that this can be beneficial, e.g. in interview performance (Lackner and Martini, 2017), practice across undergraduate education is variable, student engagement is frequently poor, and academic staff have differing attitudes to facilitating PDP (e.g. McKenna et al., 2017a; Peyrefitte and Nurse, 2016).

The challenge of improving students' employability skills is often approached by embedding generic graduate attributes, capabilities or learning outcomes in qualifications. However, the disconnect between these and student engagement has been attributed to student perceptions of them as generic and unassessed (Jorre de St Jorre and Oliver, 2018). Furthermore, the importance of students' self-efficacy, and facilitating easy use of software may also

be important factors influencing acceptance of ePDP (Ahmed and Ward, 2016). While there is broad agreement that the links between ePDP and its intended outcomes should be made more explicit, and that contextualisation and assessment improve engagement, most studies are small scale. The variability between institutions means broader research can produce inconclusive or conflicting results (e.g. McKenna et al., 2017b); this limits generalisability, thereby highlighting the need for specific information at institutional, as well as sector level.

Background to this research.

A first-year Open University multidisciplinary science module was launched in 2017. Learners studied by distance learning over 9 months, using an interactive Virtual Learning Environment (VLE) and were supported by an Associate Lecturer. The module included radar charts, which were used by students to self-assess and provide a visual aid which helped them to reflect on their skills development. This was the first time that an Open University module had recorded skills development on radar charts: they were postulated to be an easy way for level 1 students to visualise their skills development and evaluating this assumption led to this scholarship project.

Students completed the charts periodically by self-assessing their skill level on a number of parameters on an arbitrary scale between 1 ("not at all confident") and 10 ("extremely confident") – this was then automatically converted to a radar chart, with skills grouped onto a radar according to the learning outcome they were associated with. Two of these charts were used as proxies for employability skills:

1. *Collaborating with others* (commenting on others' work; contributing to discussions; working in a team; sharing digital content; business/customer awareness), and

2. *Self-reflection and planning* (time management; PDP; reflecting on feedback; reflecting on practice) (Figure 1).

The benefits of using radar charts were thought to be a collated visual summary of perceived skills development, enabling comparison of one set of charts with another to see progression.

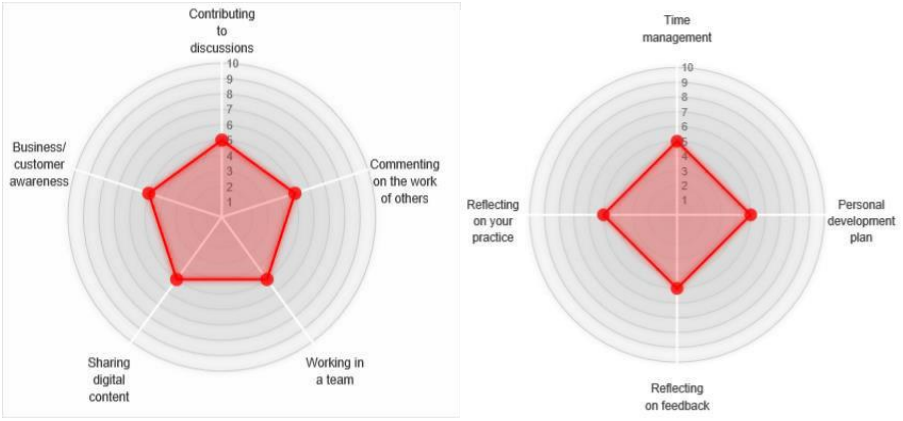

Figure 1: Examples of radar charts for Collaborating with others (left) and Self-reflection and planning (right).

Students were first directed to self-assess at the start of the module and advised to repeat this weekly; the only advice given in the module materials was to use the 1 to 10 scale from "not at all" to "extremely" confident. Subsequently, in each of six summative assignments spread throughout the module, students were asked to include certain radar charts and write a short reflection of 50 words on the skill in which they perceived they had made the most and least progress; this contributed approximately 10% of the mark for each assignment. Each student's Associate Lecturer who marked their work could see how the student was progressing and gave feedback.

There are limited examples of radar charts being used in ePDP. Chou et al. (2017) adopted radar charts to prompt student reflection on core competencies assessed via learning analytics but selected them solely as an effective means of visualising multivariate data. However, Bodily et al. (2018) evaluated the use of radar charts in a student-

facing analytics dashboard to help students identify skills to develop: student perceptions were mainly positive due to their intuitive nature, and 89% of students surveyed (n = 70) found the tool user-friendly, engaging, useful and informative. However, only 11% declared regular use of the tool, which correlates with the frequently poor engagement with ePDP reported elsewhere (e.g. McKenna et al., 2017a; Peyrefitte and Nurse, 2016).
Two research questions were addressed:

1. What are students' perceptions of their employability skills development?
2. What are students' perceptions of radar charts as a means of ePDP?

Methods

Three data collection methods were used in a mixed methods approach: collection of anonymised students' self-assessment scores from assignments; an electronic questionnaire which was sent to 636 eligible students who had completed the module [JISC Online Surveys, www.onlinesurveys.ac.uk]; and Associate Lecturer focus groups. Mixed methods enabled the strengths of different techniques to be combined to provide a robust and insightful investigation of the research questions (Creswell and Creswell, 2018). The approach devised met the criteria of the rigorous mixed methods framework in Harrison et al. (2020). Approval was obtained from the University's Human Research and Ethics Committee and Student Project Research Panel before data collection. Quantitative data from the study have been presented elsewhere (Aiken and Hutton, 2021). Here, a detailed examination of student responses to the open text questionnaire questions is carried out to enrich the quantitative findings.

The open-ended questionnaire questions were analysed using thematic analysis (Braun & Clarke, 2019) in the software NVivo [QSR International Pty. Ltd., www.qsrinternational.com]. Each questionnaire response was read by both authors separately and notes were made to help familiarisation. Codes for positive and negative comments were generated inductively by both authors together systematically. Data relevant to each code were then collated under common themes that were defined and named accordingly.

Results and Discussion

The electronic student questionnaire had 115 responses (response rate 18%); demographic data (not presented here) confirmed respondents were representative of the module cohort. The following themes, codes and numbers of responses (Table 1) were identified from the open text questions; this is followed by an examination of each theme in turn. All quotations are from students.

Category of Theme	Theme	Coded positive / negative comments
Skills development	Time management	Negative (6) Positive (10)
	Communication	Positive (4) Negative (3)
	Group work	Negative (11) Positive (10)
	Reflecting on feedback	Negative (0) Positive (7)
	IT skills (3)	
	General (21)	
Radar charts as a tool	Just for marks (20) Self-assessment problems (40) Technical or design problems (18)	Negative (53) Positive (17)

Table 1: Themes and codes identified from the student questionnaire (n=115). Numbers in brackets are the number of comments.

Skills Development Themes

The 10 positive comments on time management included statements that the module helped students develop time management as they learnt to balance studying alongside other commitments. Students developed skills in

planning ahead, using their time more efficiently and meeting deadlines. The 6 negative comments included statements that when students had to work in a group asynchronously on a forum, they found it frustrating waiting for contributions from others which were needed to progress to the next stage. There were also negative comments on the workload and needing to prioritise completing assignments over group work.

The 7 comments on communicating with others recognised that the module developed the ability to give and receive feedback constructively. There was close overlap with positive comments about group work, with students attributing improvements in communicating with others to being required to collaborate:

> Initially the team led work was taking me outside of my comfort zone, due to a lack of confidence in certain subjects. Fortunately, the way that [the module] is structured, it pushes you in the right direction as it is the only way to complete your work.

Negative comments on communication and group work also overlapped, including problems with time management, which again highlighted difficulties with asynchronous communication via forums:

> Contribution to discussions, commenting and teamwork will only work, if all members of the assigned tutor group participated and in a timely manner. I appreciated the objectives however, it was frustrating, and the lack of cooperation set me back.

It is noteworthy that the main negative point on asynchronous communication and team working is not specific to this module and is commonly encountered in distance learning (Chang and Kang, 2016).

Students' comments on reflecting on feedback were few, though consistently positive. While some praised module and assessment design (use of radar charts, reflection in each assessment), another emerging theme identified the importance of Associate Lecturer feedback on assessed work and the encouragement of reflection on progress:

> Reflecting on my practice and feedback was shown to be important in a lot of [my Associate Lecturer's] online tutorials. He always had time for reflection and his comments made you reflect.

While the module's design was clearly recognised as promoting skills development, the importance of the role of the Associate Lecturer in helping students relate to the pedagogy of the module was clearly important.

There were only 3 comments on IT skills, two mentioned how skills and confidence grew:

> Sharing digital content was a new experience. I was very nervous at first but the more I had to do it the more confident I became. This is also true of most of the above skills. Just having to carry out the relevant tasks and being encouraged to improve on these tasks builds on confidence.

In summary, broad recognition of effective skills development in the module is captured in this student quote:

> As time went on […] I felt my skills getting more honed & activities set were very well tailored.

Radar Charts Themes

Of the 17 positive comments on radar charts, around 10 simply expressed a liking for the tool, or noted it worked as intended. The largest number of comments on radar charts were negative (53). Students commented that they didn't find radar charts useful, found them hard to understand and confusing. Some found them time-consuming and difficult to use. Students didn't think they helped with reflection on their skills development and one student said they caused stress and self-doubt. Twenty comments indicated that the motivation for completing radar charts was to gain marks. This quote summaries the views expressed by many:

> I feel that the radar charts were cumbersome and actually got in the way of any real reflection on how my studies were progressing.

These results contradict the notion that radar charts are easy to use and understand when displaying multivariate data (Chou et al., 2017). There is, however, close agreement with other research that linking PDP to assessment increases student engagement (e.g. Peyrefitte and Nurse, 2016).

Students found it a challenge to self-assess their skills development on the 1-10 scale, especially benchmarking themselves at the start of the module with very limited guidance; there were over 40 comments on this:

> Filling in the radar charts at the start of the course was a mistake for me as I overrated myself and quickly found during the course that I was not as good as I thought in many skills. As I proceeded through [the module] I found I had to downgrade myself on the radar charts at first instead of improving.

Technical and design problems were identified by 18 students as barriers to engagement. These students didn't find the bespoke in-house software easy to use. Further, some students felt that the charts presented an incomplete, simplified picture of skills development:

> It is a schematic approach that flattens complex realities without providing new or interesting insights. A bureaucratic imposition without reward.

However, a number also recognised that radar charts were potentially helpful for some learners, but felt that they hadn't benefitted from it themselves. This reflects similar findings to Bodily et al. (2018) where a majority found radar charts easy to use but made limited use of them as a tool for PDP:

> I personally didn't find them that helpful, but I think it depends on the person and the kind of learning they benefit from most.

The overall findings of this qualitative analysis triangulate with the quantitative results (Aiken and Hutton, 2021), and can be related to the four pillars of education (Delors, 2013). The acquisition of employability skills fits most clearly in "learning to do". However, students' perceptions of their skills and the importance of them are often challenged by their lack of self-confidence ("learning to be"), and difficulties with collaborative peer learning ("learning to live together"). The four pillars are inextricably linked (Delors, 2013) and this highlights the need for a holistic approach to employability skills development that is seamlessly integrated into the curriculum.

Limitations

Questionnaire data are inherently limited and student focus groups would have helped to further explore and enrich the emerging themes from open questions. However, an invitation to students to participate in focus groups was unsuccessful. Furthermore, the study was conducted on one cohort of students on a single module in the Open University. A longitudinal study would be required to confirm the findings of this research over future groups of students studying the module, and a study involving multiple institutions would make the conclusions more robust.

Conclusions

Addressing the research questions:

1. What are students' perceptions of their employability skills development? There is evidence that students perceived development of most employability skills in the module, most strongly in the case of collaboration, time management and communication.

2. What are students' perceptions of radar charts as a means of ePDP? Student engagement with ePDP could be better encouraged by allowing radar charts to be an optional tool alongside other means of recording ePDP, e.g an e-portfolio.

There is also a clear need to provide reference benchmarks when students first self-assess their skills and more comprehensive support in using the digital tool that generates the charts.

References

Aiken, F.J., & Hutton, C., (2021, June 29-30). *Evaluation of students' employability skills development and the use of radar diagrams in Personal Development Planning* [Conference presentation] Horizons in STEM higher Education conference, United Kingdom, on-line.

Ahmed, E., & Ward, R. (2016). Analysis of factors influencing acceptance of personal, academic and professional development e-portfolios. *Computers in Human Behavior,* 63, 152-161. DOI: 10.1016/j.chb.2016.05.043

Braun., V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589-597. DOI: 10.1080/2159676X.2019.1628806

Bodily, R., Ikahihifo, T.K., Mackley, B., & Graham, C.R. (2018). The design, development, and implementation of student-facing learning analytics dashboards. *Journal of Computing in Higher Education*, 30, 572–598. DOI: 10.1007/s12528-018-9186-0

Chang, B., & Kang, H. (2016). Challenges facing group work online. *Distance education*, 37(1), 73-88. DOI: 10.1080/01587919.2016.1154781

Chou, C.Y., Tseng, S.F., Chih, W.C., Chen, Z.I., Chao, P.Y., Robert, L.K., Chan, C.L., Yu, L.C., & Lin, Y.L. (2017). Open Student Models of Core Competencies at the curriculum Level: Using Learning Analytics for Student Reflection. *IEEE Transactions on Emerging Topics in Computing*, 5(1). DOI: 10.1109/TETC.2015.2501805.

Cowan, J., & Peacock, S. (2017). Integrating reflective activities in eportfolios to support the development of abilities in self-managed experiential learning. *Reflective Practice*, 18(5), 655-672. DOI: 10.1080/14623943.2017.1307723

Creswell, J.W., & Creswell, J.D. (2018). Research Design (5th edition). SAGE Publications Ltd.

Delors, J. (2013). The treasure within: learning to know, learning to do, learning to live together and learning to be. What is the value of that treasure 15 years after its publication? *International Reviews in Education*, 59, 319-330. DOI 10.1007/s11159-013-9350-8

European Commission (1996). White Paper on Education and Training: Towards the Learning Society. European Commission. EN/22/95/01590500.P00 (FR) [BOOK] (europa.eu)

Gillies, D. (2015). Human capital theory in education. In M. Peters (ed.), Encyclopaedia of educational philosophy and theory. Springer Science + Business Media. DOI: 10.1007/978-981-287-532-7_254-1

Harrison, R.L., Reilly, T.M., & Creswell, J.W. (2020). Methodological Rigor in Mixed Methods: An Application in Management Studies. *Journal of Mixed Methods Research*, 14(4), 473-495. DOI: 10.1177/1558689819900585

Jorre de St Jorre, T., & Oliver, B. (2018). Want students to engage? Contextualise graduate learning outcomes and assess for employability. *Higher Education Research & Development*, 37(1), 44-57. DOI: 10.1080/07294360.2017.1339183

Lackner, C., & Martini, T. (2017). Helping University Students Succeed at Employment Interviews: The Role of SelfReflection in e-Portfolios. *Teaching and Learning Inquiry*, 5(2), 3-15. DOI: https://doi.org/10.20343/teachlearninqu.5.2.2

Marginson, S. (2019). Limitations of human capital theory. *Studies in higher education*, 44(2), 287–301. DOI: 10.1080/03075079.2017.1359823.

McKenna, G., Baxter, C., & Hainey, T. (2017a). E-portfolios and personal development: a higher educational perspective. *Journal of Applied Research in Higher Education*, 9(1), 147- 171. DOI: 10.1108/JARHE-05-2016-0035

McKenna, G., Baxter, C., & Hainey, T. (2017b). Adopting a virtual learning environment towards enhancing students' self-efficacy. *Journal of Applied Research in Higher Education*, 9(1), 54-69. DOI: 10.1108/JARHE-05-2016-0038

Peyrefitte, M., & Nurse, A. (2016). e-Portfolios: evaluating and auditing student employability engagement. Advance HE. https://www.advance-he.ac.uk/knowledge-hub/e-portfolios-evaluating-and-auditing-student-employability-engagement

Wakeham, W. (2016) Wakeham review of STEM degree provision and graduate employability. HM Government. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/518582/ind-16-6-wakeham-review-stem-graduate-employability.pdf

Wheelahan, L., Moodie, G., and Doughney, J. (2022) Challenging the skills fetish. *British Journal of Sociology of Education*, 43(3), pp. 475-494. DOI: 10.1080/01425692.2022.2045186

Acknowledgements

Daphne Chang, Isabella Henman, Jane Kendall-Nicholas, Niusa Marigheto, Diane Butler, Diane Forde, Trevor Collins. eSTEeM, the OU centre for STEM pedagogy, for funding.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

HARNESSING THE SYNERGIES OF THE EDEN COMMUNITY: THE EDEN MENTORING PROGRAMME

Deborah Arnold, AUNEGe, France

Lisa Marie Blaschke, Germany

Don Olcott Jr., HJ & Associates, Romania

Abstract

In 2017, EDEN leadership began exploring strategies for capturing and mobilising the synergies and expertise of the EDEN Fellows -- an expert group of professional researchers, educators, and practitioners within the field of online and distance learning (ODL) -- and in 2018 the EDEN Council of Fellows was established. Emerging from this venture came a mentoring programme meant to capitalise on the experience of the EDEN Fellows, while also providing coaching and guidance for EDEN members. This paper explores various types of mentoring models and how these have been applied within the EDEN Council of Fellows framework, while also presenting and discussing results of the initial pilot of the EDEN mentoring programme.

Keywords: mentoring, leadership development, EDEN Fellows

Introduction

What is mentoring?

The practice of mentoring has its roots in coaching, the two being considered sister-disciplines by Guccione and Hutchinson (2021). Both involve "A designed conversation to aid the clarification and achievement of an individual's goal(s) and to help them capture the learning involved in the processes of doing so" (p. 7). What mentoring adds is experience-based input, in the form of advice and guidance. Mentoring requires investment in the training of mentors and ensuring that both mentors and mentees have sufficient time for the mentoring relationship to be fruitful (Solansky, 2010), as well as agreement on expectations between the mentor and mentee (Guccione & Hutchinson, 2021). Like coaching, mentoring demands that the mentor adopt an appropriate posture grounded in listening, empowering the mentee to devise their own strategies for advancing. A mentor will be adept at choosing the appropriate moments for distilling advice and guidance based on their own experience.

What are the different kinds of mentoring?

Mentoring doctoral students

Mentoring doctoral students involves a supportive, personal relationship which not only provides study guidance, but also introduces them to the academic community and to professional networks with a view to contributing to launching their academic career (Yob & Crawford, 2012). This role is traditionally fulfilled by the doctoral supervisor, although mentors external to that relationship may intervene, particularly when it comes to psychosocial aspects such as emotional support.

Mentoring for academic development

As Continuing Professional Development (CPD) in academia moves from a transmissive, delivery model to more facilitated, discussion-based approaches (Guccione & Hutchinson, 2021), coaching and mentoring play a key role in this emerging landscape of academic development. Such forms of personalised development are aimed at empowering individuals to better understand the context in which they work, identifying their own strengths and potential as well as challenges and opportunities.

Mentoring as leadership development

Mentoring has been identified as a key form of leadership development alongside other approaches such as coaching, 360° feedback, networking, job assignments and action learning (Day, 2000). According to Day (2000)

and later work (Day et al., 2014; Dopson et al., 2019; Spendlove, 2007), it is important to distinguish between individual leader development and leadership development, the latter referring to actions designed to increase the leadership capacity of an organisation. Since mentoring is a relationship between individuals, it could be understood

to come under the umbrella of leader development, however if a mentoring programme is initiated strategically at organisational level, it could well indeed contribute to the goal of increasing such leadership capacity.

Mentoring within a professional community

Professional communities such as EDEN bring together large numbers of individuals from diverse backgrounds and at different levels of experience, from those entering the profession to renowned experts in the field. One of the characteristics of mentoring in such a community is that this takes place in a space beyond the immediate professional environment of both the mentors and the mentees. Such a context allows for greater freedom of expression as well as depth and breadth, but also brings with it the challenge of exposure to confidential information about a particular institution and those who work there, especially in a relatively concentrated field such as Open, Distance and Digital Education where many people know each other and where there may even be competition between individuals and organisations. As we shall see later, the ethics of mentoring are of prime importance.

Background

Professional recognition - the EDEN Fellows and Senior Fellows Awards

The EDEN Fellowship Programme was created in 1997 with the first Awards presented at the 2007 EDEN Annual Conference in Naples. The purpose of the EDEN Fellows Programme is to provide professional recognition, validation, and support to EDEN members in the field of online, open and distance education in Europe. Specifically, these awards recognise service and support of EDEN activities, projects, and governance; status and professional experience in the field; research and leadership expertise; broader contributions to the profession and Europe. As part of the transition from EDEN UK to EDEN Digital Learning Europe (EDEN DLE), the EDEN Fellows Awards were transferred to the new organisation in 2022, with all Fellows and Senior Fellows carrying forward their recognition. To date (June 2022), EDEN Fellowship has been awarded to 115 individuals: 71 Fellows and 44 Senior Fellows.

The EDEN Fellows Council

While this recognition is awarded to individuals, these individuals form a network that represents an invaluable body of collective knowledge, experience and expertise. It was thus decided to bring the community together in the form of the EDEN Fellows Council, established at the 2018 EDEN UK Annual Conference in Genoa, and with the first elected representatives taking office in 2019. The role of the EDEN Fellows Council is a) to provide strategic input to the EDEN DLE Management Board, drawing on the extensive experience and expertise in online, open and distance education of the body of EDEN Fellows and Senior Fellows, and b) to act as ambassadors for EDEN and for the field of online, open and distance education with Europe and internationally. The EDEN Fellows Council is an advisory body and not part of the formal governance structure of EDEN Digital Learning Europe. Since its inception, the EDEN Fellows Council has carried out a number of initiatives designed to support the EDEN community in various ways, from contributing to the strategic development of EDEN to setting up a mentoring programme. This latter initiative is the subject of this paper.

The EDEN Mentoring Programme

The EDEN mentoring programme was the brainchild of Senior Fellow, Don Olcott, Jr., who also served as vice-chair then chair for 2021-2022 within the Fellows Council. The purpose of the programme was to capitalise upon and leverage the extensive talent, skills, leadership, and experience of EDEN Fellows for the benefit of EDEN and its members. It is important to note that the EDEN Mentoring Programme has not been designed for doctoral students, who have their own specific relationships with their PhD supervisors, and it would be inappropriate for EDEN mentors to interfere in these processes. The EDEN Mentoring Programme has been designed as professionals supporting professionals, whatever their level of responsibility: even highly experienced individuals in governance roles in Higher Education recognise the importance of mentoring, and external mentoring in particular, as a means to further develop their leadership (Arnold, 2021).

Below is a summary of the timeline from conception to the formal launch of the EDEN Mentoring Programme.

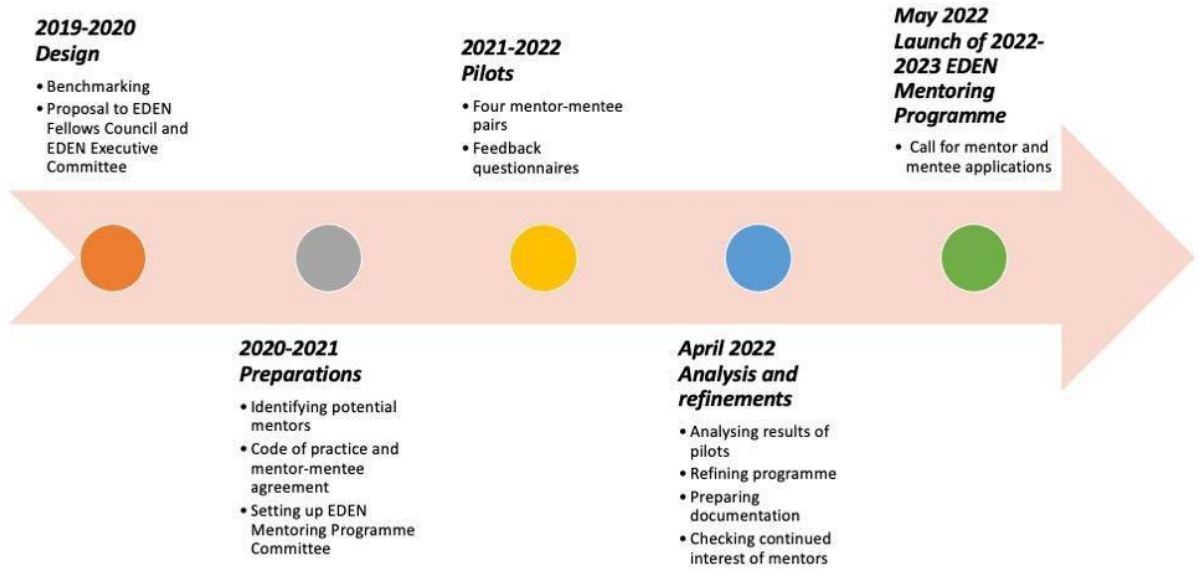

Figure 1: Timeline from conception to pilots to formal launch of the EDEN Mentoring Programme

Methodology

This paper focuses on the design and preparation stage as well as the analysis of the results of the four pilots in answer to the following Research Questions (RQ):

- RQ1: How to provide opportunities for EDEN members to capitalise and gain from the experience and knowledge of its Fellows?

- RQ2: How to build and structure a mentoring programme within EDEN's organisational framework?

Design

The mentoring programme has been designed to address the needs of four primary stakeholder groups:

- *EDEN Secretariat*, giving the organisation increased visibility and expanding upon its service offerings,
- *EDEN Senior Fellows/Fellows and Members,* who have an opportunity as mentors to share their valuable expertise and experience with others across EDEN,
- *Mentees*, who can benefit from the chance to develop professionally and grow their networks,
- *EDEN Member Institutions*, which benefit from the ongoing professional development of staff members.

Critical to the success of the programme has been the way in which it aligns with the broader core values of EDEN and the EDEN community, specifically values of accessibility, quality, innovation, collegiality, engagement, and empowerment within the area of professional development. As mentioned previously, the purpose of the programme is not for mentoring doctoral students, but rather the ongoing mentorship of EDEN members according to their individual professional development needs. Mentorships can be requested individually (1:1) or as a group (1:many or many:many), and according to a set period of time (e.g., 6 weeks, 3-6 months, one year). In addition, clear objectives and objectives are defined and mutually agreed upon as part of the mentoring relationship. In this way, the EDEN Fellows Council hoped to address the two primary issues that have arisen in organisations similar to EDEN, such as the Australasian Council on Open, Distance and e-Learning (ACODE, https://www.acode.edu.au/) and the Australasian Society for Computers in Learning in Tertiary Education (Ascilite, https://ascilite.org/), these being time restrictions of mentors and mentees and unclear objectives/deliverables.

Preparation

Potential mentors were identified by invitation, which was sent to the body of EDEN Fellows and Senior Fellows and resulted in 20 expressions of interest. Potential mentees were also identified by invitation, which was communicated widely to the whole EDEN community with the support of the EDEN UK secretariat. Both populations were informed about the aims of the Mentoring Programme and were asked to give their consent for the results to be referred to in research and communication about the programme.

A code of practice for the programme and a mentor-mentee agreement form were developed, adapted from resources provided by Guccione and Hutchinson (2021). This code of practice outlined key principles of the mentoring programme: clear and informed communication that supports informed choice by participants, coaching activities defined according to mentee and programme needs and that support the mentee's professional development, a clear mentor agreement or contract outlining the parameters of the mentoring relationship, supportive signposting throughout the mentoring relationship, recognition of mentoring as valued volunteer work, ongoing evaluation of feedback for programme improvement, and design of a programme that is inclusive, equal, and diverse. The mentor-mentee agreement -- or contract -- outlines the *expectations of participants for the mentorship* (purpose, communication modes, confidentiality, actionable learning, boundaries, declaration of third-party agendas, time commitment, ongoing feedback, conclusion of mentorship) and the *specific objectives of the mentor relationship* (modes of communication, exceptions to the general rule of confidentiality, two-three specific and achievable objectives, start and end date) that is mutually agreed to and signed by both mentee and mentor.

An EDEN Mentoring Programme Committee was established to analyse the expressions of interest from potential mentors and the expressed needs of potential mentees. This Committee consisted of Don Olcott Jr. as Mentoring Programme Chair, Deborah Arnold as Vice-Chair and Alastair Creelman as independent advisor. Four mentor-mentee pairs were identified for the pilots, and the committee then established communication with each mentee and mentor, first individually and then jointly with the mentee and mentor to launch the mentoring relationship.

Pilots

The Mentoring Programme Pilots ran from October 2021 to March 2022 with eight participants: four mentors and four mentees. After receiving and agreeing to the code of practice and signing the mentor-mentee agreement, the mentoring pairs took forward the relationship on their own agreed terms and at their own rhythm. At the end of the pilots, feedback was gathered via questionnaires, which were completed separately by mentors and mentees.

Analysis

The results of this feedback were analysed and served to refine the documentation for the formal launch of the programme in May 2022. In analysing data from the pilot programme, a thematic analysis approach from Braun & Clarke (2021) was applied as a form of qualitative and interpretive research that supports a complete, comprehensive view into the research data. Data was gathered using a written questionnaire that enquired into communication forms and uses, as well as the mentor-mentee relationship and areas for further development of the programme. Descriptive codes were assigned to the interview data, which was then clustered and interpreted in relation to the research questions (King & Horrocks, 2010). Results of the data analysis are presented below.

Preliminary results

All four mentoring pairs chose a 1:1 mentoring relationship. The mentorships formally began in November 2021 and ended at the end of January 2022, although in most cases the relationships have continued informally. As the mentors and mentees were spread across the globe (Canada, South Africa, Ireland, Romania, United States and Germany), the primary forms of communication were virtual, both synchronous (Zoom, virtual meetings) and asynchronous (e-mail, Google Docs, Miro). The number of meetings between the mentors and mentees ranged from two to five meetings over the three-month period.

Key themes were identified from the data. These included objectives of the mentorship, mentor characteristics, mentor practices, mentee practices, mentee achievements, and programme characteristics. Objectives of the mentorship varied across the mentorships. In some cases, specific and detailed objectives were identified (e.g., receiving guidance on developing a specific programme or applying a specific methodology), while in others the

objective of the mentorship was more general. In all cases, professional development was a central objective for the mentees. Programme characteristics/benefits were also identified, such as programme flexibility; the dynamic format allowing for adaptation to mentee needs; the possibility to develop relationships, receive personalised feedback and advice from, and network with senior leadership; and the opportunity to receive just-in-time mentoring and to share expertise and experience with and to learn from each other.

> *It is an opportunity that one rarely has at the beginning (or in the middle) of an academic or professional life, to be able to count on international experts who can give personalised advice to redirect or improve one's career. Thanks to the mentorship [sic], I realised that I have to define several aspects of my professional career in terms of focusing and I will work for sure on everything we talked during the sessions to improve my profile in the near future. (Mentee 3)*

Mentees identified specific mentor characteristics that were important to them, from the mentor's extensive international experience and in-depth knowledge to the mentor's authenticity and their ability to nurture supportive and welcoming environments for the mentees. Mentor practices that were beneficial to mentees included the mentor asking questions to deepen the conversation and generate curiosity, assisting in shaping academic and professional goals, sharing knowledge, resources, and experiences, and providing feedback, adapting to the mentee context.

> *At all times, [Mentor 2] adapted to my objectives, needs and specific professional context, asking beforehand what they were in order to prepare the sessions. Throughout the mentoring, [Mentor 2] took care to match his expertise to my needs and vice versa, which I think is crucial for this type of programme. Moreover, he went further, even proposing future collaborations to work together on research or publications when I had the opportunity.* (Mentee 2)

> *As a doctoral student, having access to mentors outside of the doctoral program feels like an essential step in building community. Having freedom to fail, learn at your own pace, and feeling supported have given me a greater sense of belonging.* (Mentee 4)

Mentee practices were also described, for example, defining goals and objectives for the mentorship, documenting and reflecting upon the mentoring experience both during and after the mentorship (e.g., using a reflective journal), and reporting on key results of and next steps for the mentorship, as well as application after the mentoring relationship. *Mentee achievements* was another theme, with mentees reporting that they were able to build community and relationships and to achieve a sense of belonging, as well as become more reflective. All participants reported a positive working relationship within the mentorships and that the mentoring programme met and at times exceeded their expectations -- and all would further recommend the programme.

Discussion and conclusion

Among the significant lessons learned during the setting up of the pilots was the need for clear communication, not only about the programme itself but about the very role of mentors and mentees. Some of the individuals who responded were unclear as to whether they were proposing to be mentor or mentee, on the basis of preconceptions that it was a programme for mentoring doctoral students. The Mentoring Programme Committee took this on board in the refinements to the documentation, resulting in the comprehensive 2022-2023 EDEN Mentoring Programme Brochure[1]. This need for clarity extends to the mentoring relationship themselves in setting expectations (Guccione & Hutchinson, 2021) and was addressed in feedback to the mentors.

In reflecting upon the research questions, the initial questionnaire data and analysis indicates that the Mentoring Programme has indeed the potential to and *has* given EDEN members opportunities for capitalising on Fellows' knowledge and experience (RQ1) and that this has been a positive result of the pilot, as evidenced by mentees' satisfaction with the programme. Olcott (personal communication, March 16, 2022) has also pointed out that "three of the four mentees who participated were experienced professionals – we are all… engaged in continuous learning and professional development". The detailed account of the background, preparation and methodology presented

[1] https://eden-europe.eu/2022-2023-eden-mentoring-programme/

in this paper serves to answer RQ2: How to build and structure a mentoring programme within EDEN's organisational framework? Both questions require additional exploration and reflection as the programme grows.

The next phase of the programme will involve making further improvements to this EDEN offering. In their feedback, mentors and mentees have suggested gathering more information about the mentee during the application process, offering longer mentoring periods as needed, reviewing the readiness of the mentee for the mentorship, and promoting more mentee reflection and tracking of challenges, solutions, and outcomes. Mentors noted that they would have liked more time for the mentorship -- a finding also reflected in the mentorship programme experiences of Ascilite and ACODE. Mentors also recommended that mentees more clearly document their main issues and agreements on next steps/actions, reduce the reflection time to twice during the mentorship (midway and the end of the experience, identify fewer and more achievable objectives within the timeframe, and to have a better understanding of how mentors and mentees are matched. The authors also see a need to refine the questionnaire/survey and combine it with semi-structured interviews, opening up the possibility to apply techniques such as Reflexive Thematic Analysis (Braun & Clarke, 2021) to identify additional themes in the data.

The authors recognise that the four pilots represent a limited dataset, and that more significant conclusions will be made possible by analysing data from the full 2022-2023 Mentoring Programme, which we hope to present at a future EDEN Conference. The following quote from a communication to mentors summarises the main outcomes of the pilot:

> *The mentorships were very successful and consistent with other mentoring programmes, the two issues that arose during the pilot evaluation were ensuring 1) clear objectives of the outcomes of the mentorship; and 2) recognising the time demands on today's professional and that minimally a mentorship should be 4-6 months. We knew this going in but having data to support it is validating. (Olcott, personal communication, March 16th 2022)*

Acknowledgements

The authors wish to thank all the participants in the pilots, as well as the community of EDEN Fellows and Senior Fellows who have offered their service as mentors. The contribution of the EDEN UK and EDEN DLE secretariats has been instrumental in helping to launch and communicate about the EDEN Mentoring Programme. Finally, the smooth transition of the EDEN Fellows Council from EDEN UK to EDEN DLE thanks to the engagement of the governing bodies of the two organisations is greatly appreciated, contributing to ensuring the continued success of the EDEN Mentoring Programme and future Fellows Council initiatives.

References

Arnold, D. (2021). *Supporting Leadership Development in European Universities: A Mixed Methods Study of Digital Education Leadership Literacies in Higher Education* (Doctoral thesis). Universitat Oberta de Catalunya]. http://hdl.handle.net/10609/142686

Braun, V., & Clarke, V. (2021). *Thematic Analysis - A Practical Guide*. SAGE Publications Limited.

Day, D. V. (2000). Leadership development: A review in context. *The Leadership Quarterly, 11*(4), 581–613.

Day, D. V., Fleenor, J. W., Atwater, L. E., Sturm, R. E., & McKee, R. A. (2014). Advances in leader and leadership development: A review of 25 years of research and theory. *The Leadership Quarterly, 25*(1), 63–82.

Dopson, S., Ferlie, E., McGivern, G., Fischer, M. D., Mitra, M., Ledger, J., & Behrens, S. (2019). Leadership Development in Higher Education: A Literature Review and Implications for Programme Redesign. *Higher Education Quarterly, 73*(2), 218–234. https://doi.org/10.13140/RG.2.2.18104.39686

Guccione, K., & Hutchinson, S. (2021). *Coaching and Mentoring for Academic Development*. Emerald Publishing Limited.

King, N., & Horrocks, C. (2010). *Interviews in qualitative research*. London: Sage Publications, Ltd.

Solansky, S. T. (2010). The evaluation of two key leadership development program components: Leadership skills assessment and leadership mentoring. *Leadership Quarterly, 21*(4), 675–681. https://doi.org/10.1016/j.leaqua.2010.06.009v

Yob, I. M., & Crawford, L. (2012). Conceptual Framework for Mentoring Doctoral Students. *Center for Faculty Excellence Publications*, 2. https://scholarworks.waldenu.edu/cfe_pubs/2

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

IMPROVING STUDENT SUCCESS FOR GLOBAL MAJORITY AND LOW SOCIO-ECONOMIC STATUS STUDENTS THROUGH ADDITIONAL SYNCHRONOUS SUPPORT AND INFORMATION EMBEDDED ON A DISTANCE LEARNING ACCESS MODULE

Hannah Lavery, The Open University, UK

Steve Padley, The Open University, UK

Abstract

Arts and Humanities colleagues at the Open University wanted to explore whether we could have an impact on the retention and progression of our students by embedding Employability and Careers information specifically for the Arts and Humanities early in the module, when students were completing their 'Learning Plan' (linked to the first assessment point). Recognising that GM and low SES students also have greater risks attached to completing their course of study, we organised for these students to have access to a 'Personal Learning Advisor' (PLA), offering coach-mentor support. These additional support and information initiatives were embedded on the two presentations of Y031 that ran during the 20/21 academic year. Our mixed methods study analysed quantitative data to assess the impact on retention and progression; and qualitative data, captured through survey and student interview, to give us a richer picture of individual student experiences, including their motivations to study and any barriers they experienced. We saw improvements to retention during 20/21, and synchronous Employability webinars have now been embedded as standard across the Access programme.

Keywords:

Access; Arts and Humanities; Asynchronous webinars; coach-mentor; Employability and Careers; Global Majority; Low socio-economic; retention and progression; Student Success.

Project activities during 20/21

Colleagues working in the School of Arts and Humanities (A&H) and for Access at the Open University are aware that we recruit and retain fewer Global Majority (GM) and low Socio-Economic Status (low SES) students to our modules than on comparable entry-level modules in other Schools and Faculties at the Open University (i.e. Social Sciences and STEM). Scholarship suggests that 'aspirations of parents and families and the expectations about the economic gain from going to university are significantly higher amongst individuals from ethnic minority backgrounds' (Connor et al., 2004); and that low SES students are more often driven by economic necessity (Reay et al, 2005, p. 161; Stuart 2006, p. 175). It may also be that the reputation of A&H study as not being 'open' to students from all communities is established at an earlier age, both at home and in school. Focussing on the experience of our students on the OU's Arts and Languages Access module (Y031) over both presentations in the 2020/21 academic year, we wanted to assess whether we could have an impact on the retention and progression of our students by embedding Employability and Careers information, specifically for the Arts and Humanities, early in the module. Students on Y031 already have access to two separate asynchronous Careers forums, run by colleagues in the OU's Careers and Employability Service (CES). The first of these takes place during the first of the 'Options weeks' on Y031 at week 11 of the 30 week module, at which point students have completed two of the four Tutor-Marked Assignments (TMAs) on which they are assessed; the second asynchronous forum takes place in week 24, when students have a study week set aside for considering their future study and career pathways. This 'Moving On' week comes just before students begin their work towards the final assessment task on the module. While the Careers and Employability Service is available to students throughout the year, in practice the CES for distance-learning students does not have the same visibility throughout the student journey as in campus-based higher education. We wanted to see if an earlier live event would increase student awareness of the CES. We organised for two Careers and Employability Consultants to provide a 1 hour webinar, specifically in relation to the opportunities afforded by studying A&H degrees. The webinar was timed to take place during week 2, when

students were preparing their 'Learning Plan' for the year, a reflection on their study goals, submitted as part of their first Tutor-Marked Assignment (TMA01) submission in week 5. Students are expected and encouraged to reflect throughout the module on their Learning Plan, culminating in a 'Learning Review' in the final TMA. Students on Y031 have very little interaction with online learning in the first of the three study blocks that comprise the module; Block 1 uses hard-copy materials almost exclusively, while Block 2 and Block 3 study materials are provided online only. It is striking, therefore, that the first webinar, which ran at the start of the 20J presentation of Y031 in October 2020, saw 79 students attending from a total cohort of 271 at that point (29%), with the 'empty-room' recording watched 100+ times. Attendance at the February-start presentation ('21B') was smaller, at 20%, but still well-attended for that point in the presentation (with 50+ viewings of the recording). It should be noted that the online webinar, like other online learning delivery on Y031, was not compulsory, so the attendance figures were very encouraging, and demonstrated a real willingness among students to engage with thinking about careers and employability from an early stage of their Access study journey.

Colleagues are also aware that we are losing a higher proportion of GM and low SES students during the course of the year, reflecting a similar pattern in the wider sector: despite an increase in the overall number of GM students participating in HE (from 30% in 2003 to 35.5% in 2008: Crawford & Greaves, 2015), Henderson et al show that GM First-in-Family students are 4% more likely to drop out than their White FiF peers. Recognising that low SES students also have greater risks attached to completing their course of study (Archer et al, 2003; Christie et al, 2004), we organised for students on Y031 21B to have access to a 'Personal Learning Advisor' (PLA), offering coach-mentor support. (NB This was an OU initiative that launched in January 2021, and was therefore not available for 20J students). The PLA pilot scheme, like the CES webinar, was partly designed to give distance-learning students an equivalent access to proactive student support that campus-based universities can provide. Black, Asian, minority ethnic, and/or low SES students on Y031 21B (February 2021), were offered one-to-one coaching and support from a coach-mentor Personal Learning Adviser (PLA). Students had to request this service themselves: the response rate was very good on this project, with a 61% take-up rate (87 students eligible, 53 took up the support). Just 7 of the 81 students who responded to our survey (see below) had been approached regarding the PLA service, with 6 of those students taking up the offer of support. Interestingly, half of these students were under 25; a further two were aged 26-35, and one student aged 36-45; three students 'consider themselves disabled' with two 'prefer[ing] not to say'. This indicates that younger students in GM and/or low SES categories are more likely to make use of the kind of pastoral support offered by the PLA service.

Research tools and methodology

We collected quantitative data concerning assignment submission and student progression to address whether additional synchronous support and advice affected positively on student success. We wanted to build on earlier scholarship pertaining to the impact that student motivation and subject choice might have, to better understand what kinds of additional support might benefit particular groups of students. We therefore approached the combined cohort from Y031 20J and 21B to collect qualitative data in the form of a survey (81 responses, so a 17% response rate) and via seven one-to-one interviews with student volunteers from the GM and low SES student groups.[2] Based on the project's conceptual framework we defined the categories by which the qualitative data could be identified and coded, linking to themes and issues relevant to the research question, concerning students' experiences of A&H study (historic and current); their motivations for study; and any barriers to study they had experienced.

One limitation of our study is the difficulty of assessing with statistical accuracy the experiences of GM and low SES students, given how few there are on the module. For instance, of the respondents to the survey just two students declare their ethnicity as black, Asian or ethnic minority (2.5%) and thirteen (16%) are identified as low SES. With just 9% of the total cohort of 481 students identified as GM, and 16% as low SES, when we have just a 10% response rate from within those groups to the request for volunteers for the interviews we are necessarily working with small numbers. However, data collected via the interviews, detailing individual students' experiences, adds depth to the broader statistics collected via our survey.

[2] Student Identifiers within this report: Student 1 (female, low-SES); Student 2 (female, GM); Student 3 (female, GM);Student 4 (female, GM); Student 5 (male, low SES); Student 6 (female, low SES); Student 7 (male, GM).

Findings

Perceptions of A&H study

We wanted to reflect on why students might not consider A&H a viable option for post-16 study. 48% of respondents to our project's survey agreed that 'When I was in school/college and thinking about my future I didn't consider studying Arts and Humanities subjects, as a means to a career'; 19% 'enjoyed studying Arts and Humanities subjects at school/college, but went on to further study in a different subject area'. Two interviewees within the GM cohort suggested that A&H subjects are not promoted at school level: Student 2 confirmed that when she was at school the other kids in her classes were not interested in these subjects, and therefore 'it was so hard to learn anything'; she was also not offered or able to access careers advice. A similar context is suggested by a student from the low SES grouping: 'most people around me just sort of go into care work. I've never really thought about why that is, but it's just sort of the route that everyone goes to around here' (Student 6). Strikingly, in talking about how supportive her family and friends have been of her decision to study toward an A&H degree at the OU, Student 2 said that 'they can see, from the outside in, they can see me': her choice to study a subject she is passionate about, to lead to a career that 'suit[s] me better', is defined in terms of developing her true self. This is a powerful call to ensure that we are presenting students from all communities with the information and guidance they need to make informed decisions about their study options; and to ensure that information highlights how studying A&H offers routes into a variety of vocations.

One of the students interviewed was not aware which subjects were covered by the term 'Arts and Humanities'; two other interviewees indicated that individuals outside the OU confuse A&H with 'Art' as a subject: 'they don't really know what it entails… they have a picture in their head of me drawing and painting' (Student 3). Student 1 reflected on the reputation that A&H has within her immediate environment: 'people on sort of estates like this think of arts and humanities as more sort of the pomp-y side of education… more an upper class maybe career degree'. She felt that if 'more was made to show the different careers you can do… showing more as jobs for the lower class for want of a better term… it seems a little bit less out of their reach'. In order to reach out into these communities, attention needs to be paid to how we present our courses, being specific as to which subjects fall under the banner of 'A&H', and foregrounding information about the variety of careers available to A&H graduates.

100% of respondents to the interviews (and 84% to the survey) felt that more should be done to promote the employability possibilities of an A&H degree. Two low SES interviewees acknowledged that before they looked into OU study they were not aware that an A&H degree could be used to get into teaching; students both at interview and in the survey expressed surprise at the variety of careers open to A&H graduates, such as teaching, working in the creative arts, museums, galleries etc.. The OU CES already helps registered OU students identify the career possibilities of an A&H degree, via extensive information on subject-specific pages on their website; the CES works with individual modules across the OU, through lively embedded forum events on undergraduate Level 1 modules, and a recent expansion of CES provision to Level 2 and 3 modules; plus pre-existing live events hosted by CES (e.g. an A&H Q&A series involving alumni, academics, employers and professionals, giving their real world experiences of career paths, advice, insights and sector awareness). Our project explored the potential for embedding synchronous CES events within individual modules, and linking this to assessment, in order to encourage participation. Offering a recorded version of such events, retained permanently on the module website, gives students the opportunity to revisit the webinar throughout the module, for example when they start to consider their next steps. This could encourage progression through to further study at Level 1.

Study motivations

57% of the students responding to our survey claimed that their motivation at enrolment was study for 'personal development' and this had not subsequently changed. 34% of that group registered that they were picking up study following retirement, and wanted to study something 'unconnected' to their past career or employment in general. This idea of a negative pressure associated with mention of careers and employability is echoed in another student's comment that Access is about being 'introduced to learning again' and we should avoid pushing the idea of careers 'too early'. However, free-text comments in the survey, from students who register as studying for 'personal development', paints a more nuanced picture: three students in the 'personal development' grouping

explained that their motivation to study was to make good on an earlier lost opportunity: 'I regret not getting my degree when I left College, then work & life got in my way & I am able to fit studying into my lifestyle now' (female, 46-55). Although there may be no specific career goal in mind, it would be helpful to consider these students as distinct from the post-retirement, 'leisure learner' cohort, as there is potential for this personal interest to develop a previously unfulfilled life/career aspiration. This group of prospective students may also respond favourably to promotion of degree-level study as a means to unlocking their personal and career potential, building on their passion for these subjects.

At interview, all GM students noted that the lockdown prompted their decision to research and ultimately sign-up for study with the OU ('it changed our perspective of life'); in a couple of cases this corresponds with a loss of paid employment, but it also tallies with the significant number of interviewees (across both groupings) who mentioned that OU study presents them with the opportunity to follow a new path: Student 3 notes how she wants to 'venture out into something a bit more exciting, something different'. Similar cases are recorded in the survey. Clearly lockdown had an impact on student behaviour, and the OU's online, distance-learning model provided students with a starting point for their pursuit of these study goals. Through our incorporation of additional synchronous support and guidance activities, to a previously largely asynchronous teaching model on Y031, we have effectively enhanced the learning experience for students.

Overall, there was a significant percentage of students surveyed who felt that 'a degree in the Arts and Humanities can open the door to a better paid job' (21%). Across both presentations there was a higher percentage of low SES students noting they are studying for either 'career development' or 'both career and personal development' (i.e. 46% of respondents in the lowest two deciles of the Index of Multiple Deprivation, compared with 37% of the total respondents): this bears out scholarship suggesting that low SES students are more likely to be motivated by career goals. 84% of students surveyed (and 100% of those interviewed) responded that more information relating to the range of careers open to A&H graduates would be useful for prospective students. If we want to attract a more diverse range of students, Arts and Humanities could usefully look to boost messaging around careers and employability via marketing and outreach.

Interestingly, of the six students in the lowest two deciles of IMD, studying solely for 'personal development', three note that studying Y031 could 'potentially' improve their chances for a career change in future. So even where students have registered that they are studying for personal development only, they are subsequently discovering that career development and/or change of career are some of the potential benefits of studying at Access level; and this is surely enhanced by the provision of targeted awareness-raising activities, such as our live webinar.

The more detailed feedback gained via the interviews suggests one reason why so few students select 'career only' as their motivation to study on the survey (just two students, so 2.5% of the total cohort). Over half of the interviewees register how important it is to study a subject that interests them. The focus on studying something they are passionate about, over perhaps what might be considered more directly vocational courses, is a particular driver: 'there might be lots of jobs in IT and science and law but if you have no passion for them, would you love them when you got there?' (Student 2.) This presents a challenge to studies concluding that students from particular backgrounds are necessarily drawn to 'vocational' courses. The A&H Access and Level 1 modules at the OU are interdisciplinary in nature (with Y031 covering English Literature; English Language; History; Art History), encouraging a focus on the transferability of skills, whilst opening students' eyes to subjects they may not have previously considered studying. A&H might build on this to encourage students to enrol to study a subject they enjoy, in order to attain a degree that opens doors to multiple vocations. Evidence from our project suggests that this message would land particularly well with students in the GM and low SES cohorts, as well as the considerably larger cohort of 'second-chancers' registering on Y031.

Barriers to student success (1): Access to student communities

Scholarship has documented the important role that student communities can play in terms of helping individuals develop studentship skills, as well as having a positive impact on the retention of students, by counteracting feelings of isolation. Such feelings are more likely to occur in a distance-learning environment than at a campus-based university. Stuart concludes that 'a sense of belonging and a source of academic and emotional support' (2006, p. 162) can make the most difference in terms of student success, particularly for students from non-traditional backgrounds. At the Open

University (and particularly over the years of non- face-to-face provision, since March 2020, due to the pandemic), development of these student communities has been a particular challenge. This is reflected in feedback from interviewees, who felt they missed opportunities to meet and interact with other students and their tutor; three of the four students from the GM cohort mentioned this at interview). Evidence from the interviews suggests that asynchronous forums are not providing students with adequate access to student communities; they are increasingly turning to alternatives such as Facebook student groups, which have their own challenges and limitations. We should consider how to encourage and promote student communities at a distance; and we need to reflect on the importance students place on being able to see as well as hear each other. The importance of this cannot be underestimated: Christie et al (2004) found [friendship] to be a significant factor affecting non-completion of courses of study: 'non-continuers reported more difficulties in meeting new people, getting involved in student activities and were more likely to perceive the environment as alienating' (p 625). Embedding opportunities for students to participate in video-chat with tutor and peers could enhance the support we can provide and enable construction of student communities at a distance.

Barriers to student success (2): Student support issues

Respondents to the survey noted the range of personal challenges and obstacles they faced. Of those students who experienced difficulties, only 41% contacted their tutor or Student Support Team (SST) for support. Of the 59% who did not seek advice/ support: 74% were 'able to work through the problem and catch up without help'; 11% 'Didn't realise I could ask for support from my tutor for this'; 26% were 'embarrassed to ask'. The latter figure suggests that existing routes (i.e. via their tutor or referral through the SST) are not appropriate for all support needs. Beck (1992) notes that students from non-traditional backgrounds, who do not have the same resources as middle class students to draw on, often rely more heavily on personal determination to succeed; Stuart notes too that personal determination was a significant factor for the working class respondents to her project, but reflects that there is 'almost a kind of rigidity about their responses, which may shatter' (p. 172). This acknowledges both a likely causal factor for the high percentage of students not requesting support, and also offers a potential reason for higher levels of withdrawal amongst particular groups of students when that personal determination shatters, and they do not feel they have access to the support and advice they need.

Two of the interviewees in the low SES grouping experienced health issues that presented barriers to successful study. However, there is evidence in both the interviews and survey of the positive impact of the additional support provided by PLAs: 'you've just been amazing as a university because you've got multiple forms of support… maybe stuff you wouldn't want to bring up with one person, you can talk to the other person' (Student 5). In the survey, we find some powerful case studies. The case study in Figure 1 records that this individual found the support he needed despite a reluctance to approach his own tutor. Access to a PLA helped him through a bad patch and encouraged him to keep going. This is evidence for the impact of this additional support in terms of improving retention and progression for vulnerable students.

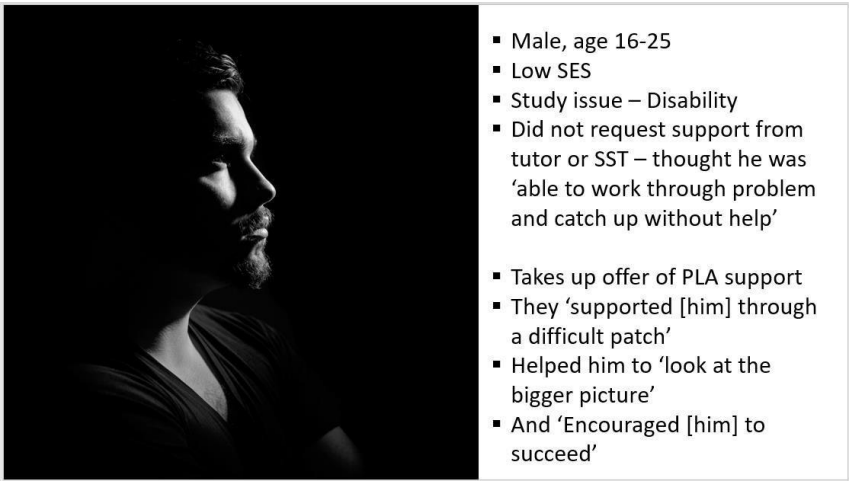

Figure 1: Case study of male student receiving PLA support (21B)

- Female, age 36-45, low SES
- Feedback: Her PLA was 'very good at finding out what interests me personally and applying it to the course which greatly helped with my TMA02'

Figure 2: Case study of female student receiving PLA support (21B)

The case study in Figure 2 shows that the PLA helped the student to identify what was important to them as an individual and how that could be applied positively to their academic work. This echoes the importance of study for both bringing out and shaping self-identity. Stuart (2006) concludes that 'enabling widening participation is less about structure, teaching and learning, the curriculum or teachers, but more about intangible things such as belonging, developing determination, imagination and self-worth' (p. 182). From the qualitative evidence in our project, it seems the PLA service is allowing the OU to reach and potentially retain these students through harnessing these types of 'intangible things'.

Results and Outcomes

Quantitative data from Y031 20J and 21B shows that these presentations record improved retention and progression of students, compared to previous presentations:

Y031 TMA submissions 20J

	18J	**19J**	**20J**
TMA01 %	92	89	94
TMA02 %	76	82	88
TMA03 %	68	68	78
emTMA04 %	65	63	75

Y031 TMA submissions 21B

	19B	**20B**	**21B**
TMA01 %	87	90	90
TMA02 %	76	75	83
TMA03 %	65	63	70
emTMA04 %	62	59	65

It is important to note that the submission rate of 75% for the emTMA04 on 20J is the highest figure recorded for the final assessment in any presentation of the module, which has been running since 2013. There has been little change to assessment strategy and content that might account for improvements in retention and submission, so the impact of the project is likely to have been a significant contributory factor. Also, note the decrease in the gap between TMA01 and TMA02, and TMA02 and TMA03. Such gaps are consistent across all three Access modules, and to some extent inevitable, as the difficulty of assessment tasks increases. However, the increased submission rate for TMA01 in 21J and the decreased gap between TMA01 and TMA02 in 22B may have been a positive unintended consequence of so many students being able to get together and 'meet' at the employability webinar

during a period in which students are mainly working with materials in hard copy rather than online, so have fewer opportunities to interact with other students. Analysis of the progression routes of students show these to be broadly in line with previous presentations; however qualitative data, collected via survey and interview, records that the additional information regarding employability and careers was welcomed by students, with evidence that in some cases this had led to some students shifting their study goals from 'personal only' to 'personal and career development'. All interviewees confirmed that studying Y031 has encouraged them to move on to further study.

Conclusion

Giving individuals the space to develop as students, and allowing them to recognise and build upon their own passions, interests, and identities, needs to be a key element when addressing EDI for our modules, particularly where students are taking their first steps (back) into education. However, it is clear that, as a sector, we face a challenge attracting a more diverse range of students to A&H degree pathways in the first place. More positively, student responses to the CES webinars show an increased awareness of the career possibilities of A&H study. Student feedback collected by CES about the webinars was very positive: 69% of attendees felt clearer regarding their next steps after attending. The survey revealed a further 69% of respondents found the webinar helpful for completing their 'Learning Plan'; 59% agreed it gave them new ideas about possible careers. Recognising the success of the webinars, similar events were rolled out to the other two Access modules for 21B, and are now part of the standard offering for all Access students. Synchronous CES webinars should continue to raise awareness and better inform students when deciding about progression to higher-level study. Attention also needs to be paid to the support framework available to these students, as evidence from this project suggests that a higher level of individuated and longer term support, offered through a blend of synchronous and asynchronous contact (with student preference being a key determinant of the form of that support), can have a significant impact on student success.

References

Archer, L, Hutchings, M and Ross, M (2003) *Higher Education and Social Class*. London: Routledge Falmer

Christie, H, Munro, M and Fisher, T (2004) 'Leaving university early: Exploring the differences between continuing and non-continuing students', *Studies in Higher Education* Vol 29 No 5, pp 617–31

Connor, H., C. Tyers, T. Modood and J. Hillage (2004), *Why the difference? A closer look at higher education minority ethnic students and graduates*, DfES Research Report RR552, London

Crawford, C. , & Greaves, E. (2015). *Socio-economic, ethnic and gender differences in HE participation*. London: BIS (Department for Business Innovation and Skills), (Research Paper No. 186).

Field, J (2005) *Social Capital and Lifelong Learning*. Bristol: The Policy Press

Henderson, M, Shure, N, & Adamecz-Völgyi, A. (2020) 'Moving on up: "first in family" university graduates in England', *Oxford Review of Education*, 46:6, 734-751, DOI: 10.1080/03054985.2020.1784714

Office for Students. N.d. 'BME Attainment Gap'. *Closing the Attainment Gap.*

The Project – BME Attainment Gap (closingtheattainmentgap.co.uk), accessed 29 Sept 2021.

Reay, D, David, M, Ball, S (2005) *Degrees of Choice: Social Class, Race and Gender in Higher Education*. Stoke-on-Trent: Trentham Books

Stuart, Mary. (2006). 'My friends made all the difference': Getting into and succeeding at university for first-generation entrants. *Journal of Access Policy and Practice*, 3(2), 162–184

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

DESIGNING AN ASSESSMENT MODEL OF ENTREPRENEURSHIP COMPETENCE FOR THE PROMOTION OF SUSTAINABILITY IN COMPULSORY AND POST-COMPULSORY EDUCATION

Paloma Cisa, Estel, UOC, Spain

Guàrdia Ortiz, Lourdes, UOC, Spain

Buil Fabregà, Màrian, Tecnocampus-UPF, Spain

Abstract

The development of cross-curricular or generic competences for lifelong learning is especially relevant in compulsory and post-compulsory education, among which entrepreneurship competence is included as one of the competences that will enhance essential skills for the development of sustainability. In order to successfully implement it, it is essential to have a learning and assessment model that allows the educational community to adequately guide the development and acknowledgment of this competence. This article presents the first necessary results for the design and anchoring of the model for its implementation in the Escola Pia de Mataró. These results are the outcome of the work carried out with 200 students of 5th and 6th year of Primary School (compulsory education) who were surveyed, as well as with the workshop carried out with 15 teachers. They have provided relevant information on their knowledge and awareness of entrepreneurship competence that offers a better understanding of the context of application regarding how to establish the basic pillars for the design of an appropriate assessment model.

Keywords:

Entrepreneurship competence, assessment model, primary education, competency-based assessment, cross-curricular competencies, assessment by competences,

Introduction

The aim of this article is to present the first results of the research of the doctoral thesis project "*Model for the evaluation of the development of entrepreneurship competence for the promotion of sustainability in compulsory and post-compulsory education*". This project is being developed within the framework of the industrial doctoral program[3] funded by the Government of Catalonia, and its object of study is to propose a model for the evaluation of the development of entrepreneurship competence that facilitates the promotion of sustainability in primary and secondary school students.

Entrepreneurship competence is one of the eight key competences defined since 2006[4] by the European Parliament and the Council of the European Union, in its resolution of 2018[5]. It is also in this last resolution that a

[3] The objective of the Industrial Doctorates Plan is to contribute to the competitiveness and internationalisation of the Catalan industry, strengthen the tools to attract the talent generated by the country and place future doctors in a position to develop R&D&I projects in a company. https://doctoratsindustrials.gencat.cat/en/els-doctorats-industrials/que-es-un-di/

[4] RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 on key competences for lifelong learning (2006/962/EC) https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF

[5] COUNCIL RECOMMENDATION of 22 May 2018 on key competences for lifelong learning (Text with EEA relevance) (2018/C 189/01): 32018H0604(01) - EN - EUR-Lex

new competence appears, which highlights the importance of sustainability: "Citizenship competence". Entrepreneurship competence is also defined as a key competence in the different Spanish regulations (LOE 2006, LOMCE 2014 and LOMLOE 2020). However, although the aspiration of the Spanish Ministry and also of the Generalitat de Catalunya is to introduce them in their curricula, the fact of considering entrepreneurship competence as a transversal, makes its evaluation more difficult, since it does not belong to any specific subject, so it is the responsibility of the whole teachers' staff to decide how to proceed with its assessment.

Theoretical background

The assessment of learning through competences is one of the great challenges of education. This requires the gathering of evidence of such learning, and in the case of transversal competences, it is not possible to do so with a simple exam, but it also requires other instruments and methodologies that allow the tracking and support of the student's learning process (Gipps, 1994; Mislevy, 1994) and (Rosales López, C., 2010), becoming a more reflexive process at the same time (Monereo, C., & Pozo, J. I., 2007).

In this context of competence assessment, the fact of having a reference framework where the entrepreneurship competence is defined makes it possible to create its own model for its assessment. This framework is EntreComp (Bacigalupo et al., 2016), where such competence is defined as the ability to convert ideas into actions that generate value for someone other than oneself. EntreComp (Bacigalupo et al., 2016) was born with the aim of giving European citizens, whether individuals, teams or organisations, the knowledge, skills, and attitudes to face the fast-paced social changes in all areas of life. The framework is divided into three areas (in this research we will call them dimensions to be able to match the Spanish and Catalan regulations), 15 sub-competences, 15 descriptors and 442 learning outcomes. All this unfolding facilitates the development of assessment and learning activities within a curricular framework that will give an answer to a specific assessment model of the entrepreneurship competence. And beyond assessing entrepreneurship competence, this research intends to show the interrelationship between entrepreneurship competence and sustainability, as already has been demonstrated by Berglund et al., 2014; Corney & Reid, 2007; Firth & Winter, 2007; Hassan et al., 2010; Zupan et al., 2018.

The assessment of this competence, as with the rest of the cross-curricular competencies, must be integrated into the curriculum by defining tasks (Domingo Segovia, J., & Barrero Fernández, B., 2010), (Torres, 2010, Alonso, J.R.V., 2010) and non-conventional activities (Marco Stiefel, 2008, pp. 52-52, J.R.V., 2010) such as project work, role-playing, solving real challenges, among other active methodologies. In order to design the appropriate assessment model, a pedagogical approach based on the pedagogy of integration (Roegiers, 2010) will allow us to incorporate the competence in a disciplinary or interdisciplinary way, and to promote, at the same time, an assessment of the process in more meaningful learning contexts (Guàrdia, L. et al., 2018) (Maina, M. et al, 2020)..

Research context

The model is implemented at Escola Pia de Mataró, where the researcher is working as a teacher. The school, which has about 2500 students and all educational levels, is part of a wider institution that includes 19 schools throughout Catalonia: Escola Pia de Catalunya. Since 2015-16, an innovative project called SUMMEM[6] began to be implemented in all schools, where at least 50% of the learning time in the classroom had to be project work in an interdisciplinary approach and in teams using the concept of learning itineraries. The project is currently consolidated in all schools at the compulsory education level and is being piloted in post-compulsory education. It is in this project where it makes all the sense to evaluate, and thus, to collect evidence of learning for the entrepreneurship competence, but also for the rest of the transversal competences. The assessment model will be proposed in the context of the learning itineraries mentioned under the umbrella of project-based learning methodology.

The design of an assessment model for entrepreneurship competence proposed in this research is composed of different phases. The first one required the adaptation and validation of EntreComp (Bacigalupo et al., 2016) as a

[6] SUMMEM: Projecte per la interdisciplinarietat a l'aula: https://www.escolapia.cat/summem/

reference framework with entrepreneurship experts at Escola Pia de Catalunya. Then, and from the itineraries of the SUMMEM[4] project that were carried out in the courses to pilot the model, the tasks and evidence that should show the learning outcomes of the itineraries were identified. Also, the EntreComp Performance Criteria (Bacigalupo et al., 2016) that would allow us to assess the entrepreneurial competence were identified. To disseminate this work, interviews were conducted with the pedagogical heads and coordinators of the educational levels of Primary and Secondary Education, and it was at this point when I was aware that the lack of knowledge of entrepreneurship competence among the teaching staff was important and if it had not been taken into account, the model that I wanted to implement with this research would fail or not been really successfully implemented at the end. The paradox is the meaning of the word entrepreneurship, since it is usually used for a start-up company or initiative, and therefore in the educational world, especially in the compulsory one, it is not well accepted. There are authors who have already sufficiently differentiated the concepts of business and entrepreneurship (Alemany & Urriolagoitia, 2014; Marina, 2009) where it is defined from the attitude: resilience to failure, communication, creativity, and therefore from a competence view. This conceptualization of entrepreneurship competence has been the first challenge to be solved before implementing the competence assessment model.

This conceptualization of competence was carried out with three groups involved:

- School management team: with whom a general workshop was held on the research to be carried out at the school.
- Teams of coordinators and tutors of the levels to be implemented: with whom a workshop was held in which these points were announced:
    - the doctoral thesis project
    - the concept of entrepreneurship competence (EntreComp)
    - the concept of sustainability
    - the relation of the SUMMEM[4] project itineraries with these two concepts (the need to expand the view of the usual classroom activities).
    - the process for collecting information from the students, in order to know the starting point on competence
    - the use of the information from the questionnaire as another instrument for the evaluation of the autonomy, personal initiative and entrepreneurship competence of these students.
- Students: for them a questionnaire was designed, based on the study conducted in the Community of Extremadura (Sánchez-Hernández and Maldonado-Briegas, 2019) where the objective included the following :
    - to understand the meaning of entrepreneurial competence.
    - to know if, after working in an itinerary in which the entrepreneurial competence is implicitly being developed, their understanding had improved

Methodology

This research is carried out within an industrial doctorate program, so it is a research applied to the context of the Escola Pia de Mataró. The research is framed within an action-research model (Lewin, 1973; López Górriz, 1993)), where the researcher takes an active part in the process, integrating reflection and intellectual work in the analysis of the experiences that are carried out, as an essential element of what constitutes the educational activity itself.

The objective of the research is to answer the following questions:

1. What are the direct relationships, in terms of learning outcomes established, between the EntreComp framework (Bacigalupo et al., 2016) and sustainability?
2. What characteristics of the proposed entrepreneurship competence assessment model will cause teachers to take it and see it as an opportunity to improve the teaching-learning process?
3. What learning methodologies will facilitate the generation of evidence showing the development of entrepreneurship competence?
4. What methodological and student performance changes have been produced in the educational practices of teachers who have implemented the model?

5. What is the perception of the actors involved in relation to the implementation of the assessment model of entrepreneurship competence, and especially in relation to the improvement of the promotion of sustainability in students? In relation to the ease of adoption and implementation by teachers, of learning support by students and by the institution?

Application of the model at Escola Pia de Mataró is established for the courses listed in the following table 1:

Course	Students	Teachers
5º Primaria	100	8
6º Primaria	100	7
1º ESO	150	5
2º ESO	150	5
GM1	34	9
TOTALS	534	34

Table 1: Group sample Escola Pia de Mataró (Own elaboration)

As the research is still in progress, at the moment, this publication will only report on the research carried out in primary school, developed with a quasi-experimental methodology with a pre-post design for the students and a qualitative analysis of the workshops with the teachers.

The first data collection was carried out in the third term of the 20-21 academic year, in the midst of the Covid-19 pandemic, using the survey form based on the Extremadura Regional Government's study (Sánchez-Hernández & Maldonado-Briegas, 2019). Two rounds were passed, a first one at the beginning of the SUMMEM project itinerary and the second one at the end of the same. It was carried out with the CoRubrics tool[7], since it allows self-evaluation and co-evaluation by students, as well as sending students the results and feedback, either the one they have done themselves or the one from the other evaluators. The survey is a Likert scale 4 options questionnaire, as this is the usual way of assessment in Compulsory Education.

This form was validated by the coordinators of the upper primary cycle, and also teachers in the workshop were able to make contributions. The form was divided into 3 sub forms, one for each of the areas or dimensions of EntreComp (Bacigalupo et al., 2016) and the software to perform the analysis has been SPPS

1. Dimension 1 Ideas and Opportunities (with 7 items).
2. Dimension 2 Resources (with 10 items)
3. Dimension 3 Into Action (with 9 items)

[7] *CoRubrics,* an add-on for Google Sheets, helps teachers in the assessment process. It is used to assess students (or groups of students) with a rubric designed by the teacher and also allows students to assess other students (coevaluation). https://www.corubrics.org/ Author: Jaume Feliu, ITC teacher

Table 2 quantifies the evaluators (self- and co-) for each dimension and each round:

	Dimension 1		Dimension 2		Dimension 3	
COURSE	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2
5è primària	397	451	396	336	382	352
6è primària	385	251	397	251	385	244
Totals	782	702	793	587	767	596

Table 2: Self and co-evaluators of the students' participation (Own elaboration).

Different numbers of evaluators can be observed. There were basically two reasons for it:

1. The school is a dynamic system and, therefore, the data collection was carried out at different times when possibly not all students were always in a class (due to illness, especially because of the Covid 19 pandemic, absenteeism, medical visits, or other reasons).
2. Not all teachers collected the co-assessment, some because they did not know they had to do it or because they did not sufficiently use CoRubrics.

Analysis of results

In this section, we will analyse both the results of the qualitative analysis of the teachers' workshop and the quantitative analysis of the students' forms.

Analysing the first results obtained from the forms submitted to the students in November 2021, in order to see how the variables behaved, statistical analysis was carried out. According to the Kolmogorov-Smirnov Test, it was observed that they did not fit a normality pattern, so non-parametric tests were used.

Results can be observed in Table 3 and Figure 1, in terms of the mean of averages as a measure to explain the variations of each dimension in each round for the analysed students:

Table 3: Mean of averages of dimensions and rounds (Own elaboration))

		N	Mean of averages
Round 1	Dimension 1 (mean of averages)	211	2,8711
	Dimension 2 (mean of averages)	211	3,0036
	Dimension 3 (mean of averages)	211	2,9872
Ronda 2	Dimension 1 (mean of averages)	200	2,9621
	Dimension 2 (mean of averages)	200	3,0465
	Dimension 3 (mean of averages)	200	3,0786

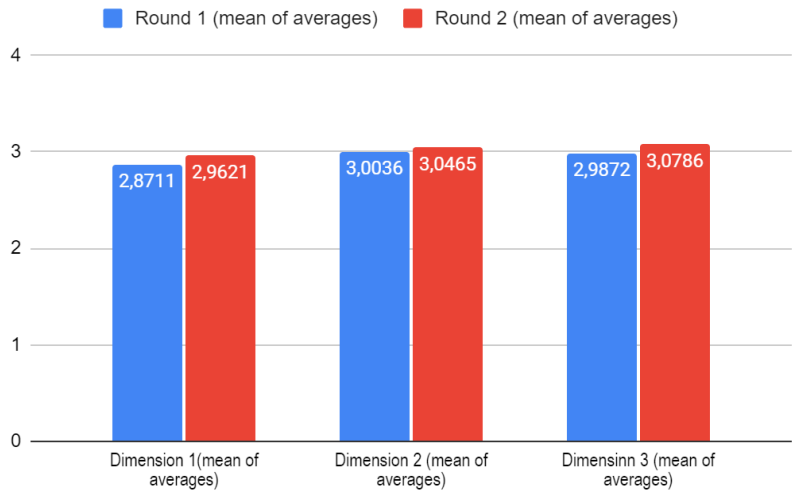

Figure 1: Mean of averages of dimensions and rounds (Own elaboration)

After the first round, dimension 2 was the highest scoring one, followed by dimension 3 and dimension 1. On the second round, dimension 3 was the highest scoring dimension, followed by dimension 2 and finally dimension 1. Although the differences in terms of the mean of average scores are small, the Friedman test of difference of variables was performed to examine if the differences are significant and the result was that they are significant, which means that the different scores of the students are significantly different.

If we compare the results of round 1 with those in round 2, we see that they have increased between rounds. We have performed a Wilcoxon test to see if these differences are significant and the result is also positive. In other words, the difference is significant, that is, it has not happened by chance, but there is a causal effect between the beginning of the itinerary and the end of the itinerary. The fact of knowing the assessment criteria makes the students aware of what they should focus on, so that in the second round, they can be more precise when filling in the survey and, therefore, understand what the entrepreneurship competence is. Another result is the positive value of this knowledge in terms of their perception of improvement.

It was not possible to carry out this statistical analysis until November 2021, however, in June 2021 a report on the individual results of the class was sent to each tutor in order to be able to use it if necessary at the time of the final assessment of the student in relation to the competence of autonomy, personal initiative and entrepreneurship.

Regarding the qualitative analysis of the workshops performed with the teachers, the following results emerged through observation:

- The words assessment evidence were very often repeated, indicating the need to find them in order to assess a competence such as the entrepreneurship one.
- When showing the relationships between the tasks of the itineraries and EntreComp (Bacigalupo et al., 2016) and therefore the evaluation evidence, the word confidence appeared, since they were made participants that were already aligned with the entrepreneurship competence.
- They were surprised to know about EntreComp (Bacigalupo et al., 2016) and the concept of entrepreneurship competence, as it was not a concept that was within their mind set.
- The introduction of co-evaluation and student self-evaluation represented a relief for the teachers' work (the third term is very stressful for them, and introducing another element in which they had to be in charge did not seem like a good idea).
- Most of them found the use of CoRubrics very interesting for their teaching practice.
- When showing the student survey, there were some remarks on some items regarding ambiguity, however they were committed to help students' understanding.

Conclusions

To conclude on this first part of the research that is still in process, some contributions resulting from the analysis of the form data and also from the teachers' comments in the workshop can already be described. These first conclusions are particularly relevant to anchor the research on how the model of entrepreneurship competence assessment should be implemented. Let us see, then, what these conclusions are in relation to some research questions:

Regarding question 2, we highlight four aspects:

1. The need to show what is the concept of entrepreneurship competence in the context of the research in order to avoid generating doubts in this regard for both teachers and students.
2. It is important to use tasks that are currently being developed in the classroom, especially in the learning itineraries of the SUMMEM project or another project-based learning approach, but changing the focus from the entrepreneurship competence in order to observe, obtain evidence and, finally, assess it.
3. Distributing the assessment among the different agents, especially students, reduces the pressure on teachers to assess cross-curricular competence.
4. Emphasizing that it is essential for teachers to have acquired the digital competence, as the lack of knowledge of CoRubrics made it difficult to follow up on it.

Regarding question 3, we highlight one aspect:

1. Active learning methodologies generate the evidence to be able to develop cross-curricular competencies. Showing teachers the interaction between learning itineraries and EntreComp (Bacigalupo et al., 2016) generates confidence in assessing competence.

Regarding question 4, we highlight two aspects:

5. Knowing the criteria has made self-assessment and co-assessment improve the knowledge of the entrepreneurship competency, both for students and teachers, and also the improvement of the development of the competency itself.
6. Empowering students in their evaluation generates a better knowledge of what is being evaluated and therefore an improvement of this observation.

A better understanding of the context of this research has allowed me to design the necessary assessment model of entrepreneurship competence for the primary education level, which will be applied during the 2022-23 school year, as well as the design of a quality survey questionnaire for this model. This survey, adapted and validated, is based on the one that had already been implemented in the CRISS[8] project in relation to a similar research scenario in which the assessment model was applied on digital competence (Balaban, I., 2020), and will be the instrument that will allow me to know if the assessment model proposed in this research is adequate for the development of entrepreneurship competence and transferable to the rest of the educational community.

References

Alemany, L., & Urriolagoitia, L. (2014). Iniciativa Emprendedora y Jóvenes en España. *ICE Empleo Juvenil*, *nº881*, 101–120. http://www.revistasice.com/CachePDF/ICE_881_101120__5AF09DB65D5E07E7F74BCD31284DC74D.pdf

Alonso, J. R. V. (2010). *Enseñar y aprender por competencias: Qué son las competencias*. Instituto de Orientación Psicológica Asociados.

[8] CRISS Project: Demonstration of a scalable and cost-effective cloud-based digital learning infrastructure through the Certification of digital competences in primary and secondary schools (https://www.crissh2020.eu/)

Bacigalupo, M., Kampylis, P., Punie, Y., Brande, G. V. den., & European Commission. Joint Research Centre. (2016). *EntreComp : the entrepreneurship competence framework.* Publications Office.

Balaban, I. (2020). An empirical evaluation of E-Portfolio critical success factors. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(4), 37-52

Barrero Fernández, B., & Domingo Segovia, J. (2010). Integrar competencias básicas y aprendizajes imprescindibles: Potencial curricular de las actividades globalizadoras.

Berglund, T., Gericke, N., & Chang Rundgren, S. N. (2014). The implementation of education for sustainable development in Sweden: investigating the sustainability consciousness among upper secondary students. *Research in Science and Technological Education*, *32*(3), 318–339. https://doi.org/10.1080/02635143.2014.944493

Corney, G., & Reid, A. (2007). Student teachers' learning about subject matter and pedagogy in education for sustainable development. *Environmental Education Research*, *13*(1), 33–54. https://doi.org/10.1080/13504620601122632

Firth, R., & Winter, C. (2007). Constructing education for sustainable development: the secondary school geography curriculum and initial teacher training. *Environmental Education Research*, *13*(5), 599–619. https://doi.org/10.1080/13504620701659079

Gipps, C. (1994). Developments in Educational Assessment: What makes a good test? *Assessment in Education: Principles, Policy & Practice*, *1*(3), 283–292. https://doi.org/10.1080/0969594940010304

Gipps, C. (1994). Beyond Testing: towards a theory of educational assessment (London, Falmer).

Guàrdia, L., Maina, M., Baztan, P. (2018): "Digital Competence Assessment Framework for Primary and Secondary Schools in Europe: The CRISS Project". (EDEN research Workshop 2018). Barcelona, 24-26 October.

Hassan, A., Noordin, T. A., & Sulaiman, S. (2010). The status of the level of environmental awareness in the concept of sustainable development amongst secondary school students. *Procedia - Social and Behavioural Sciences*, *2*(2),

Lewin, K. (1973). Action research and minority problems. En K. Lewin (201 – 216): Resolving Social Coflicts: Selected Papers on Group Dynamics (ed. G. Lewin). London: Souvenir Press.

López Górriz, I. (1993). La investigación – acción como metodología de teorización y formación del profesor desde su práctica. Revista de Investigación Educativa, 71 – 92.

Maina, M. F., Santos-Hermosa, G., Mancini, F. & Guàrdia Ortiz, L. (2020). Open educational practices (OEP) in the design of digital competence assessment, *Distance Education* 41 (2), 1-18 https://doi.org/10.1080/01587919.2020.1757407

Marina, J. A. (2009). *La competencia de emprender The entrepreneurship competence*.

Mislevy, R. J. (1994). Evidence and inference in education assessment. In *PSYCHOMETRIKA* (Vol. 59, Issue 4).

Monereo, C., & Pozo, J. I. (2007). Competencias para (con) vivir con el siglo XXI. *Cuadernos de pedagogía*, *370*(12), 12-18.

Roegiers, X., de Ketele, J. M., & Utrilla, J. J. (2010). Una pedagogía de la integración: competencias e integración de los conocimientos en la enseñanza. Fondo de Cultura Económica.

Sánchez-Hernández, M. I., & Maldonado-Briegas, J. J. (2019). Sustainable entrepreneurial culture programs promoting social responsibility: A European regional experience. *Sustainability (Switzerland)*, *11*(13). https://doi.org/10.3390/su11133625

Stiefel, B. M. (2008). Competencias básicas: hacia un nuevo paradigma educativo (Vol. 111). Narcea Ediciones.

Torres, J. R. (2010). De las programaciones didácticas a la unidad didáctica 1 : incorporación de competencias básicas 2 y la concreción de tareas. *Revista Docencia e Investigación*.

Zupan, B., Cankar, F., & Setnikar Cankar, S. (2018). The development of an entrepreneurial mindset in primary education. *European Journal of Education*, *53*(3), 427–439. https://doi.org/10.1111/ejed.12293

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

EU3D – BOOSTING DIGITAL SKILLS AND COMPETENCES OF THIRD SECTOR ORGANISATIONS AND SOCIAL ENTERPRISES

Alfredo Soeiro, University of Porto, Portugal

Ademar Aguiar, University of Porto, Portugal

Carol Jacklin-Jarvis, The Open University, UK

Tot Foster, The Open University, UK

Abstract

EU3Digital aims to gather and develop learning resources for Third Sector Organizations (TSO) and Social Enterprises (SE) to increase individuals and organisations' digital competences. The EU3Digital outputs serve to support them in advancing their digital strategies, engaging with existing digital support and software, and building capacity. Digital development leverages many opportunities for TSOs and SEs, as they operate in ever-changing settings and their employees often find themselves wearing many 'hats' – digital technologies and skills offer increased efficiency, outreach and growth for social enterprises and are vital for their capacity to innovate. Summaries of Intellectual Outputs (IOs) IO1 and IO2 are presented and comments are made concerning the impact already made in the project goals. IO3 and IO4 are described and the plans to produce training and deliverables are discussed. The project outputs are Curricula and Training Materials and the Toolkit on Digital Skills. These intend to be practical materials that TSOs and SEs can use to improve their digitalisation activities. The Framework of Competences and the Policy Paper are theoretical outputs that contribute to the existing knowledge on this topic, aiming to support relevant stakeholders to be more aware of the digitalisation needs of TSOS and of SEs.

Keywords:

Digital competencies, Third Sector Organizations, Social Enterprises, Training, Digital Skills.

The Project

Digital technologies are developing fast and offer tremendous opportunities to social enterprises across Europe. For this reason, EU3Digital will develop over the next years learning resources specific to the needs of European social enterprises to develop their digital competencies, advance their digital strategies, help them to engage with existing digital support, and software, and thereby build capacity. Being a pilot project, EU3Digital will create a framework of competencies for digital skills and provide an open-access knowledge centre for current and future social enterprise professionals to navigate through e-learning materials and strategic tools to develop specific digital skills for a swift adaptation of digital technologies to ensure the success, impact, and sustainability of their organization (EUCLID Network).

The project EU3Digital (https://eu3digital.com/) is financed by the Erasmus+ program of the European Commission with reference 2020-1-PT01-KA204-078846. Consortium has five partners coordinated by Eslider (PT - https://esliderportugal.pt/) and with partners University of Porto (PT – www.fe.up.pt), Open University (UK - https://www.open.ac.uk/), DKolectiv (HR - https://www.dkolektiv.hr/public/hr), Euclid Network (NL - https://euclidnetwork.eu/) and ABD (ES - https://abd.ong/en/). It is a two year financed project and it is expected to finish in mid-2022 (EU3Digital).

The first IO1 is a EU Framework of competences for digital skills. It intends to support citizens to become digitally competent. However, there is no equivalent framework that supports social enterprises during the transformation to improve the digital performance. The partner Open University, UK, is coordinating this package and developing a European Framework of Digital Competencies for Social Enterprises. This articulates the first step in a long-term strategic view to develop digital skills and competences of social enterprises, to build a more modern, dynamic,

committed and professional environment inside social enterprises, and to increase their capabilities to work at local and international level (EU3Digital).

The second IO is Curricula design and assessment of training. It is intended to articulate with IO1 and with DGCOMP EU Framework of Competences for Digital Skills. It is coordinated by the partner University of Porto and it will prepare curricula, innovative training materials and assessment specifically targeted to the digital skill-gaps and needs of social enterprises (EU3Digital).

The IO3 is denominated Emergency Toolkit for Third Sector Social Organisations & Social Enterprises. It is intended to be a hands-on toolkit addressing the immediate needs of social enterprises, who are facing enormous challenges in the Covid-19 context, having to execute most of their operations remotely. In this Toolkit, the partners Euclid Network and Eslider, will illustrate and guide through open access tools, resources and services, focusing on cybersecurity, project management to marketing and outreach, tailored to the context in which social enterprises operate (EU3Digital).

IO4 will be a Policy Paper dealing with Digital Support for Social Impact: How digital competences can improve the action and impact of social enterprises? All above-mentioned deliverables of EU3 Digital concur with in depth empirical- and literature research. These findings offer detailed insights into how digital competences can improve the action and impact of social enterprises. For this reason, Euclid Network will convert all those research findings into a policy advising paper aimed to inform the European Commission and other relevant stakeholders to inform further initiatives for developing digital skills and competences in Europe's social economy ecosystem (EU3Digital).

While the digital transformation is already many years underway and the EU increasingly prioritises digitalization, EU3Digital is arriving at the right moment, as digital skills became for the first time an absolute necessity amidst the Covid-19 pandemic accelerating the digital transformation by several years. This sudden acceleration illustrates the potential of digital technology in changing business as we know it, but at the same time, it has also widened the gap between those who had the capacity to adapt fast and those who struggled to stay afloat during the pandemic or have limited resources. However, going digital leverages many opportunities for social enterprises, as they operate in agile settings and their employees often find themselves wearing many 'hats' within the organization – digital technologies and skills offer increased efficiency, outreach and growth for social enterprises and are vital for their innovation capacity (EUCLID Network).

Summary of IO1 - Framework of Digital Competences for Third Sector Organisations and Social Enterprises

The goal of this work package was to develop a digital competence framework for the third sector and for the social enterprises. The work performed considered several subjects like aims and research questions, what is different about third sector organisations, social mission, voluntarism and stakeholders, networks, digital competence, digitalisation, inclusion, existing competence frameworks and DigComp. An empirical research was conducted from existing practice and identification of digital competences for TSOs e SEs was carried out. Competences following the European Qualification Framework structure were organized in knowledge, skills and attitudes. Taking into account the other IOs, example competences were rewritten to act as learning outcomes for the subsequent training (Van Laar).

A glossary was created defining terms like digitalisation - the process through which organisations make use of digital technologies to support organisational functions and further organisational mission; digital culture - describes the relationship between humans and technology, informed by values and mission; a digital culture is developed and nurtured at individual, team, and system levels; leadership - denotes the visioning, strategizing, stakeholder engagement, and momentum needed to pursue digitalisation in the context of a TSO or SE.

The focus was to introduce a digital competence framework for TSOs that supplements DigComp and other existing resources. The aim was to provide a framework that clearly adds to rather than replicates existing resources. Therefore, the EU3Digital competence framework can be used within third sector networks and as a basis for developing learning resources and opportunities. Research was done with a review of the academic digital competence literature, a broader review of literature and resources from different sources, a review of DigComp

and other extant competence frameworks in the light of the above literatures and empirical research consisting of several semi-structured interviews with experts from across Europe.

Some key findings were that (EU3Digital):

a) TSOs and SEs need both hard and soft digital skills. 'Hard' skills are technical, whereas 'soft' skills take familiar leadership and management competences (e.g. managing change) and apply them in the digital domain.

b) Maximising the potential of digital requires changes in both working practices and in attitudes and ways of thinking; that is to say the development of a digital culture.

c) Involving all stakeholders in digitalisation informs effective decision-making and meets users' needs.

d) Digitalisation may promote democracy and inclusion, but it can also exacerbate social divides.

e) To promote effective digitalisation, which avoids negative impacts; TSOs need to maintain the centrality of their social mission, whilst simultaneously adopting digital business practices that deliver efficiencies.

f) Leadership that empowers, re-imagines, and develops shared vision has a central part to play in the process of digitalisation

g) Digital competences are distributed across an organisation, rather than concentrated in a single individual, support sustainable and effective digitalisation. This means it is not necessary for each individual in an organisation to develop the whole range of digital competences.

h) Organisations which make effective use of their existing networks and create new connections fare better than those that digitalise in isolation.

Finally, the EU3Digital competence framework has five Dimensions and twenty-two competences. The five dimensions are Digital Tools, Operational Effectiveness, Organizational Culture and Leadership, Ethical Principles and Participation and Connection. These dimensions were subdivided into competences such as Gather, manage and analyse data to further social mission; Know when and how to outsource; Explore digital service delivery; Move forward on digital inclusion; Make use of existing networks to explore digital possibilities. This set of descriptors was used to develop IO2 looking at training of TSOs and SEs resources.

Summary of IO2 – Curricula and training materials

This intellectual output was elaborated for designing, developing, and implementing the training curricula based on IO1. Document has three parts. Part A contains documents, articles or others in folders 1 to 5 available in a Google drive share mode. Each competence has one source that is related and provides support about meaning of competence, how it can be obtained, the possible usefulness and the description of indicators. Part A is useful for preparation of teaching by each trainer. Part B has training materials related with each of the five areas of competence. These training materials are from free online courses or from projects related with the areas of competence. Part C provides guidance on how to obtain proposals to assess the different types of competences with three suggestions for each of the competences. Parts A to C may be combined in different arrangements to obtain a strategy to provide teaching and training and to conduct proper assessment.

Part A has contents with related documents to provide for each of the twenty-two competences existing online materials that could be used to train elements of TSOs and of SEs. For instance, for the competence Identify digital needs and functions of the organization the document suggested was "Developing Organizational Approaches to Digital Capability" (JISC). It is a guide that aims at supporting organizations to develop their culture, infrastructure and practices to help grow organisational digital capability and enable individual digital capabilities to flourish.

In Part B other resources were listed like projects like DISK (Digital Immigrants Survival Kit - https://www.disk-project.eu/web/) and DSA (Digital Skills Accelerator - https://www.digitalskillsaccelerator.eu/learning-portal/online-

self-assessment-tool/). Other digital resources were suggested like open online courses "Organisational Culture and Leadership" from Coursera - https://www.coursera.org/specializations/organizational-leadership.

Part C addressed the assessment of competences by learners in terms of evaluating the effectiveness of training. The proposed approach used the TALOE (Time to Assessment Learning Outcomes in E-learning) web tool to facilitate the choice of assessment methods according to the type of competences presented in IO1. Web tool is freely available at https://taloe.up.pt. Tutorials and examples are presented that may help any user.

An example of assessment is for example the competence "2.4. - Evaluate and monitor efficiency and sustainability of digital infrastructure". Accessing the tool at https://taloetool.up.pt/ and taking the text of the competence the verbs (from revised Bloom Taxonomy) that better suit are "Evaluate" (Checking) and "Analyze" (Organizing). Using the webtool the advice for this competence has three suggestions: 1.Practical work – structured enquiry, 2. Reflective practice – abstract conceptualization and 3. Essay – Problem. The trainer responsible for the assessment may choose one of the three according to own decision and to suitability in the process. This assessment procedure may be repeated for all competences and a group of three assessment techniques can be proposed for each competence (TALOE).

IO3, IO4 and future plans

IO3 consists of Policy Paper addressing Digital Support for Social Impact and how digital competences can improve the action and impact of TSOs and SEs. The aforementioned deliverables of EU3 Digital concur with in-depth empirical and literature research conducted for the EU3 Digital project. Findings offer detailed insights into how digital competences can improve the action and impact of social enterprises. This policy deliverable converts the research findings into a policy advice paper aimed at informing the European Commission and other relevant stakeholders in their initiatives for developing digital skills and competences in Europe's social economy ecosystem (EU3Digital).

The deliverable IO4 is a Toolkit on Digital Skills to support SEs and TSOs with going digital, this Toolkit provides users with a hands-on guide to open access tools, resources, and services that can enable them to adapt dynamically and swiftly to societal changes. Whether one wants to learn more about the processes one needs to have in place to meaningfully implement digital tools within the organisation, or if one would like to learn which free or low-cost tools can support in executing the organisation's mission and activities, this toolkit intends to answer these requests. It addresses Data Collection, Cybersecurity, Teamwork, Finances, Design, Outreach, Community management, Conferences/events and Next Steps.

The other activities of the project are to test with 'fellows' – TSOs and SEs leaders and members from the project countries (UK, NL, Portugal, Spain, Croatia). The fellows are involved at key moments in the project to consult the project partners in the development of the IOs. The engagement of fellows guarantees that project outputs are relevant, adequate and responsive to the needs of TSOs and SEs in some European countries.

A session was held in June 2022 in Porto when a workshop was held for two days with stakeholders. These two days comprised training provided by the Croatian partner in coordination with the other members of the consortium. The goal was to train participants with two competences of the IO1 following guidance from IO2. The third day of the workshop was dedicated to the appreciation of the workshop outputs and producing recommendations for future training events. Next training session is planned for Barcelona, Spain in October of 2022.

Acknowledgements

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Funded by
the European Union

References

EU3Digital (2021). Retrieved from https://eu3digital.com/.

Euclided Network (2021). Retrieved from https://euclidnetwork.eu/.

JISC (2017). Retrieved from https://www.jisc.ac.uk/guides/developing-organisational-approaches-to-digital-capability.

TALOE (2015). Time to Assess Learning Outcomes in Elearning. Retrieved from https://taloe.up.pt.

Van Laar, E. Van Deursen, A, Van Dijk, J and de Haan, J. (2020). Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review. SAGE Open. Jan-March 2020, 1-14.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

PERSONALIZED VIRTUAL REALITY EXPERIENCE WITHIN MUSEUM EDUCATION CONTEXT: THE INCLUSIVE MEMORY WEB APP

Antonella Poce, University of Modena and Reggio Emilia,Italy

Maria Rosaria Re, University Roma Tre, Italy

Carlo De Medio, University Roma Tre, Italy

Mara Valente, University Roma Tre, Italy

Abstract

It is a fact that museum needs are changing, and the arrangement of visitor experiences in both physical and virtual settings today centres around the idea of personalization. The present paper aims at presenting the results of a personalized virtual reality museum education experience. We realize an inclusive and personalized virtual environment realized through the integration of different technologies with the Frame-VR application for the Tito Rossini permanent collection at the Department of Educational Sciences of Roma TRE. Following a lecture, 183 students participated in the remote experience, which consisted of an initial questionnaire, a virtual tour, and a final questionnaire. Significant correlations between the visitors' artistic preferences and personality traits were discovered, establishing the indicators for a user model. In addition, the system was also positively evaluated from the point of view of usefulness and usability by the participants through direct feedback.

Keywords:

Museum Education, Virtual Reality, Personalization, Webapp, Inclusion.

Introduction

The current world situation with the ongoing Covid-19 pandemic has highlighted the great importance of the use of technology in the field of education (Ting et al., 2020). In particular, technology-enhanced learning environments have been increasingly widespread, especially thanks their ability to develop transversal key competences through collaborative learning experiences, in formal and non-formal education contexts (Marion Gruber 2015). As stated by Pavolova (2015) and Pozzi (2015), these systems succeed in optimizing and supporting learning processes by using technology to provide materials, a social platform and digital learning tools even within museum settings. Moreover, museum education, as non-formal education context, can play a pivotal role in the acquisition of specific knowledge and promotion of 4C skills (Critical Thinking, Communication, Collaboration, Creativity) (Trilling & Fadel, 2015; Poce, 2018) in a life-long learning view, thus trying to achieve the learning objectives (in terms of knowledge, skills and attitudes) that were not reached due to the closure of schools and universities during the spread of the pandemic (Azevedo et al., 2020). Furthermore, the European Commission has been highlighting informal education for many years, recognizing the impact that cultural heritage can have in education supported by modern technologies (European Commission, 2000, p. 7). A fundamental role in the field of technology-enhanced learning environments within museum education context is played by Augmented Reality (AR) and Virtual Reality (VR) technologies. Many research has shown the efficacy of the use of AR and VR within museum education context to increase professional and soft skills within visitors (Qian & Clarck, 2016), together with social and cultural inclusion development (Grau, Coonless & Ruhse, 2017). In the last 6 years, many AR and VR applications have been realized in this direction (Cellan-Johns, 2016), and in terms of personalized user experience (Limongelli, 2015). In the museum education fields, personalization is often linked with the problem of using user data to create the concept of personas, i.e. models that represent aggregates of target users with common characteristics (Miaskiewicz & Kozar, 2011). These personas can be deduced through two approaches: implicit, indirect visitor feedback (camera footage or eye-tracking) (Antoniou & Lepouras, 2010); explicit direct feedback from the visitor normally through questionnaires; questions can be direct ones about museum interests (e.g. favorite works) or indirect ones aimed at improving visitor engagement (Antoniou et al., 2016). Within this field, important results have

been achieved in previous research of the authors (Poce et al, 2019), where, through the Inclusive Memory Web App, the central theme of personalization is dealt with by using direct feedback obtained by questionnaires and indirect feedback obtained by sensors within the exhibitions. Thanks to the Inclusive Memory Web App, users were anonymously tracked and their time spent in visiting the museum and seeing the artworks automatically calculated in order to define specific personas useful for the construction of personalised learning paths. The Inclusive Memory Web App developed is based on five works from the permanent collection of Tito Rossini at the Department of Education of the University of Roma Tre. The exhibition was not equipped with technological supports but only with traditional labels. Initially, the research group developed QR codes with a recorded story and a piece of music associated with each work. The positive results of this first pilot phase are reported in (Poce & Re, 2020). Due to the Covid-19 pandemic, the Inclusive Memory Web App was transformed into a collaborative experience within in a virtual environment by reproducing the 5 artworks and providing them with the following supports: description of the artworks, acted narration, musical soundtrack. The environment used for the experience described in the present paper is "Frame-VR", a platform where virtual rooms can host multiple visitors represented by meta-style avatars and make available an audio-video chat to stimulate collaboration between virtual users.

Methodology

The realized second experience here described was carried out as mentioned above within a virtual environment. The objective was to maximize visitor involvement and develop personas to represent the users. The research questions were:

- How do visitors evaluate a living exhibition accessible through digital tools?
- Is it possible to identify relationships between users' artistic preferences and their personality traits in order to create personas and personalize the experience?

To answer these questions, the research team developed a Web App to profile visitors consisting of three basic modules: an initial questionnaire to be administered before the experience, a virtual room where it is possible to carry out a collaborative visit with other users and an end-of-activity questionnaire. The first questionnaire aimed to profile users through an implicit approach in order to identify personas using items from a similar project developed at the Acropolis Museum in Athens (Antoniou et al., 2016) but with the addition of items related to the dimensions of extroversion and introversion taken from the Big five questionnaire (McCrae & Costa, 2004), 12 items on a Likert scale. Afterwards, the users enjoyed the virtual exhibition followed by a museum educator who conducted a guided tour; this figure is fundamental when working with technological supports in order not to distort the results due to technological gap problems. The second questionnaire was developed to assess the usability and usefulness of the tool developed beyond the preferences of the paintings and mediation tools. The data collection of the questionnaires took place through google forms integrated within the virtual environment to make the process transparent to the visitors. 183 (average age=26 F=157 M=25) university students from University of Modena and Reggio Emilia, attending the courses in "Research Methodology in Education" and "Design and evaluation in educational and training contexts" participated in this second experience. During an introductory lecture, the Frame-Vr virtual environment was presented. In addition, the teacher presented the digitalized artworks and the linked mediation tools. The experience was conducted as a guided tour where the visitors simultaneously enjoyed the recordings of the stories and associated songs to the artworks and a collaborative audio- video chat was set for supporting interaction and dialogue between participants. At the end of the visit, the participants filled in an evaluation questionnaire on the exhibition and the technological tools used. The anonymously collected data were analysed to find the correlations through the IBM's SPSS software.

Results of the User experience

The group of participants consisted of 133 students (72.7%), 42 working students (23%) and 8 students/professionals experienced in the arts and culture sector. 72% had a high school diploma, 37.2a university degree and 8.7% a postgraduate degree. Only 25 participants had heard of the artist and his works. The first research question investigates how visitors rated the virtual experience; participants were almost unanimous in their opinion of the emotion the experience aroused in them, 82% curiosity, 9% surprise and only 9% sadness and boredom.

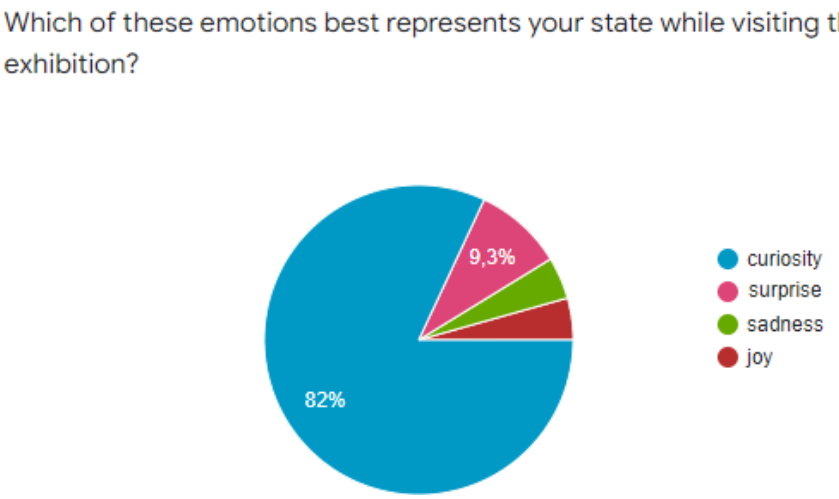

Figure 7. Feelings promoted

However, 92.9% would recommend the experience to others. In contrast to the first pilot phase, which took place in presence, the digital tools within the virtual environment were very successful as shownin the graph: especially the soundtrack, which in presence was described as a disturbance within the app, was evaluated positively, also in combination with the narrative. Compared to the first pilot phase carriedout with 15 participants (Poce et al., 2019), where low levels of extroversion corresponded with a preference for the multimodal exhibition, this second experience here described shows a weak correlation between high levels of extroversion and exhibition preference (R=0.62 P=0,06).

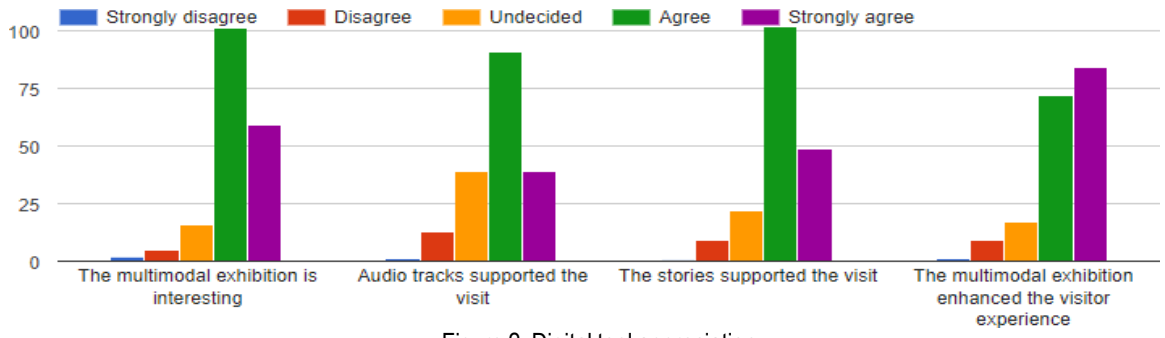

Figure 2. Digital tool appreciation

Results on correlations between personality traits and preferences

The second question explores the relationships between user artistic preferences, extroversion / introversion dimensions, and experiences styles within the exhibition. In the first pilot phase, a correlation emerged between extroversion and realistic art preference, but as shown in the contingency table, in the virtual experience this correlation is no longer true.

	Barely extrovert	Moderately extrovert	Very extrovert
Abstract Parthenon	17	37	23
Realistic Parthenon	9	25	41
Romantic Parthenon	14	34	11
Realistic Monnalisa	12	53	51
Monnalisa Marcel Duchamp	10	26	16
Abstract Monnalisa	18	17	8

Table 8. Contingency table kind of art X extroversion

There is a slightly positive correlation (R=0.75 p=0.004) between levels of extroversion and the preference on the use of storytelling for the artwork mediation. Furthermore, a weak relationship (R=0.67 p=0.046) emerges between average levels of extroversion and the preference for a human museum educator.

	Barely extrovert	Moderately extrovert	Very extrovert
Without supports	8	20	5
Painting + soundtrack + narration	4	15	32
Painting + narration	16	8	33
Museum Educator	12	53	5

Table 2. Contingency table digital tool appreciation X extroversion

As in the pilot phase, it emerged as shown by the contingency table that the works “The hour of revelation” is the preferred setting for the largest number of extroverted participants, and this brings us positive results to demonstrate how personality traits can be used to generate personalized paths that optimize visitor satisfaction.

	Barely extrovert	Moderately extrovert	Very extrovert
Painting “The hour of revelation”	10	34	20
Painting “The moon on the terrace”	3	17	31
Painting “The red bow”	4	23	9
Painting “In the morning”	8	11	7

Table 3. Contingency table best work X extroversion

Discussion

It is a fact that by now all museums around the world are integrating modern technological tools targeted for each user category to increase the visitor pool and optimize their experience by providing customized tours. Building on the pilot experience presented in Poce et al, 2019, the Inclusive Memory Web App was implemented through the "Frame-VRr" application to overcome some of the limitations of the in-presence experience organized in the previous work (use of digital media and inclusion limits) and other limitations imposed by the recent Covid-19 pandemic such as the limit of social distance. Moreover, unlike classical museums where the collection of works is physically arranged within the spaces, the virtual environment allows each user to create a different path based on his or her user model and needs, creating a highly inclusive environment. The correlations found in the extroverted groups with realistic art (in both the Monalisa and Parthenon tests) and multimodal tools showed how it is possible through the analysis of personality traits to propose personalized art styles and routes. The data analysis shows a general appreciation for mediation tools, in particular for narratives, associated with works of art and the song chosen to accompany them. This countertrend to that found in the pilot phase could be explained by the lower average age of the visitors, who fall into a group of users more familiar and comfortable with this type of experience. In contrast to this result, it emerges that low levels of extroversion are indicators of a preference for abstract art. In our opinion, this experimentation has shown how this type of approach can improve the heritage experience.

The methodologies presented and the personas generated from these data can be used to generate personalized museum tours supported by digital materials. In addition, as part of the Inclusive Memory project presented, a system was also developed to anonymously calculate data on the time spent by users in front of individual works of art and the total visiting time from museum surveillance cameras or ad hoc installed cameras. These results can be implemented within the virtual experience by developing software that connects to Frame-VR and, upon explicit consent, captures this data from the visitor's device and sends it to the application.

In the future, through this type of profiling, we aim to produce, taking advantage of the ongoing process of digitization of museum works, customized remote experiences by building virtual tours with works from all over the world as needed. By exploiting information on visit times and artistic preferences after a short questionnaire, the system could produce a virtual room with a pool of works chosen according to one's profile. This is in no way intended to

drive visitors away from the museum, but rather to bring people who find it difficult to enjoy the heritage closer to the environment and encourage them to visit the museum in person in the future.

References

Antoniou, A., & Lepouras, G. (2010). Modeling visitors' profiles: A study to investigate adaptation aspects for museum learning technologies. *Journal on Computing and Cultural Heritage,3*(2), pp. 71– 89.

Antoniou, A., Katifori, A., Roussou, M., Vayanou, M., Karvounis, M., Kyriakidi, M., & Pujol-Tost, L. (2016) *Capturing the Visitor Profile for a Personalized Mobile Museum Experience: an Indirect Approach*. In: 24th ACM Conference on User Modeling, Adaptation and Personalisation (UMAP 2016), Workshop on Human Aspects in Adaptive and Personalized Interactive Environments (HAAPIE), Halifax, Canada, 13-17 July 2016.

Azevedo, J.P., Hasan, A., Goldemberg, D., Iqbal, S. A., & Geven, K. (2020). *Simulating the Potential Impacts of COVID-19 School Closures on Schooling and Learning Outcomes: A Set of Global Estimates*. Policy Research Working Paper; No. 9284. World Bank, Washington, DC. © World Bank. Retrived from https://openknowledge.worldbank.org/handle/10986/33945

Cellan-Johns, R. (2016, January 1). 2016: the year when VR goes from virtual to reality. BBC News [Blog post]. Retrieved from https://www.bbc.com/news/technology-35205783

Draganov, L., Paneva-Marinova, D., Pavlova, L., Luchev, D., László Márkus, Z., Szántó, G., Szkaliczki, T. (2015). Technology-enhanced Learning for Cultural Heritage. *Digital Presentation and Preservation of Cultural and Scientific Heritage, V*(2015), pp. 293–301.

European Commission (2000). *Lifelong Learning in Museums. A European Handbook*. Bruxelles. http://online.ibc.regione.emiliaromagna.it/l/libri/pdf/LifelongLearninginMuseums.pdf (ver. 10.12.2019).

Fadel, C., Bialik, M., & Trilling, B. (2015*). Four-Dimensional Education*. BBC News [Blog post]. Retrieved from https://www.bbc.com/news/technology35205783

Grau, O., Coones, W. J., & Rühse, V. (2017). *Museum and Archive on the Move: Changing Cultural Institutions in the Digital Era*. De Gruyter

Gruber, Marion & Glahn, Christian. (2015). *E-learning for arts and cultural heritage education in archives and museums*. Doi: 10.13140/RG.2.1.2941.6401.

Limongelli, C., Gasparetti, F., & Sciarrone, F. (2015). *Wiki course builder: A system for retrieving and sequencing didactic materials from Wikipedia*. In 2015 International Conference on Information Technology Based Higher Education and Training (ITHET), pp. 1-6, doi: 10.1109/ITHET.2015.7218041

Lo Turco, M., & Luigini, A. (Eds.). *2nd International and Interdisciplinary Conference on Images and Imagination IMG 2019. Book of Abstract*. Alghero: Pubblica

McCrae, R. R., & Costa Jr, P. T. (2004). A contemplated revision of the NEO five-factor inventory. *Personality and individual differences, 36*(3), pp. 587–596.

Miaskiewicz, T., & Kozar, K. A. (2011). Personas and user-centered design: How can personas benefit product design processes? *Design studies, 32*(5), pp. 417–430.

Nardi, E. (2014). *Musei e Pubblico*. Milano: FrancoAngeli.

Parry, R. (2010). *Museums in a Digital Age*. New York, NY: Routledge.

Poce, A. (2018). *Il patrimonio culturale per lo sviluppo delle competenze nella scuola primaria. Cultural Heritage and the Development of XXI Century Skills in Primary education*. Milano: FrancoAngeli.

Poce, A, Amenduni, F., De Medio, C., Valente, M., Re, M.R. (2019). Adopting Augmented Reality to Engage Higher Education Students in a Museum University Collection: the Experience at Roma Tre University. *Information, 10*(12): pp.373. https://doi.org/10.3390/info10120373

Poce, A., Re, M.R. (2020). *Developing Users' Soft Skills in Higher Education Through University Painting Collections. The Tito Rossini project*. In Cicalò, E., Basso, D., Brusaporci, S., Moretti, M.M., Lo Turco, M., Luigini, A., Menchetelli, V., Panciroli, C., Rossi, D., Villa, D. (Eds.) Proceedings of the 2nd International and Interdisciplinary Conference on Images and Imagination IMG 2019, Alghero, Italy, 4–5 July 2019.

Pozzi, F., Alivizatou, M., Dagnino, F., & Michela, O. (2015). Going Beyond Preservation: How to Support Technology-Enhanced Learning in ICH Education. *International Journal of Heritage in the Digital Era, 4*, 21-40. 10.1260/2047-4970.4.1.21.

Roussou, M., Katifori, A., Pujol, L., Vayanou, M., & Rennick-Egglestone, S. J. (2013). A life of their own: museum visitor personas penetrating the design lifecycle of a mobile experience. CHI'13 Extended Abstracts on Human Factors in Computing Systems, 547–552. Paris, France. ACM.

Ting, D. S. W., Carin, L., Dzau, V. et al. (2020). Digital technology and COVID-19. *Nat Med, 26*, 459-461.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

DIGITAL STORYTELLING FOR DIGITAL SKILLS DEVELOPMENT. A PILOT EXPERIENCE WITH IN-TRAINING EDUCATORS

Maria Rosaria Re, University Roma Tre, Italy

Abstract

The present paper aims at presenting the results of a pilot experience of digital skills promotion within in-training educators carried out at the University of Modena and Reggio Emilia. The experience was realised in the academic year 2020/2021 through the use of the MOOC "Digital Storytelling" of the Erasmus+ DigiCulture project (Andone, 2019; Re, 2022). The MOOC, assigned to more than 100 students participating in the "Educational Research Methodology" laboratory, and designed in 5 modules, aims at soliciting the digital skills of Information and Data Literacy, Communication and Collaboration, Digital Content Creation according to the DigComp 2.1 model (Carretero et al., 2017) through the Digital Storytelling learning strategy. The pilot experience was carried as a response to the educational urgency of promoting digital competences in (future) teachers and educators for the development of the national social and educational context (Italian Law 107/2015 , Observatory of Digital Competences, 2019; OECD, 2019; Digital Education Action Plan 2021-2027), especially following the spread of the Covid-19 pandemic that has brought the need to redesign and reconfigure learning processes and programmes through the use of digital technologies (Secundo, Rippa & Meoli, 2020), Distance Learning and Digital Integrated Learning. The results show that the self-perception of the competences of “Browsing, searching and filtering data, information and digital content",” Integrating and re-elaborating digital content" and "Collaborating through digital technologies" improved in a statistically positive way within the participants.

Keywords:

Digital skills, Educators, MOOC, Digital Storytelling, University.

Introduction

According to the indications and data presented by international and national reports, the promotion of digital skills in the educational and school context is an increasingly urgent need (Law 107/2015, European University Association, 2019; Digital Skills Observatory, 2019; OECD, 2019; Digital Education Action Plan 2021-2027). During the Covid-19 pandemic, it was observed how low levels of digital competence are associated with inequality and cultural marginalisation: the lower the development of skills such as Information and data literacy, Digital Communication and collaboration and Digital Content Creation, the greater the possibility of being excluded from the cultural and social life of a given local and national context (Azevedo et al., 2020).

In Italy, the spread of the Covid-19 pandemic led first to the use of Distance Learning at all levels of education, and then to the use of Digital Integrated Learning, i.e. the simultaneous presence of students both in presence and at a distance while the teacher was in presence. The processes of digitalization of the national school system, which have also affected the school-family and school-territory relations, have faced the low levels of digital skills in the Italian population: according to the Italian National Institute of Statistics (2019), among people aged 16-74, only 22% (compared to 31% in the EU) declared to have high digital skills, i.e. to be able to carry out different activities in the 4 domains of information, communication, problem solving and content creation. Most people have low (32%) or basic (19%) skills, while 3.4% have almost no skills and 24% say they have not used the internet in the last 3 months. In the European Skills Agenda (2021), one of the main objectives is to have 230 million adults, or 70% of the corresponding EU population, with at least a basic level of digital skills by 2025. This objective has so far only been reached in the Netherlands, Finland, Sweden, Germany and Denmark; Italy, with 42% of people with low levels of digital skills, ranks third last in Europe. Moreover, according to Eurostat, only 1% of Italian university graduates have an ICT qualification (the worst position in EU) and the percentage of ICT specialists - although it has increased over time and reached 3.6% of total employment - is still far from the EU average (4.2%).

Moreover, the growing social demand for education in relation to the continuous technological progress imposes the need from the university system to provide training courses that are as respondent as possible to these educational needs, but which at the same time can promote the critical, creative and aware use of digital tools and methods, so as to stimulate cultural and social innovation. Redesigning university learning courses for future educators and teachers through the use of digital technologies (Secundo, Rippa & Meoli, 2020) is, therefore, urgent.

Starting from these assumptions, the pilot experience, described here, was implemented in the academic year 2020/21 at the University of Modena and Reggio Emilia. Participants were asked to register and attend the MOOC "Digital Storytelling", realised within the Erasmus+ KA204 DigiCulture project "Improving the Digital Competences and social inclusion of adults in Creative Industries, coordinated by Politehnica University of Timisoara (Andone, 2019) (www.digiculture.eu).

The "Digital Storytelling" MOOC of the DigiCulture project

The Erasmus+ KA204 "DigiCulture" project (2018-2021) aims to create a sustainable and efficient education program devoted to adult learners with low digital skills and low-qualified adults involved in the Creative Industries sector. The partnership of the project, composed by eight Educational Institution and Association from 7 different EU Countries, was involved in the design of the DigiCulture MOOCs, whose main objective is to fill in the digital skills gap of people who operate in CI sector, promoting social inclusion, media literacy, intercultural competences and 4C skills (critical thinking, creativity, communication and collaboration).The DigiCulture MOOCs (https://digiculture.eu/en/courses/) provide important new opportunities for adults to access knowledge, gain new digital skills and inter-cultural competences and improve their chances of finding employment or performing better in their current employment. The DigiCulture project had the following priorities:

- to enhance awareness of the need for adult training in digital skills for the CI;
- to design and validate cross-country Guidelines for Digital Competences for CI;
- to create an Integrated Virtual Learning Hub as an online and mobile MOOC platform for developing digital competences in the culture and heritage sector using Open Educational Resources (OERs), Tools and Practices;
- to design, develop and deliver Digital Skills and Social Inclusion for Creative Industries Courses, translated into all partners' languages, aimed at promoting digital competences and social inclusion in adults involved in the CI sector;
- to improve the achievement and recognition of digital skills through formal and informal learning by introducing Digital Skills e-assessment and Open Badges for adult education in CI;
- to provide engaging and effective learning experiences in the context of Digital Skills promotion for CI adult employers;
- to enhance collaboration between education providers, universities, cultural and heritage institutions and associations, cultural actors, workers and volunteers;
- to verify how achievement, assessment and validation of digital skills contribute to the uptake of new skills in adult learners.

One of the DigiCulture MOOC is the "Digital Storytelling" MOOC (https://digiculture.eu/en/digiculture-course/?id=18). This course will introduce attendees to the methodology of digital storytelling (DST) which should help to increase the effectiveness of creative and educational working activities. At the end of the course, participants will be able to design, create and evaluate a digital storytelling video to promote the organisation their work for, or communicate the artistic and cultural heritage you help to preserve, or to realize learning experiences with the use of this DST learning strategy. Attendees learn storytelling content development through the use of digital skills and other general skills such as communication, collaboration, creativity and critical thinking. The main topic of the "Digital Storytelling" MOOC are the following:

1. The art of Storytelling;
2. Digital storytelling as learning and teaching methodology;
3. DST to promote 4C skills (Creativity, Communication, Collaboration and Critical Thinking);
4. Digital tools for the design, creation and assessment of Digital Storytelling videos;

5. DST for culture and heritage (museums, archaeological sites, libraries).

At the end of this module, participants will be able to:

- describe the main features of DST methodology;
- outline the educational aims of the DST methodology in terms of communication, collaboration, creativity and critical thinking development;
- use digital tools for the creation of a DST video;
- design a DST video;
- evaluate a DST video;
- promote information and data literacy and digital content creation;
- reflect on DST as a tool of social inclusion.

Organised in 5 different modules, the "Digital Storytelling" MOOC presents different learning activities: OERs, forum of discussion; searching activities; video DST realisation, evaluation activities. The Digital storytelling MOOC is available in English, Italian, Romanian, Danish, German, Lithuanian and Irish.

Research questions and methodology

The main aim of the pilot experience is to verify the possibility to use the "Digital Storytelling" MOOC, created for Creative Industries employees, in developing digital skills at university level, especially within in-training educators.

The experience was realised during the academic year 2020/2021, with the participation of 108 Educational Science students attending the Laboratory on Educational Research Methodology, at University of Modena and Reggio Emilia. The MOOC was assigned to the participants as online learning activity within the Laboratory. The students had 4 weeks to complete the course. The language course assigned during the pilot experience was Italian.

The course evaluation tools were used to collect data on digital skills development and course contents acquisition within participating students.

Evaluation tool and phases

The "Digital Storytelling" MOOC requires participants to answer a task-based questionnaire on digital competences (Nunan, 2004) and a final assessment test (Hougaard & Knoche, 2020).

The task-based questionnaire is administered to participants before and at the end of the course activities: composed by 3 different questions, it is designed to collect data on the perception of the level of three specific digital skills, "Browsing, searching and filtering digital content", "Integrating and re-elaborating digital content" and "Collaborating through digital technologies".

No.	Prior to the course	After the course	Type	Skill under evaluation
	How well do you think you can complete the following task while learning online?	*How well do you think you can complete the following task at the end of the course?*		
1	"I can select digital tools to create scripts for digital storytelling products"	"I can select digital tools to write and edit a script in a collaborative way"	Likert Scale 1 - Not at all 2 – Poorly 3 - Adequately	Browsing, searching and filtering digital content
2	"I can use online tools to realize digital storytelling videos"	"I can use image editing programs to realize digital storytelling videos"	4 - Well 5 - Very Well	Integrating and re-elaborating digital content
3	"I can collaboratively create a storyboard through online tools and app"	"I can collaborate in recording the audio of a digital story"		Collaborating through digital technologies

Table 1: Task-based questionnaire of the Digital Storytelling MOOC

The final assessment test of the course is composed by 11 closed questions aimed at evaluating the acquisition of the course contents: DST characteristics as learning strategy; DST for 21st century skills development; tool and

phases for DST realisation; DST for different communication purposes and contexts; best practices and case studies. The maximum score for this assessment tool is 10 points.

The collected data were analysed through basic statistical analysis.

First results

Results show a very good level of contents acquisition by the participants. The average of the final assessment test is 8.99 points out of 10 (DS=1.52), with a kurtosis index of 2.13. Cronbach's Alpha of the test delivered into Italian language is 0.772. Almost all questions received more than 80% right answers: the question with the lowest percentage of right answers (63%) is question number 6, which aimed at investigating the lineal or non-linear narrative characteristics of a DST video. The histogram of the frequency of the final assessment test scores shows a j-shaped curve, highlighting the good performance of the participants.

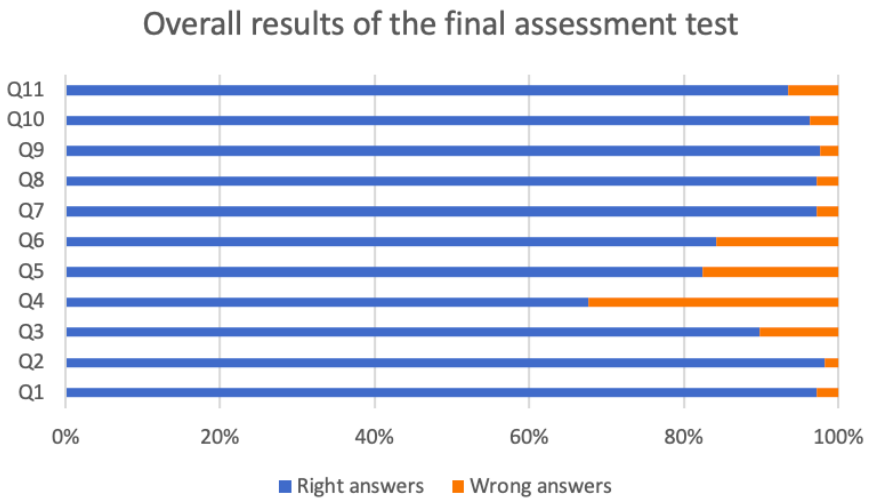

Figure 9. Percentage of right and wrong answers for each question in the final assessment test of the MOOC

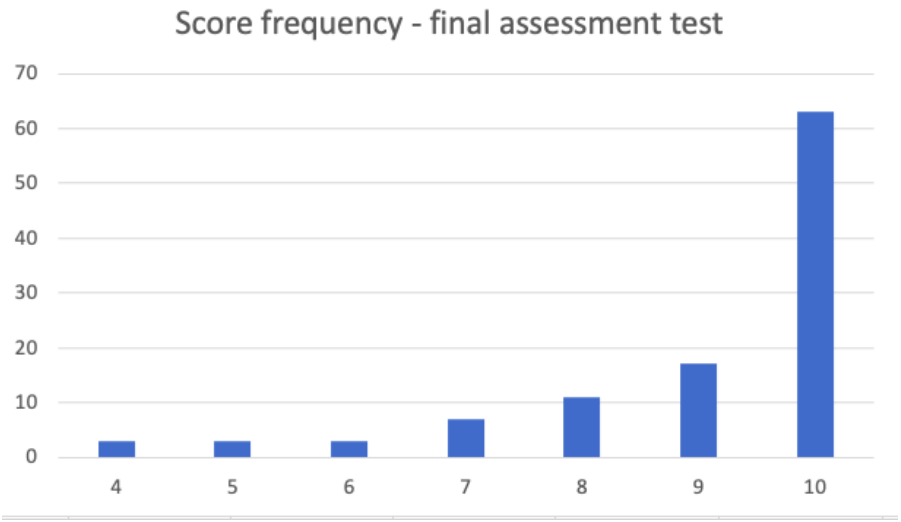

Figure 2. Frequency of scores assigned to the final assessment test of the MOOC

The most encouraging results of the pilot experience are related to the self-assessment of digital competences. The paired t-test is conducted on the averages of the scores assigned by the participants at the beginning and at the endo of the MOOC through the task-based questionnaire. The results show a statistically significant difference between the incoming and outcoming task-based questionnaire in all three assessed skills: Browsing, searching

and filtering digital content: prior to the course (M=1.98, SD=0.93); after the course (M=3.42, SD=0.77) t=1.46 p<0.001; Integrating and re-elaborating digital content: prior to the course (M=1.97; SD=0.94); after the course (M=3.31; SD=0.88) t=6.01 p<0.001; Collaborating through digital technologies: prior to the course (M=1.96; SD=0.91); after the course (M=3.30; SD=0.88) t=1.80 p<0.001.

Cronbach's Alpha of the task-based questionnaire delivered before the course into Italian language is 0.901; while Cronbach's Alpha of the task-based questionnaire delivered at the end the course into Italian language is 0.885.

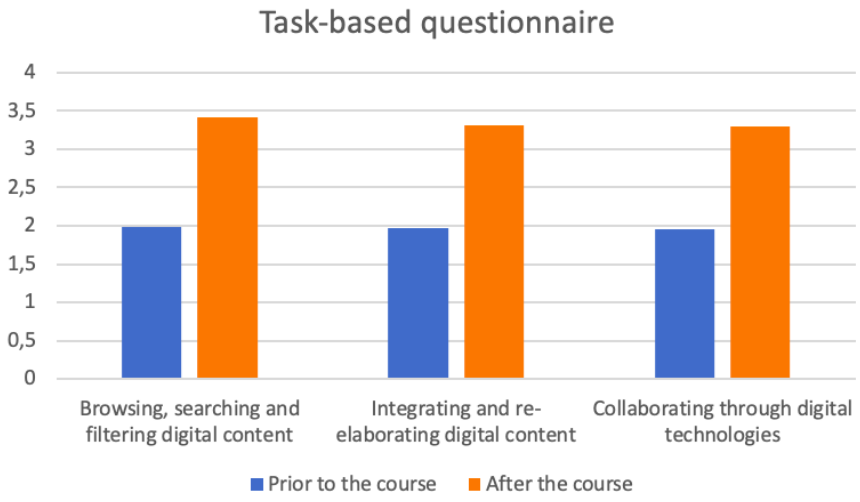

Figure 3. Perception of digital competence levels before and after the "Digital Storytelling" MOOC

Conclusions

The pilot experience, here described, was realised in response to the educational urgency of promoting digital skills in in-training teachers and educators for the development of the national social and educational context (Italian Law 107/2015 , European University Association, 2019; Digital Skills Observatory, 2019; OECD, 2019; Digital Education Action Plan 2021-2027), especially after the spread of the Covid-19 pandemic that brought the need to redesign and redefine learning processes and programmes through the use of digital technologies, Distance Learning (DAD) and Digital Integrated Learning (DDI).

The results of the pilot experience, which cannot be generalised, show a statistically positive increase in the perceived competences of Browsing, searching and filtering digital content, Integrating and re-elaborating digital content and Collaborating through digital technologies within the university students attending the "Digital Storytelling" MOOC ($p < .05$). The average score assigned to the final assessment test of the MOOC (8.99) was also very good, highlighting the good achievement of the learning objectives by the attendees.

The limitations of the pilot experience are the absence of a probability sample of the in-training educators attending the MOOC and the absence of validation of the Italian language assessment tools used. On this last point, the Cronbach's Alpha results are however good.

Future developments of this research may be the implementation of the experience in other training contexts, such as with the participation of in-service educators and teachers, as well as the use of validated digital skills assessment tools in Italian. An in-depth study of the assessment of 21st century skills and the analysis of possible correlations with digital skills levels is also hoped for.

References

Andone, D. (2019). Development of DigiCulture Educational Program for Digital Skills Training for Adults in Creative Industries. Proceedings EDULEARN19, ISBN: 978-84-09-12031-4, doi: 10.21125/edulearn.2019.2573

Azevedo, J. P., Hasan, A., Goldemberg, D., Iqbal, S. A., Geven, K. (2020). *Simulating the Potential Impacts of COVID-19 School Closures on Schooling and Learning Outcomes : A Set of Global Estimates*. Policy Research Working Paper; No. 9284. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/33945 License: CC BY 3.0 IGO

Aica, Anitec-Assinform, Assintel, Assinter Italia (2019). *Osservatorio delle competenze digitali*. Available at https://competenzedigitali.org/wp-content/uploads/2020/01/Osservatorio_CompetenzeDigitali_2019.pdf

Carretero, S., Vuorikari, R., Punie, Y. (2017). DigComp 2.1: *The Digital Competence Framework for Citizens with eight proficiency levels and examples of use*. EUR 28558 EN, doi:10.2760/38842.

European University Association (2019). *Digital skills. Where universities matter*. Brussels: European University Association asbl.

EU (2020). *Digital Education Action Plan*. Available at https://education.ec.europa.eu/focus-topics/digital-education/digital-education-action-plan

Hougaard, B. I. Knoche, H. (2020). *Design and integration of Open Badges. Digital Skills E-Assessment Tool*. Available at https://digiculture.eu/wp-content/uploads/2020/12/O4.1-Digital-Skills-E-Assessment-Tool-Interrim-Report-Draft-v0.2.docx.pdf

ISTAT (2019). *Cittadini e ICT. Report*. Available at https://www.istat.it/it/files/2019/12/Cittadini-e-ICT-2019.pdf

Nunan, D. (2004). *Task-based language teaching*. Cambridge: Cambridge University Press

OECD (2019), *Education at a Glance 2019*: OECD Indicators. Paris: OECD Publishing. Available at https://doi.org/10.1787/f8d7880d-en

Re, M.R. (2022). *Applicazione delle tecniche digitali in contesti di educazione per gli adulti: le linee guida per le industrie creative del progetto europeo Digiculture / Using digital skills within adult education context: the DigiCulture project Guidelines for Creative Industries*. In A.M. Pietro Lucisano (Ed.), Quale scuola per i cittadini del mondo? A cento anni dalla fondazione della Ligue Internationale de l'Éducation Nouvelle (pp. 763-773). Lecce : Pensa MultiMedia Editore.

Secundo, G., Rippa, P., & Meoli, M. (2020). Digital transformation in entrepreneurship education centres: Preliminary evidence from the Italian Contamination Labs network. *International Journal of Entrepreneurial Behaviour and Research, 26*(7), 1589–1605.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

USING LEARNING ANALYTICS DURING A VIRTUAL CLASS

Fred Dixon, co-founder, BigBlueButton Inc.

Abstract

This paper shares research by the BigBlueButton project on how it deconstructs the complexity of delivering effective virtual classrooms into four key foundations and seven use cases. We apply this framework to two EDEN's workshop objectives and explore the use of learning analytics during a virtual class to improve student outcomes.

Keywords:

Virtual classroom, e-learning, online learning, learning analytics, Bloom's Taxonomy.

Introduction

Delivering an effective virtual classroom is a complex undertaking. During the pandemic, when moving classes online quickly, many schools reached for familiar video conferencing tools that included Zoom, Teams, and Meet (referred hereafter as "generic video conferencing systems"). These systems emphasized sharing of audio, video, and screen sharing, but offered limited built-in support for the pedagogy of teaching and learning. Ramachandran (2022) showed this overreliance on video ultimately leads to "zoom fatigue." When video is the primary form of assessment, if students decline to share their video, the instructor is left teaching to the screen and hoping that students are learning. A video conferencing system does not make an effective virtual classroom, but how should today's virtual classrooms evolve beyond video?

To answer this question, we reflected on the challenge given for the 2022 EDEN workshops (and highlight two key objectives):

> *… to explore the consequences of emergency remote teaching and learning as well as to tackle the new approaches in **creating learning environments that should be smarter**, more inclusive, and involve emerging technologies that will boost the digital skills of students and give them a more p**ersonalized experience**.*

Four foundations of a successful virtual classroom

Since 2020, the BigBlueButton project has held more than 20 focus groups with educators, students, and members of our open-source community towards understanding how the virtual classroom could (and should) evolve. The research allowed us to deconstruct the complexity of delivering an effective virtual classroom into four areas: *management, relationships, engagement,* and *assessment.*

We map the two EDEN objectives into this framework.

	As an **instructor**, I want to …
Management	**setup and manage my classroom for success**
Relationships	**establish presence and trust with and between students**
Engagement	**effectively** engage and **activate** their minds for learning (EDEN: "creating learning environments that should be smarter")
Assessment	**assess their progress** and **give timely feedback**

Table 1: Instructor user stories for the foundations of a successful virtual classroom.

	As a **student**, I want to …
Management	
Relationships	feel **comfortable** to participate
Engagement	**efficiently** master new skills
Assessment	**receive help** when I am struggling (EDEN: "personalized experience)

Table 2: Student user stories for the foundations of a successful virtual classroom.

Is a virtual class more effective when students actively apply their knowledge during class?

Yes. Bloom's Taxonomy shows that our brain goes through stages of learning (Bloom & Krathwol,1956) (referred hereafter as "the learning journey").

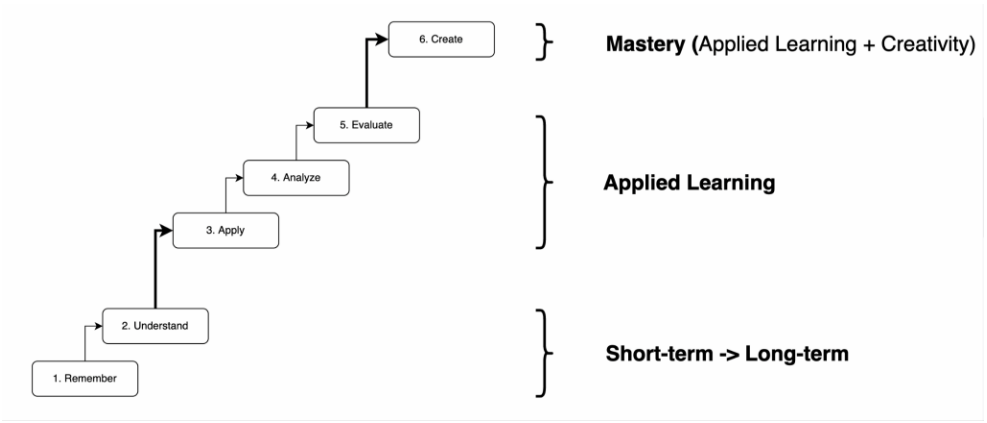

Figure 1. Three types of learning in Bloom's Taxonomy

Bloom's taxonomy shows that students cannot achieve mastery without going through the middle stages of applied learning. It follows that a virtual classroom if the instructor can help the student move through these stages during the live class.

Is a virtual class more effective when students receive help during the class?

If a student could receive a few minutes of personalized help during the live class – either individually or as a group – the student would perceive a higher value from attending the virtual class. How can the instructor know if a student is struggling? The answer is learning analytics.

The role of Learning Analytics in virtual classrooms

The Society for Learning Analytics Research (SoLAR) defines 'Learning Analytics' as: "the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (2021).

Nguyen et al. (2021) provides an overview of theory-based design principles in Learning Analytics Information Systems (LAIS). The first principle is that LAIS "should have features that allow for the reporting of actionable information about learners and their learning" (Nguyen et al., 2021, p. 545). The second principle is that LAIS "should generate reports in a timely matter." The third and last principle is that LAIS "should be available and accessible to both data clients and data subjects at any time and be able to interoperate with any learning and teaching system, including virtual learning environments (VLEs), and allow the integration of different data sources." Using real-time analytics during the lecture, the instructor could see the results and summary of testing students and adjust the pace of their lecturing (Atsushi et al., 2018).

The following diagram shows the role of learning analytics before, during, and after the instructor engages the students.

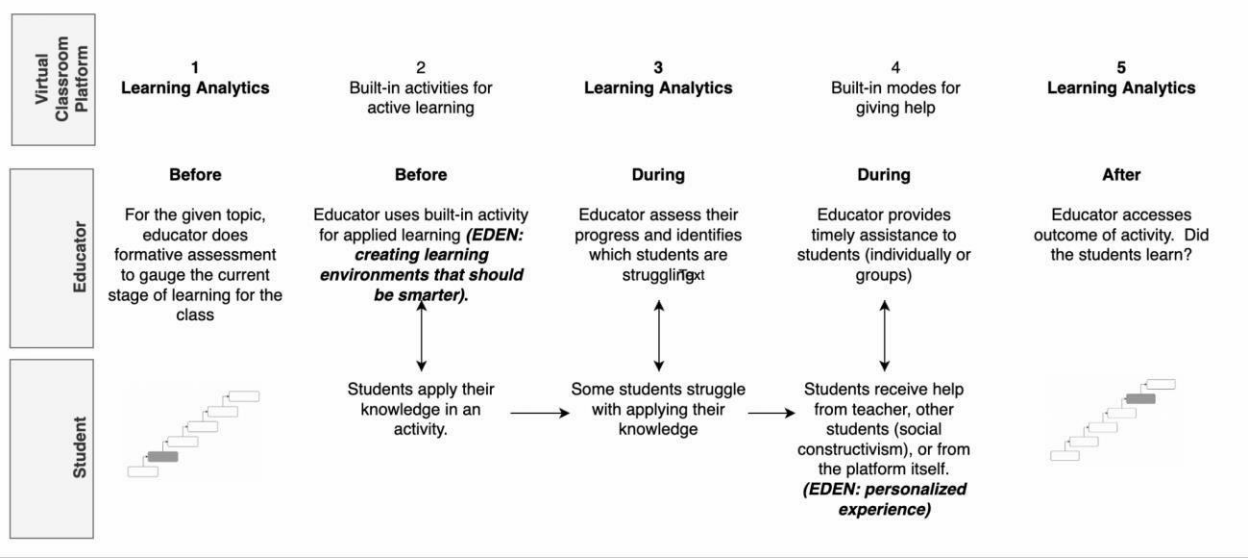

Figure 2. The role of the virtual classroom, the activities of the instructor, and the student's learning.

Consider the following scenario: an instructor is teaching a class of 25 students in basic statistics. At the end of the previous class, the instructor introduced the concepts of *mean* (average value), *median* (middle value), and *mode* (value that occurs most often). After the class finished, the instructor asked that students read a section of material in the LMS, watch a brief video on basic statistics, and complete a 5-minute quiz in preparation for the next class.

1. Learning Analytics (before)

Learning Analytics should enable the instructor to quickly assess the preparedness of students. Specifically, the learning analytics should help the instructor determine:

1. Which students are absent from the class?
2. Which students have
    a. Visited the page in the LMS
    b. Watched the video
    c. Completed assignment along with their score

2. Built-in activities (before)

The virtual classroom should have a built-in set of activities for the instructor to help students move through the learning journey. Each activity should generate learning analytics. Examples:

- **Chat:** Ask students to give examples of where they would calculate the median. Students can also anonymously vote on the suggestions of others. *Analytics: which students answered, voted for the other suggestions, and received the most votes for their example.*
- **Polling:** Show a slide with a list of numbers with the mean, median, and mode and ask which one of these numbers is the most useful? *Analytics: which students responded to the poll (this may be subjective based on the context, so there is no right answer).*
- **Quiz:** Present a slide giving a list of numbers and prompt in a quiz "Which number is the median?". Analytics: which students correctly answered the quiz and how quickly did they answer.

- **Breakout rooms (group assignment):** Show a slide with a list of numbers. Put students into breakout groups and ask them to calculate the mean, median, and mode. *Analytics: live monitoring of activity in each breakout room discussions (talking, chatting, using the whiteboard)? Which breakout rooms have submitted the correct answer (or not)?*
- **Individual writing/whiteboard:** Show a slide with a list of numbers. Put students into an "individual activity mode" for 5 minutes where they can't collaborate with each other, but the instructor can see all the individual whiteboard activity. Students are asked to work out the correct answer and submit it. Any student that does not give the correct answer within 4 minutes will be automatically given a hint. *Analytics: live monitoring of individual activity with tracking of which students calculated the correct answer within the allotted time (with or without the hint)*

All these activities generate learning analytics that can help the instructor assess students' performance during the live class.

3. Live analytics (during)

All the analytics derived from the activities should be visible and summarized, such as in a dashboard with graphs, with the ability to drill down into the underlying data, such as:

- A relative activity score (based on talking, responding to questions, raising hand, etc.) to gauge student participation.
- A table showing which students gave correct answers to the quiz questions.
- A scatter plot with two axes: speed of response and correctness of answers.
- A timeline view showing student participation according to time and the currently displayed slide. (The instructor might have two slides explaining the same concepts, but participation was higher in one of them.)

4. Modes for giving help (during)

Using the analytics from engagement activities, the instructor can assess if the class, a group, or individual students are struggling, and give timely help.

5. Live learning analytics (after)

As in Step 3, the analytics should enable the instructor to assess the overall outcome of the activity (did all students, even if they needed a bit of help, get the right answer in the end)?

Conclusion

We conclude the virtual classroom should provide built-in engagement tools to help the students move through the learning journey. These tools should generate analytics that enable the instructor to easily assess students learning outcomes before, during, and after each activity. The analytics should also enable the instructor to pinpoint those students that are struggling, and the platform should make it easy to render group or one-on-one assistance.

From the student's perspective, this assistance provides a personalized experience and reinforces the value of attending and participating in the virtual class.

From the instructor's perspective, the learning analytics ensure there is no "back of the classroom." The instructor is not reliant on webcams. All students are visible to the instructor through the learning analytics, and the analytics should be shared with the LMS.

We note that this paper is not exhaustive in exploring the potential of learning analytics. Points of discussion for further exploration would include the following questions:

1. What other built-in activities (beyond those listed herein) should the virtual classroom support to foster active learning?
2. What learning analytics could be derived from these activities?
3. How could the virtual classroom display and summarize the learning analytics to make it easier for the instructor to gain insight from them to adjust their teaching in the moment and identify students at risk?

References

Abou-Khalil, V.; Helou, S.; Khalifé, E.; Chen, M.A.; Majumdar, R.; Ogata, H. (2021). Emergency Online Learning in Low Resource Settings: Effective Student Engagement Strategies. *Education Sciences,* 11(1), 24. https://doi.org/10.3390/educsci11010024

Atsushi Shimada, Shin'ichi Konomi, & Hiroaki Ogata. (2018). Real-time learning analytics system for improvement of on-site lectures. *Interactive Technology and Smart Education,* 15(4), 314–331. https://doi.org/10.1108/ITSE-05-2018-0026

Bloom, B.S. & Krathwol, D.R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. David McKay.

Mwalumbwe, I. & Mtebe, J. S. (2017). Using Learning Analytics to Predict Students' Performance in Moodle Learning Management System: A Case of Mbeya University of Science and Technology. *The Electronic Journal of Information Systems in Developing Countries,* 79(1), 1–13. https://doi.org/10.1002/j.1681-4835.2017.tb00577.x

Nguyen, Tuunanen, T., Gardner, L., & Sheridan, D. (2021). Design principles for learning analytics information systems in higher education. *European Journal of Information Systems,* 30(5), 541–568. https://doi.org/10.1080/0960085X.2020.1816144

Ramachandran, V. (2022, August 31). *Four causes for 'zoom fatigue' and their solutions.* Stanford News. Retrieved September 6, 2022, from https://news.stanford.edu/2021/02/23/four-causes-zoom-fatigue-solutions/

Tsavdaris, P., Deuff, O. L., & Batier, C. (2016). *Importance of a content management tool inside a Learning Management System (LMS)*. EDP Sciences. https://doi.org/10.1051/shsconf/20162601109

Maity, Sahu, T. N., & Sen, N. (2021). Panoramic view of digital education in COVID-19: A new explored avenue. *Review of Education (Oxford)*, 9(2), 405–423. https://doi.org/10.1002/rev3.3250

Vanhorn, S., Ward, S. M., Weismann, K. M., Crandall, H., Reule, J., & Leonard, R. (2019). Exploring Active Learning Theories, Practices, and Contexts. *Communication Research Trends*, *38*(3), 5–25. https://link.gale.com/apps/doc/A621689776/AONE?u=ocul_carleton&sid=bookmark-AONE&xid=027886a0

What is learning analytics? Society for Learning Analytics Research (SoLAR). (2021, March 24). Retrieved September 6, 2022, from https://www.solaresearch.org/about/what-is-learning-analytics/

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

QUALITY DISTANCE EDUCATION IN THE CONDITIONS OF WAR

Natalia Grushko, Zalishchyky State Gymnasia Zalishchyky, Ukraine

Roman Hrushko, Ternopil National Pedagogical University Named after V. Hnatyuk, Ukraine

Abstract

The coronavirus pandemic has forced educators to adapt and set up remote work. However, the war in Ukraine brought new challenges - the destruction of schools, the forced relocation of students and teachers who study and work in new schools throughout Ukraine and beyond, "dropping out" of the educational process of individual children and entire classes due to hostilities and other reasons, related to war. The experience of organizing distance education, acquired last year and the year before last during the covid-quarantine, helped the Ukrainian education system to quickly adapt to the new realities of the war.

Since the beginning of the war, distance learning has become the main option for accessing knowledge, and schools are trying to adapt their work during the pandemic to new conditions. Now, when Ukrainians are forced to study online because of the war, a logical question arises: what are the main advantages of distance learning in Ukraine and how can the lessons of the pandemic help in wartime? The article examines the material on the implementation of distance education in Ukraine in wartime conditions, which will allow developing recommendations for the possible application of distance education methods in wartime and peacetime in Ukraine and other countries.

Keywords: distance learning, communication technologies, online communication, web resources.

Distance education allows you to meet the individual needs of each person in learning and to solve such problems of traditional education as the lack of an individual approach to students, insufficient use of active forms of teaching, weak motivation for independent cognitive activity of children, strict dependence on the territory and time of classes, subjectivity assessment of learning outcomes. Distance education can support students and teachers in difficult times for the state.

Distance learning, also known by various names such as distance education, e-learning, mobile learning, or online learning, is a form of education where there is physical separation of teachers from students during the instruction and learning process. It is also an instructional practice that effectively utilizes a wide range of tools and technology to enrich the student learning experience and to facilitate student-faculty and student-student communication. The minimum technological requirements for successful distance learning include the acquisition of hardware such as a computer, mobile device (cellular phones), or webcam, some form of listening device, video conferencing applications such as WebEx or Zoom, Microsoft Windows or Apple operating systems, and a stable internet connection with a speed of about 56K or greater.

Distance learning is a technology of the future, which requires constant improvement and compliance with the development of online technologies and platforms.

Tips for organizing distance learning in wartime

Changes to the calendar and thematic planning

In the conditions of war and constant air alarms, it is difficult to adhere to a stable schedule of classes and calendar-thematic planning. Therefore, it should be a flexible tool in the hands of the teacher. It is important for the school director to convey to the teachers that the current calendar-thematic plans are not up to date. The teacher can use his usual plan as a basis, and at the same time adapt and change the plan, increasing the time, for example, for repeating the material of the previous year and specifying the material after diagnosis.

In the calendar and thematic plan, the teacher should: choose topics that can be transferred to independent study by students (it is advisable to include topics from which quality resources are available); to consolidate topics that are easier to learn, and vice versa - to identify those that require more detailed study; identify topics that are studied for the first time and without which it is impossible to learn further material.

A single educational platform

Long-term distance learning should take place using a special online platform. In order for children and teachers to be comfortable and understandable, it is important that such a platform is uniform for the entire school. It can be, for example, Google Classroom, Moodle, Office 365, or a platform developed to the order of an educational institution. In turn, it is important for teachers to provide feedback to students and establish an evaluation system through clear criteria, deadlines for tasks, and the introduction of deadlines.

Mixed learning

In the conditions of war, it can be difficult to organize mixed training; however, there are other models of its organization, which mainly concern training methods. All models of the distribution of the learning time of the lesson into synchronous and asynchronous modes are models of mixed learning. One of the effective methods is the "Flipped Class", which stimulates students to be active participants in the educational process. Activity-based learning methods, step-by-step instructions for independent work can be used to teach students in asynchronous mode.

Active learning methods

Project, search, and research tasks will help the teacher to ensure a variety of cognitive activities and interest students. As a rule, the main part of such tasks is performed by students in asynchronous mode. One of the types of organization of such training can be the systematic use of the "Flipped Class" technology, which involves providing students with tasks to familiarize them with new material before the teacher explains it in class. This can be watching a video, analyzing practical problem situations, processing the educational text and transforming it into another form - a table, infographics, charts, tests, etc. In this case, the role of the teacher and the very format of the lesson changes.

Independent processing of the material

Students' independent mastery of the material during distance learning in war conditions has its own characteristics. The teacher should divide the material into logical thematic blocks. This will help children learn independently. At the same time, it is important for teachers to provide children with as clear instructions as possible on mastering each block of material and criteria for independent assessment of the result. It is important to remember that independent work must have a clear material embodiment - a product. Tasks can refer to both the entire volume of the material and its part. Oral traditional tasks (retelling the material or answering questions) are ineffective for independent learning.

Tracking the dynamics of educational achievements

Despite the war, it is important and necessary to monitor the educational achievements of students. For this, teachers should develop diagnostic tasks. Teachers can do this by choosing tasks according to topics and expected results. Tracking the dynamics of students' educational achievements will enable teachers to timely diagnose possible educational losses and respond to them in time. In order to diagnose educational losses, it is first of all necessary to identify missed topics, develop tasks for evaluating educational achievements, and analyze the results. After that, develop plans to overcome educational losses: collective, group or individual. Such plans may include the student's independent work, teacher's consultations, performance of tasks in groups.

Cooperation with parents

Cooperation between teachers and parents is an important component of the success and quality of distance learning of students. However, it is worth remembering that cooperation does not mean that parents are responsible for explaining the material or completing tasks. The role of the teacher is important here. Parents, for their part, can

motivate children, support them and help organize independent work, create conditions for self-control and self-evaluation. In the conditions of distance education, the most attention should be paid to cooperation with the parents of primary school students, since they will organize their children's education, at least in the first months.

Means of distance learning organization

Criteria for choosing means of organizing distance learning

To ensure remote learning of students, the teacher can create his own web resources or use other web resources of his choice. At the same time, it is necessary to provide students with recommendations on the use of resources. To foster academic integrity in children, it is important to always give correct references to sources. The most important criterion for the selection of means for the organization of distance learning should be compliance with the set methodical goals. At the same time, it is also desirable to take into account the versatility of these tools. When comparing several tools, it is worth considering the clarity of the interface for both teachers and students. At the same time, it is important to take into account the possible special needs of students and the principles of universal accessibility of software tools. In environments where learning takes place through the use of personal devices, it is necessary to consider the diversity of these devices and choose resources that are most suitable for different platforms. An important point is the need to register students on the web resource, because information security should be kept in mind and the number of platforms on which we offer students and teachers to register to a minimum. It is necessary to carefully familiarize yourself with the rules of using the platforms.

Basic forms of online communication

A video conference is a real-time online conference. Video conferencing is one of the modern methods of communication that allows classes to be held in "remote classes" when students and the teacher are at a distance. Therefore, discussion and decision-making, discussions, project protection take place in real time. The teacher and students can see each other, the teacher has the opportunity to accompany the lecture with visual material. The forum is the most common form of communication between teachers and students in distance learning. Each forum is dedicated to a certain problem or topic. The moderator of the forum implements the discussion, stimulating it with questions, messages, and new interesting information. Chat — communication between network users in real time, a means of operational communication of people via the Internet. A blog is a form of communication that resembles a forum, where the right to post belongs to one person or group of people. E-mail is a standard Internet service that provides the transmission of messages both in the form of plain texts and in other forms in open or encrypted form. Questionnaires - it is convenient to use various questionnaires for ongoing control during distance learning. The questionnaire is quite a flexible tool, as questions can be asked in many different ways. In distance learning, after mastering each topic, you can use questionnaires in which the student can self-assess the learning results. Social networks, instant messaging services, and mobile applications allow you to create closed groups, communities, chats, and discuss topics, tasks, problems, and information.

Common web resources for distance learning

The All-Ukrainian Online School (https://lms.e-school.net.ua/) is a platform for distance and mixed learning of students in grades 5-11 and methodical support for teachers. The goal of the All-Ukrainian online school is to provide every Ukrainian student and teacher with equal, free and free access to high-quality educational content. The platform contains video lessons, tests and materials for independent work in 18 main subjects: Ukrainian literature, Ukrainian language, biology, biology and ecology, geography, world history, history of Ukraine, mathematics, algebra, algebra and beginnings of analysis, geometry, art, fundamentals of jurisprudence , natural science, physics, chemistry, English language and foreign literature. Children can use the platform both to study during quarantine, war, and to familiarize themselves with a topic they missed at school due to illness or other reasons. For teachers, recommendations have been developed for conducting mixed and distance learning using the educational materials of the platform.

The Moodle platform (https://moodle.org/) is a free, open-source distance learning management system. Allows you to use a wide range of tools for educational interaction between the teacher, students and the administration of the educational institution. Moodle has in its toolkit: assignment submission forms; discussion forums; uploading

files; evaluation journal; exchange of messages; calendar of events; news and announcements; online testing; Wiki resources.

The Google Classroom platform (https://classroom.google.com) is a service that connects Google Docs, Google Drive, and Gmail, and allows you to organize online learning using video, text, and graphic information. The teacher can conduct testing, control, systematize, evaluate activities, review the results of exercises, apply various forms of assessment, comment and organize effective communication with students in real time. The main element of Google Classroom is groups. The platform also allows you to collect students' answers using Google forms and then conduct automatic evaluation of test results.

Application of Office 365 cloud service applications. Teams, Office Web Apps, Outlook; Planner, Forms, OneDrive.

Zoom (zoom.us/download) is a service for conducting video conferences and online meetings. To do this, you need to create an account. Video conferences can also be held using Microsoft Teams, Google Meet, Skype, etc.

Classtime (https://www.classtime.com/uk/) is a platform for creating interactive educational applications that allows you to conduct analytics of the educational process and implement individual approach strategies. There is a library of resources, as well as the ability to create questions.

LearningApps.org (LearningApps.org) is an online service that allows you to create interactive exercises. They can be used when working with an interactive whiteboard or as individual exercises for students. Allows you to create exercises of different types on different topics. This service is a Web 2.0 application to support educational processes. LearningApps builder. org is intended for the development, storage and use of interactive tasks in various subjects.

Useful tips for teachers

Equal access

At the beginning of distance learning, set uniform standards for all students and voice your expectations. Whenever possible, interact with students individually or in small groups to establish an emotional connection with them. Encourage children to tell you about their circumstances and ask questions.

Communication and communication

Simplify the communication process. Organize a common platform that all students will have access to and post all messages there. Collect feedback from students and their parents. Use group work methods to strengthen the connection between students. Group work is especially important in distance learning conditions - it creates the effect of being present in the classroom. Create virtual classrooms and use mentoring to connect with students informally in small groups.

Technologies and tools

Be patient with yourself, your students, parents and colleagues. Learn from each other. The main thing is to master the basics of working with distance learning tools. Teach parents how to use the apps you use in the classroom. This will allow you to interact with them during the learning process. Share experiences with colleagues. Give the students an assignment during the lesson. Children can come up with many ways to make the lesson more interesting.

Emotional well-being

The priority in distance education should be the physical and emotional health of each participant in the process. Without this training is impossible. Your task is to set the tone of learning, taking care of the well-being of each student and your own. During quarantine or war, children do not have the opportunity to gather together in the classroom or on the playground. The social aspect is extremely important for healthy development and cannot be ignored. The task of teachers is to support the social interaction of students. Take breaks. Reduce the amount of

homework - so children will have more time to be physically active or just have fun. Be flexible when evaluating achievement. Because your students have different learning environments at home, the results will also be different. When communicating with students, emphasize the importance of good health, exercise, sleep, and rest. Dilute the learning process with informal communication and humor. Encourage children to help each other in their studies. Suggest how to do it better. Celebrate birthdays and other important events. Take care of yourself. Find work-life balance in your schedule.

Lessons learned from the pandemic indicate the advantages of remote education in our country during the war. In particular:

- Ability to study at any time. Student can independently decide when and how much time to devote to studying the material. He builds an individual study schedule for himself.
- Ability to study anywhere. Children can learn from anywhere in the world. To start learning, you only need a computer with Internet access.
- Study without breaking away from the main activity. It is possible to study remotely at several courses or at several educational institutions at the same time.
- Ability to learn at your own pace. It is not necessary to study at the same pace as other students. A student can always return to studying more complex issues, watch video lectures several times, re-read correspondence with a teacher, and can skip topics already known to him.
- Availability of educational materials. There is access to all necessary literature. The problem absence of textbooks disappears.
- Mobility. Communication with teachers is carried out in various ways: both online and offline.
- Learning in a calm environment. Intermediate evaluation of courses takes place in the form of on-line tests. Therefore, students have less reason to worry. The possibility of subjective assessment is excluded.
- Individual approach. With traditional education, it is quite difficult for the teacher to pay the necessary amount of attention to all students, to adapt to the pace of each student's work. The use of remote technologies is suitable for organizing an individual approach.
- Distance education is cheaper. If you compare the cost of education in correspondence and distance education, distance education will most likely be cheaper. The student does not have to pay for travel, accommodation.
- Convenience for the teacher. Remote teachers can focus on more students and work even when they are not at home.

The implementation of distance learning during quarantine restrictions indicated a number of shortcomings. Namely:

- A strong motivation of the student is necessary. Practically all educational material is mastered by the student independently. This requires sufficient willpower, responsibility and self-control. Not everyone is able to maintain the desired learning pace without external control.
- Lack of practical skills and abilities. It is quite difficult to organize high-quality distance learning in areas of training and specialties that include a large number of practical classes. Even the most modern computer simulators cannot replace "live" practice.
- Distance education is not suitable for the development of communication skills. With distance learning, personal contact of students with each other and with teachers is minimal, if not completely absent. Therefore, this form of training is not suitable for the development of communication skills, confidence, and teamwork skills.

At the same time, it is important to emphasize that to ensure distance learning in educational institutions, it is necessary to observe a number of pedagogical conditions, in particular:

1. creation of an information-technological educational environment, in which the key place is occupied by information technologies with the possibility of automating certain aspects of the process;
2. development of quality didactic support. It is about a didactic system in which distance learning takes place, each of its components is described;

3. ensuring a sufficient level of information competence of the teachers of the educational institution, which allows to effectively form and support the distance learning process.

Methodological recommendations for the implementation of pedagogical conditions for the introduction of distance learning into the educational process should be drawn up in accordance with the following structure:

- recommendations for the teacher on the organization of the information technology educational environment (choice of the style of interaction of the subjects of the educational process within the environment, the ratio of traditional and innovative methods, means and forms of education);
- recommendations for the teacher on the development of didactic support for distance learning (content of electronic educational resources, databases, etc.);
- recommendations for increasing the information competence of the teachers of the educational institution, in particular, the ability to fluently use Skype, Moodle, Zoom, Viber, Telegram, Messenger platforms for the purpose of distance learning.

Taking into account the given recommendations and experience, it is possible to provide students with access to quality education, even in difficult military times.

Having desire and motivation, you can find affordable ways not to stop in development and not to interrupt your education, because every minute devoted to education is a contribution to the victory of Ukraine not only today, but also decades after the war.

Literature

Al-Tamimi DM. Application of information and communication technologies in medical education. J Fam Comm Med. (2003) 10:67–76.

Analysis of features of distance learning and the possibility of its full integration into the educational process / I. K. Churpii [et al.] // Art of Medicine. – 2020. – N 4. – P. 135–139

Bachurin G. V. Distance learning - as a challenge of time during the COVID-19 pandemic / G. V. Bachurin, S. S. Lomaka, Yu. S. Kolomoets // Urology. – 2020. – Vol. 24, No. 3. – P. 257–258

COVID-19 and Distance Learning: Effects on Georgia State University School of Public Health Students Retrieved from https://www.frontiersin.org/articles/10.3389/fpubh.2020.576227/full

Distance learning Retrieved from https://mon.gov.ua/ua/osvita/pozashkilna-osvita/distancijne-navchannya

High-quality distance learning in the conditions of war: advice to the school director Retrieved from https://sqe.gov.ua/yakisne-distanciyne-navchannya-v-umovakh/

How the education of children in Ukraine changed during the war Retrieved from https://www.unicef.org/ukraine/stories/education-during-war-in-ukraine

Learning in Wartime: What to Expect for School Students and Their Parents Retrieved from https://www.volynnews.com/news/all/navchannia-pid-chas-viyny-choho-ochikuvaty-shkoliaram-i-yikhnim-batkam/

Methodical recommendations for the organization of distance learning at school Retrieved from https://mon.gov.ua/storage/app/media/zagalna%20serednya/metodichni%20recomendazii/2020/metodichni%20recomendazii-dustanciyna%20osvita-2020.pdf

Preparing for the academic year: principles and methods of organizing online education Retrieved from https://nus.org.ua/articles/gotuyemosya-do-navchalnogo-roku-pryntsypy-ta-metody-organizatsiyi-onlajn-navchannya/

Simonson GAB. Distance Learning Education. Britannica: Encyclopedia Britannica, Inc. (2016).

Tymoshchuk O.V. Peculiarities of the influence of distance education on the quality of life of students of modern institutions of various types / O. V. Tymoshchuk // Art of Medicine. – 2020. – N 4. – P. 124–128

What is better: distance learning or traditional school Retrieved from https://optima.school/blog/sho-krashe-distancijne-navchannya-abo-tradicijna-shkola

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

TRAVELLING CULTURE: DEFINE, IMPLEMENT, ENRICH AND DISSEMINATE THE DIGITAL CULTURAL HERITAGE. THE "DIGITXL PROJECT" CASE STUDY

Tiziana Pasciuto, CNR-IMATI & University of Genoa, Italy
Riccardo Albertoni, CNR-IMATI, Italy
Roberta Maggi, CNR-IMATI, Italy
Maria Teresa Artese, CNR-IMATI, Italy
Isabella Gagliardi, CNR-IMATI, Italy
Maurizio Gentilini, CNR-DSU, Italy

Abstract

In the last decades, the digitalization of the cultural heritage has become actual, promoting not only the conservation of the most fragile artefacts but also the enjoyment of the cultural objects. The importance of increasing the digitalization process of cultural heritage has been confirmed during the critical times of the last two years. In order to provide a useful tool to catalogue, digitalize and enrich the document flows, an infrastructure to integrate, manage and display data and information from archives, museums and libraries is being studied and developed. One of the steps to be addressed to develop the GECA infrastructure consists in comparing and mapping the most used national and international descriptive standards adopted in archives, museums, and libraries. The standards mapping is key to developing new cataloguing data sheets, to ease the insertion of information also for those who are not professionals in the domain. To promote cultural enjoyment for every kind of target audience, cultural narratives could be developed, to encourage not only web search, but also an interaction with the cultural object. This study aims also to contribute at the creation and promotion of thematic routes that aggregate information from distinct domain of studies and provide for the cultural object to be perceived, experienced, and studied.

State of the art and goals

The process of digitizing cultural resources has been evolving for several years. There are many different conditions that encourage its development: digital consultation, for example, allows access to documentation physically preserved on the other side of the world; moreover, it promotes the preservation of cultural objects themselves, especially of the most fragile, whose physical consultation is impossible or strongly discouraged.

The need to enrich digital resources has been made even more evident following the COVID-19 pandemic: the concrete impossibility to study, consult and observe "live" any type of material stored in libraries, museums and archives highlighted the importance of making cultural heritage accessible and available to every type of user (Kolokytha & Rozgonyi, 2021).

This urgency also implies the need to implement and digitize the resources currently available only through consultation, using standardized descriptive criteria as complete and detailed as possible, to guarantee through the study of the "virtual" item the same quality (or superior) provided by the "real" consultation of a cultural object (Sweetser & Orchard, 2019).

In order to provide a useful tool to catalogue, digitalize and enrich document flows, an infrastructure to integrate, manage and display data and information from archives, museums and libraries is being studied and developed.
One of the steps to be addressed to develop the GECA infrastructure (GECA 3.0, Manage integrated resources, 2022), realized by CNR IMATI, consists in comparing and mapping the most used national and international

descriptive standards adopted in archives, museums, and libraries. Currently, the bibliography on the realization of a complete, updated and/or freely available mapping among the main descriptive standards is rather sparse or dated (Assumpção & da Costa Santos, 2015; Jakšić, 2004). For example, in the Tag Library of the EAD3 standard a partial mapping between the ISAD(G) - EAD3 and MARC21 - EAD3 standards is reported. Instead, a mapping

between EAD3 and UNIMARC is totally missing, since these are standards of American and European origin respectively (EAD Tag Library, 2019). Moreover, the conversion sheets from UNIMARC to MARC21, made available by the Library of Congress, are currently at version 3.0, dated to August 2001 (UNIMARC to MARC 21 Conversion Specifications, 2001), despite the standards being updated respectively to the 3rd edition in 2008 (IFLA & Hopkinson, 2008) and Update No. 33 in 2021 (MARC 21 Format for Bibliographic Data, 2021).

The purpose of the mapping is to describe the digitalised objects in a lingua franca, allowing the interchange of data between standards. The standards mapping is key to developing new cataloguing data sheets, to ease the insertion of information also for those who are not professionals in the domain (as opposed to archivists, librarians, museum cataloguers) and to support complex thematic routes which need to integrate information coming from separated domains.

To avoid confining the digital cultural heritage in a digital “limbo” known only by researchers and scholars, it is necessary to approach every kind of target audience, for example even the fans and the simply curious ones. This process could be implemented through the development of cultural narratives that encourage not only web search, but also an interaction with the cultural object.

This is exemplified in the work undertaken by Nanyang Technological University in Singapore with a project of engineering historical memory and interactive exploration of archival documents (Nanetti & Benvenuti, 2021). In this way, digital documents are no longer just a "digital reproduction" that replaces the original for preservation, dissemination, and fruition reasons, but become a tool for deepening and amplifying the meaning and content of the original itself (Campagnolo, 2020; Turbanti, 2021).

This study aims also to contribute at the creation and promotion of thematic routes that provide for the cultural object to be perceived, experienced, and studied. The thematic routes allow the management, the visualization and the fruition of the information coming from the three different domains, with the possibility to integrate them with other information or multimedia materials external to the platform (audio, video, images). Eventually, the various search paths and routes should support a range of experiences and cater for different users' needs and interests as well as personalised ways to relate to the cultural heritage and learn more about it or its context.

Methods and Tools

First, an analysis of the main national and international standards and guidelines used in the domain of cultural heritage (libraries, archives, and museums) was carried out. Were analyzed the standards created by authoritative bodies in the sector (i.e., bibliographic domain: IFLA, Library of Congress; archival domain: ICA, SAA; museum domain: Getty Institute, ICCD), the most used and recognized by the reference communities.

Subsequently, based on the needs of the DigitXL Project and the metadata provided by the various bodies, a choice was made on the standards to be used and custom cards were developed for entering the metadata manually or through import. The resulting (meta) data model is the backbone of the GECA system and pivotal to deal with multi-domains thematic routes that provide for the cultural object to be perceived, experienced, and studied.

DigitXL Project

The DigitXL Project, promoted within the agreement of scientific collaboration between the Department of Social Sciences and Humanities, Cultural Heritage of the National Research Council (CNR-DSU) and the National

Academy of Sciences called the XL (Accademia Nazionale delle Scienze detta dei XL, 2016), consists of a census of the scientific writings produced by the academic members during the history of the Academy, in their bibliographical description, digitalisation with criteria and modalities based on advanced technological standards to enable consultation on the web. The collection and publication in digital critical edition of this heritage is an opportunity to offer to an extremely large and diverse public a collection of works and authors of the highest quality for the history of science.

The GECA infrastructure for the project represents the management tool of the online digital edition of the works of the members of the National Academy of Sciences, starting from the initial nucleus of 40 scientists who founded the association in 1782. The initiative has started with the development of the pilot project "Novum Corpus Fontanianum", focused on the figure of the scientist and naturalist Felice Fontana, one of the first members of the Academy of Sciences called XL, as well as founder and first director of the Museum of Sciences in Florence.

The pilot project, lasting 24 months and to which CNR-IMATI, CNR-DSU and the Academy of Sciences called the XL are working, was divided into 7 main phases:

1. Research of archival, bibliographic and museum resources;
2. Inventory and bibliographic descriptions;
3. Digitisations;
4. GECA infrastructure customization;
5. GECA infrastructure population;
6. Design of the Felice Fontana website;
7. Construction and population of the Felice Fontana website.

During the early stages of the project, it is proposed to conduct a census of the bibliographic and archival material, as well as the scientific instrumentation related to the naturalist Felice Fontana (1735-1805), one of the first members of the National Academy of Sciences called the XL and founder of the Museum of Sciences in Florence (Museo Galileo, 2022). These materials, present in various locations and conservation institutes, were described and digitalized with homogenous criteria and according to updated standards, and will be managed by the upper mentioned infrastructure and shared on web. Among the national and international cultural institutions that took part in the project, through collaborations and agreements with the Accademia dei XL, there are, for example, the Archive of the Accademia degli Agiati, the Civic Library and the Rosminiana Library of Rovereto, the Municipal Library of Trento, the Galileo Museum of Florence, the University Library of Leiden, the Municipal Archive of Reims and many others. The adopted descriptive reference standards for the management of cultural materials are UNIMARC (IFLA & Hopkinson, 2008), MARC21 (MARC 21 Format for Bibliographic Data, 2021) and ISBD (IFLA, 2011) for the bibliographic domain, ISAD (International Council on Archives, 1999), ISAAR (International Council on Archives, 2003) and EAD (Society of American Archivists, 2019) for the archival domain, ICCD (Istituto Centrale per il Catalogo e la Documentazione, 2022) for the museum domain.

With the Fontana project, it was possible to highlight and understand the critical issues and the circumstances of improvement for the use of GECA. The DigitXL project, in fact, provides a context to evaluate GECA's versatility in providing the user with an integrated and homogeneous view of the resource description cards.

In addition to the sheets for the cataloguing of archival, bibliographical and museum resources, an additional card with a dual function has been designed:

- aggregate all the resources of the DigitXL Project in a single virtual container, functional to the development of the project website;

- enhancing the heritage relating to the figure of Felice Fontana, through the implementation of specific thematic paths.

All the cards made for the Fontana project, therefore, have been collected in a project called "Novum Corpus Fontanianum. DigitXL Project - Felice Fontana". At the same time, with the aim of recounting the figure of Felice Fontana and describing, more generally, the DigitXL project, six thematic paths were suggested (GECA 3.0, Themed routes/projects/stories, 2022). For each of them, information has been provided, both in Italian and in English, on the figure of Felice Fontana, on the issues dealt with in the specific path and on the chronological arc that concerns the heritage enclosed in it. In each route, moreover, there are cover images with caption, aimed at describing in a graphic and concise way the theme proposed. As shown in figures 1 and 2, each route collects links to the cultural resources, divided by type, belonging to a specific theme or, in general, to the project Novum Corpus Fontanianum. To consult the resource of interest, just click on the arrow next to the title to be redirected to the cultural object's cataloguing card. It is worth noting how the routes build upon information coming from different fields of knowledge, for example, bibliographic data, such as the scientific articles written by Fontana over the years (figure 2) and archival data, such as notes, memorials and correspondence sent and received (figure 3).

The project, still in progress, is currently between the fifth and the sixth phase: specifically, the population of the GECA platform with the available resources is being completed, while the website dedicated to Felice Fontana is under construction.

Figure 2. Detail of the drop-down menu containing the articles (bibliographic domain) linked to the thematic route. To consult the resource of interest, just click on the arrow next to the title to be redirected to the cultural object's cataloguing card.

Figure 3. Detail of the drop-down menu containing the items (archival domain) linked to the thematic route. To consult the resource of interest, just click on the arrow next to the title to be redirected to the cultural object's cataloguing card.

The project will end with the population and visualization of resources on a portal dedicated to Felice Fontana, which will be connected to the GECA infrastructure. This tool will be designed on a platform and CMS open source, in order to aggregate a wide spectrum of content and information services and offer them to users according to a defined organizational model, ensuring access, making research efficient, facilitating and guiding the navigation and exploration of resources.

Acknowledgment

We would like to thank the Academy of Sciences called the XL and Fondazione Caritro, Cassa di risparmio di Trento e Rovereto for supporting this research. We thank our colleague Fabio Forgione who provided information and skills that have greatly helped the research.

References

Accademia Nazionale delle Scienze detta dei XL (2016). Retrieved from https://accademiaxl.it

Assumpção, F.S., & da Costa Santos, P.L.V.A. (2015). Representation in the bibliographic domain: A look at MARC 21 Formats. *Perspectivas em Ciencia da Informacao, 20*(1), 54-74. doi:10.1590/1981-5344/2054

Campagnolo, A. (2020). *Book Conservation and Digitalization: The Challenges of Dialogue and Collaboration*. York: Arc Humanities Press

Encoded Archival Description Tag Library Version EAD3 1.1.1 (2019). EAD Crosswalks. Retrieved from https://loc.gov/ead/EAD3taglib/EAD3.html#appendix-AppendixAEADCrosswalks

GECA 3.0 Manage integrated resources (2022). Retrieved from http://geca.imati.cnr.it/make_home_page.php?status=start3

GECA 3.0 Themed routes/Projects/Stories (2022). Retrieved from http://geca.imati.cnr.it/sub_pages.php?db_name=Geca3_0&language=ENG&view=PPS&subdata_code=&sub_voice=&voice_code=LST-PPS&fcode=SHOW

IFLA, ISBD International Standard Bibliographic Description Consolidated Edition (2011). Retrieved from https://www.ifla.org/wp-content/uploads/2019/05/assets/cataloguing/isbd/isbd-cons_20110321.pdf

IFLA UNIMARC Strategic Programme, & Hopkinson, A. (2008). *UNIMARC Manual – Bibliographic Format, 3rd ed.* Munich: De Gruyter Saur.

International Council on Archives, ISAAR (CPF): International Standard Archival Authority Record for Corporate Bodies, Persons and Families, 2nd ed. (2003). Retrieved from https://www.ica.org/sites/default/files/CBPS_Guidelines_ISAAR_Second-edition_EN.pdf

International Council on Archives, ISAD (G): General International Standard Archival Description, 2nd ed. (1999). Retrieved from https://www.ica.org/sites/default/files/CBPS_2000_Guidelines_ISAD%28G%29_Second-edition_EN.pdf

Istituto Centrale per il Catalogo e la Documentazione (2022). Retrieved from http://www.iccd.beniculturali.it/

Jakšić, M. (2004). Mapping of bibliographical standards into XML. *Software – Practice and Experience, 34*(11), 1051-1064. doi:10.1002/spe.603

Kolokytha, O., & Rozgonyi, K. (2021). From social distancing to digital un-distancing: The covid-19 pandemic and new challenges for digital policy in the cultural and audiovisual sectors. *Journal of Digital Media and Policy, 12*(1), 177-184. doi:10.1386/jdmp_00054_7

MARC21 Format for Bibliographic Data, Library of Congress, 32nd edition (2021). Retrieved from https://www.loc.gov/marc/bibliographic/

Museo Galileo Istituto e Museo di Storia della Scienza (2022). Retrieved from https://www.museogalileo.it/en/

Nanetti, A., & Benvenuti, D. (2021). Engineering Historical Memory and the Interactive Exploration of Archival Documents: The Online Application for Pope Gregory X's Privilege for the Monastic Community of Mount Sinai (1274) as a Prototype. *Umanistica Digitale, 10*(1), 325-357, doi:10.6092/issn.2532-8816/12567

Society of American Archivists, Encoded Archival Description Tag Library Version EAD3 1.1.1 (2019). Retrieved from https://loc.gov/ead/EAD3taglib/tl_ead3.pdf

Sweetser, M., & Orchard, A. A. A. (2019). Are We Coming Together? the Archival Descriptive Landscape and the Roles of Archivist and Cataloger. *American Archivist, 82*(2), 331-380, doi:10.17723/aarc-82-02-18

Turbanti, S., (2021). Recensione: A. Campagnolo. 2020. Book conservation and digitalization: the challenges of dialogue and collaboration, ARC Humanities Press. *Umanistica Digitale, 10(1)*, 417-421, doi:10.6092/issn.2532-8816/13438

UNIMARC to MARC21 Conversion Specifications, Version 3.0 (2001). Retrieved from https://www.loc.gov/marc/unimarctomarc21.html

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

IMPLEMENTING PEER ASSESSMENT IN A UNIVERSITY CONTEXT THROUGH THE USE OF A VIRTUAL PLATFORM: A PILOT EXPERIENCE

Mara Valente, University of Roma Tre, Italy

Abstract

The present contribution aims to show the first results of a pilot activity carried out in the university context to explore the peer assessment process among students in teacher training through the use of an online platform. The goal is to analyze the influence of this process in supporting the students in the development of their soft and digital skills and to examine the benefit of peer review in terms of self-reflection and self-assessment on tasks performed. The research was undertaken within the workshop of educational measurement at the Faculty of Primary Education - University of Modena and Reggio Emilia and 46 students enrolled in the fourth academic year attended. In the first two meetings, the students were asked to work in small groups (in pairs) to realize an authentic task and the related evaluation rubric. The focus of the third meeting was on the peer review of the works and the related discussion on the feedback given by colleagues. Educational activities, learning and assessment tools, and the online platform to review and share feedback are described. The collected data analysis is in progress: the first results are shown and discussed in the present contribution.

Keywords:

Peer assessment; assessment for learning; Peergrade platform; peer evaluation.

Introduction

After the advent of the SARS Covid-19 pandemic, educational institutions have been called upon to redesign curricula and learning environments also using digital technologies (Secundo et al., 2021). Indeed, digital competence is one of the eight skills that European citizens should master by the end of compulsory schooling from a lifelong learning perspective (Gonzales Vazquez et al., 2019). The acquisition of digital skills does not only result from the ability to use digital tools: digital technologies evolve and change rapidly, so mastering digital skills mean above all being able to approach the use of new digital tools in a flexible way (Poce, 2015). Furthermore, the new teaching styles suggest an always greater focus on placing the student at the center of the teaching/learning process, aiming for strategies and methodologies that promote their engagement and active participation also using technology, thus creating new learning environments. In this regard, Peer Assessment is recognized as one of the most effective strategies. This kind of assessment is meant to support students in planning their learning, identifying their strengths and weaknesses, finding areas for corrective interventions, and developing metacognitive and other transferable skills on a personal and professional level (Boud, 1990; Brown et al., 1994; Topping 1998). Topping (1998) has defined peer assessment as «a system in which individuals consider the quantity, level, value, quality or success of the learning products or outcomes of peers of the same level». Kollar e Fischer (2010) argue that peer assessment is “an important element” of “a more participatory learning culture” that helps “the design of learning environments”, as well as being “basically a collaborative activity occurring between at least two peers” (Kollar et al., 2010).

Giving students the possibility to take an active part in their assessment alters the balance between teacher and learner and encourages appropriate control over their learning, since, as stated by Vickerman (2009), peer interaction of any kind engages students in developing their learning, not only from an academic point of view but also from a cognitive and emotional one (Vickerman 2009). In Bloxham and Boyd 2007’s study, where the peer assessment in a university context is examined, a range of positive aspects regarding students taking part in the assessment process was identified. According to the authors, peer assessment supports learners in: realizing the academic standards of the course; understanding in detail the assessment criteria and how they are related to student's performance; realizing alternative approaches to academic tasks; developing the ability to express

judgments and justify their point of view; promoting the ability to give constructive feedback to peers; bringing them closer to autonomous learning by encouraging their ability to monitor their own progress, rather than rely on others to do so (Bloxham and Boyd, 2007). Furthermore, Falchikov (1986) underlines how the importance to adopt peer assessment strategies is inherent in their ability to encourage the stimulation of transversal skills. Despite the international educational research encourages and promotes the adoption of peer assessment strategies, the situation in Italy is still too oriented to the traditional assessment forms, especially if we consider the university context, where the assessment of individual learning seems to be an end in itself. University students are often only focused on obtaining the degree, disregarding the importance of the formative processes. Indeed, especially in the university context, the assessment aims to certify and quantify learning, often without emphasizing processes that should instead be aimed at guiding and supporting learning, triggering what in the Anglo-Saxon environment is referred to as *Assessment for Learning* (Sambell et al. 2013; Grion et al. 2017). Assessment "for learning" has a high formative character, since the collected information is also employed to shape teaching to the real educational needs of students and their learning styles, modifying activities according to what has been observed and from what can be enhanced (MIUR, 2020). Moreover, *Assessment for Learning* encourages self-reflection and self-assessment forms, that can be spent in various areas of everyday life, including *lifelong learning*. Assessing learning does not only verify mnemonically stored knowledge, but it is also essential to identify and promote the activated mechanisms that concern the stimulation of «critical thinking, problem-solving, metacognition, efficiency in testing, collaboration, reasoning, and lifelong learning competencies» (Arter and Bond,1996). Only in such a way can assessment be intended as assigning and/or identifying the value of learning within a framework of meaning, which contributes to a real improvement, growth, and integral development of the person (Tessaro, 2014).

A Workshop to experiment peer assessment: a pilot experience

Given the above theoretical premises, in order to promote and apply in the university context the practice of peer assessment and peer feedback, at the end of May 2022, educational practice strategies, aimed at fostering peer assessment as part of educational measurement Workshop, planned for the 4° year of the degree course in Primary Education at the University of Modena and Reggio Emilia, were put into place. The decision to create a workshop foreseeing peer assessment purposes and feedback comparing is related to several motivations:

1. to promote and implement assessment practices not yet widely used in an academic context, more justified by the fact that the workshop is aimed at future preschool and primary school teachers who will be engaged in assessment processes daily.
2. To test the impact that the adoption of such methodologies has in terms of self-reflection and self-assessment and the solicitation of cross competencies in students taking part in the workshop.

Peer assessment contributes to meaningful learning and the solicitation of soft skills (Lynch, et al. 2012; Sluijsmans et al. 2002; Poon et al. 2009; Foschi et al., 2019). To give students, future teachers now in training, the opportunity to experience such assessment strategies is address also to the opportunity of personally experiencing such educational practices and hopefully make their potential be appreciated for possible use in the classrooms they are going to teach in the future.

The research context

The overall main objectives of the educational measurement Workshop were to provide the participants with the fundamentals to be able to use the tools adequately and independently for the assessment and self-assessment of the learning acquired, to implement and improve their skills, develop metacognitive skills, especially regarding peer assessment.
The activities involved 46 students (44 females and 2 males). The workshop lasted twelve hours and was held entirely in person.
The activities took place over three different meetings and included:

- 4 hours dedicated to the theoretical framework of the concept of competence and its evaluation; paired implementation of an authentic task[1].
- 4 hours focused on the introduction of the new Italian assessment for primary school; pairwise design of an assessment rubric, which is an integral part of the authentic task[1].
- 4 hours dedicated to peer evaluation, giving feedback using the *Peergrade* platform; filling in the questionnaire[9].

After the first two meetings devoted to the development of an authentic task and its evaluation rubric, the third and final meeting was dedicated to the peer assessment process and the exchange of feedback after the peer review phase. Students were invited to upload their assignments onto the *Peergrade* platform[10]; the platform automatically and anonymously distributed two assignments to each pair of students; they read and reviewed their colleagues' assignments by filling in a specific assessment rubric, consisting of multiple-choice and open-ended questions. Once the revision process was completed, the platform sent the collected reviews to the students, allowing them to read the responses and, if necessary, send feedback to the reviewers on the assessments they had received. At the end of the peer review and feedback process, the students were asked to complete a questionnaire in order to express their perceptions of the peer review activity and the transversal competencies it solicited.
All the proposed activities were carried out in pairs; the pairs were formed spontaneously during the first meeting and continued to work together during the second and third meetings. Pair work was aimed at soliciting collaboration, communication, and critical thinking skills. From several studies in the field, it is evident how collaboration is increasingly understood as an important goal of education in general (Poce, 2018). Griffin et al. (2015) consider it as the «ability to work together towards a common goal» and Kuhn again in 2015 defines it as a process that leads to the effective realisation of desired individual and group outcomes. Vygotskij himself founded many of his well-known theories on collaborative learning by emphasising the fundamental significance of the social role of education: collaborative activities facilitate learning in the zone of proximal development, enabling the internalisation of theories and concepts, in the process in which the individual also assimilates and learns through the support of the other (Vygotskij, 1931).

The *Peergrade* platform

Peergrade[1] is an online platform that was created to improve peer-review, it has multiple functions, and it has a structure designed to encourage discussion and dialogue between evaluators and evaluated in order to guide learning profitably. The platform allows teachers to freely use different types of tasks according to the goals they set for the students; to select the digital format and the characteristic of the task they have to share; whether to create a customized evaluation rubric for the peer review or to use those available online already made accessible by other teachers; to choose whether to allow an individual or group review; to select the number of tasks to be assigned to each evaluator. Teachers also can constantly monitor the activities carried out by their students thanks to a general live overview.
During the evaluation phase, in addition to filling in the rubric, students can use the “Flags” option to keep in mind specific feedback issued by colleagues and request more information on the matter.
Peergrade also encourages evaluators to express their impressions of the feedback received; they can express the usefulness of the feedback received through five descriptors and, finally, they are allowed to comment on final marks through a space reserved for free text.
The feedback release phase is certainly the one that makes students focus most on the assessments received and that gives motivated and accurate comments, triggering processes of reflection, self-reflection, and critical processing. The platform also provides the peer assessment process to be first oriented to evaluating the work of colleagues and only later to self-evaluate their own and release feedback. This process is in line with the indications coming from research in the field (Nicol et al., 2014) which highlights that: students learn more through giving feedback on peers’ work, than by getting feedback from peers.

[9] Students worked in pairs on the proposed activities; the pairs formed during the first phase were the same throughout the entire workshop.
[10] https://www.peergrade.io/

Data collection and data analysis

The structure of the peer assessment activity questionnaire

After the review of the papers and the feedback using the virtual platform, the students were asked to reflect on their experience by filling in a questionnaire. This opens with questions about age and gender. The first section focused on assessing the knowledge gained and learning methods on peer assessment. Students, using a Likert scale from 1 to 5, expressed their thoughts on the following points:

1. I learned what I expected from this activity.
2. The learning was progressive;
3. I immediately understood what I had to do.
4. Some information was taken for granted without appropriate explanations.
5. I needed more information about some points.
6. The activity aroused my curiosity, and I would like to explore some topics.

Then, the students were asked to give a score from 1 to 10 on the peer assessment experience.
The next section was focused on the perceptions about technology and the *Peergrade* platform used in the activity. Thanks to a Likert scale from 1 to 5, the students gave their opinions on growing motivation and participation, cooperative and participatory education methods, confidence with digital tools, educational improvements, use of new e-learning tools and platforms, and easy sharing of materials.
The last section was reserved for reflection on the perception concerning the skills solicited by the peer review activity. By using a scale from 1 to 5, the students expressed their opinion on Creativity, Innovation, Communication, Critical Thinking, Problem-solving, Working memory, Attitude to research, and Collaboration. The questionnaire submitted to the students was created by the undersigned for the purposes of this research.

Some results: the evaluation questionnaire

In this section, the results from the questionnaire filled in by the students after their experience and the feedback about the benefit of peer-reviewing are presented and commented on.
45 students attended the questionnaire (43=F; 2=M): the students were enrolled in the fourth year of the Faculty of the Primary Education Science at the University of Modena and Reggio Emilia and their average age was 27 years old. The average of the results related to the perception of the knowledge gained by students shows that the student's expectations were almost completely expected (M=4.33/5; std. dev.=,564), learning was perceived as progressive (M= 4.44/5; std. dev.=,693) and the performance of the activity was understood easily. In fact, almost all students expressed an average score of 4 out of 5 based on the Likert scale (M= 4.31/5 std. dev.=,668).
By following a scale from 1 to 5 (1= nothing; 5= a lot of things), the students were asked if some information was taken for granted without appropriate explanations. The average score was 1.82 out of 5: this confirms a good understanding of the information given. By following the same assessment method, the students were asked if they would prefer more information and the score was M= 2.27 out of 5, which means that the explanations given on the activity were considered exhaustive by students and this represented support for the performance of it.
The positive results emerging from the analysis of the first section of the questionnaire are also confirmed in the last question in which the students state that they were so interested in the activity that they wanted to investigate further topics after the workshop (M= 4.13 out of 5; std. dev.=,968) (Fig. 1). This last result is encouraging both for any further progress and for the benefits arising from the study, which may be performed by the students in their classes.

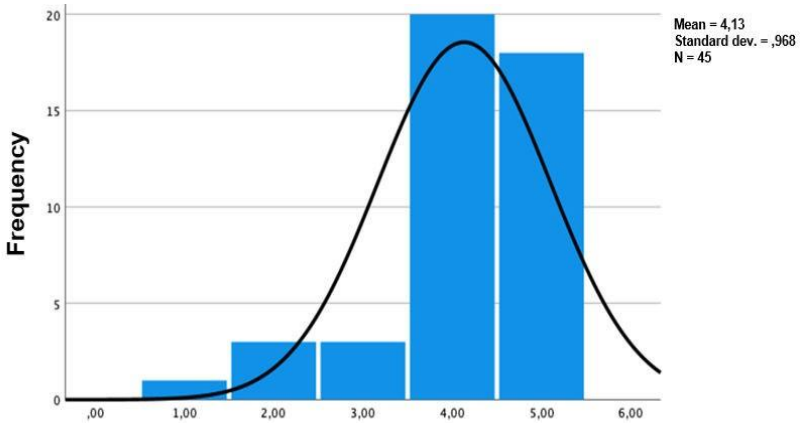

Figure 1. The activity aroused my curiosity, and I would like to explore some topics. (Likert scale from 1= nothing to 5= a lot of things)

The average score resulting from the peer assessment experience keeps confirming the positive tendency reported in the first part of the questionnaire. In fact, the average score was 8.33 out of 10.

By analyzing the second section on the *Peergrade* platform use and its influence on certain aspects related to the collaborative education methods associated with technology, it is possible to notice, by taking into consideration the Likert scale (1: no incentive – 5: highest incentive), that the average score of the growing motivation and participation of the students is 4.09 out of 5 (Fig. 2). This is a significant result that confirms what specialist scientific research underline. Peer assessment combined with critical use of technological tools increases motivation in learning and tends to create high levels of participation.

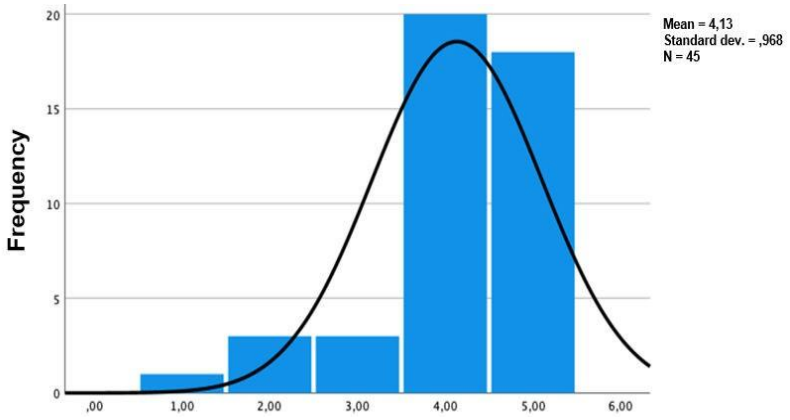

Figure 2. Growth in motivation due to students' use of the Peergrade platform for peer assessment activities

The data on the solicitations triggered by the peer review activity on the *Peergrade* platform show that it encouraged forms of collaborative learning by obtaining an average of 4.47 out of 5 points. The online activity also recorded a perceived improvement in the quality of didactics by scoring 4.11 out of 5. The student's familiarity with these technological tools confirmed positive values with an average of 3.96 on 5 as well as the prompting in using new tools for e-learning (M= 4.11/5 std. dev.=,885). Furthermore, the activity performed on *Peergrade* supported the sharing of materials among students gaining an average of 4.33 out of 5.

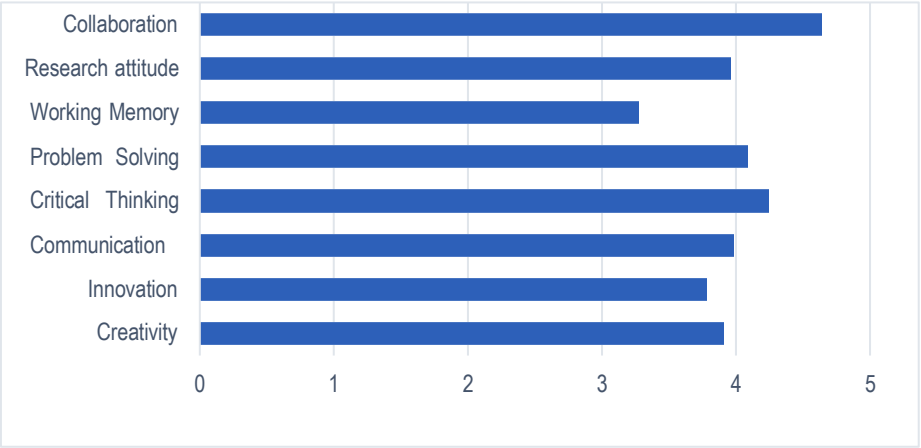

Figure 3. Competencies solicited by the peer assessment activity

In the last section of the questionnaire, which was aimed at measuring the level of the student's perception of the soft skills stimulated by the peer review activity (Fig.3) it is possible to notice that the most triggered competencies were Collaboration (M= 4.64/5; std. dev.=,609) and Critical Thinking (M= 4.24/5; std. dev.=,857). The work, which was performed in pairs, solicited collaboration among students, triggering comparisons, different points of view, teamwork to reach shared goals, respect, active participation, and support among colleagues. Critical Thinking skill is also encouraged by the peer assessment activity, which involved the students in the processes of inferences, links among several information, self-correction, conceptualization, good speaking, and skill in objective reasoning and assessments.

The remaining competencies analyzed are all prompt enough; the Working Memory was the only one to have gained an average value lower than the others (M= 3.27/5).

By examining the correlations among the benchmarks in the questionnaire, some interesting results are reported in the correlation between the growing personal motivation related to the collaborative education methods by using *Peergrade* and the peer review activity (r=,427; p=,001). The use of new tools in e-learning activities appears to be correlated also to the solicitation of Creativity (r=,461; p=,001) and Collaboration (r=,413; p=,005) and thus confirms the results from the research in the field.

Another interesting result to focus on is Collaboration skill which is correlated to the improvement of the quality of the education methods related to the peer review activity on the *Peergrade* platform (r=,600; p <,001).

Furthermore, the results show that Critical Thinking competence appears connected to the Peergrade platform (r=,563; p <,001). The abilities to reason critically, make inferences, and connect information are correlated with the use of a new digital tool for peer assessment, leading to a positive stimulation of both Critical Thinking and digital skills in the students.

Concerning the opinions that have been expressed on the usefulness of the feedback received from the classmates after the peer review activity, 42 students answered the question extremely positively. Out of a maximum of 5 attributable points, the average of the responses recorded a score of 4.43 (dv=,831), confirming the positive trend found in general regarding the peer assessment experience.

Conclusions

The pilot activity illustrated in this contribution aims to describe the adoption of peer assessment, conceived as an educational strategy to foster the development of transversal and digital skills and processes of self-reflection and self-evaluation, in a university context in order to disseminate good practices that are still not widespread in Italy, especially in the university context.

The Educational measurement Workshop at the degree course in Primary Education held in May 2022 involved 46 learners who took part in three meetings aimed at creating an authentic task and its evaluation rubric, which were then peer-reviewed and compared through feedback from the evaluated. At the end of the experience, a questionnaire was administered to survey participants' perceptions of the peer assessment activity, the soft skills it solicited, and to register impressions regarding the conduct of the peer review on the *Peergrade* platform and the release of feedback.

The data show a positive reaction of the students to the proposed activity, which, as revealed in classroom discussions, was being experienced by them for the first time. Expectations were broadly respected (M= 4.33/5), learning was gradual (M= 4.44/5) and the information received about the activity was considered comprehensive (M= 4.31/5), students were very interested in what was done in the classroom with the intention of pursuing the strategy further (M= 4.13 out of 5). The data on the solicitations triggered by the peer review activity on the Peergrade platform show that it solicited forms of collaborative learning, scoring an average of 4.47 out of five points; the conduct of the online activity also registered a perceived improvement in the quality of teaching by obtaining 4.11 out of five points. Encouraging results also come from the questions regarding perceptions of the skills solicited by the activity: among all of them, Collaboration (M= 4.64/5) and Critical Thinking (M= 4.24/5) scored highest; the least stimulated, according to the students' opinion, turns out to be Working Memory (M= 3.27/5). Positive feedback is also evident from the summaries of opinions expressed regarding the usefulness of peer review and the release of feedback from the evaluated.

These findings, which are preliminary in nature and not generalisable, provide an initial methodological and pedagogical overview regarding the application of peer assessment in a university context using a digital tool. Compared to what has been put in place, the study has room for improvement. Students attending different course years, for example, could be involved in the activities to facilitate objective evaluations and extend the number of participants. A larger number of students involved and over a longer period, in fact, could be useful in order to more specifically analyze the data regarding the actual effectiveness of peer assessment in the university context and ascertain its relative impact in terms of soliciting soft and digital skills.

References

Arter, J. A., & Bond, L. (1996), Why is assessment changing. In R. E. Blum, & J. A. Arter (Eds.), *A handbook for student performance assessment in an era of restructuring*, (I3: 1-4), Alexandria, VA: Association for Supervision and Curriculum Development.

Bloxham, S., & Boyd, P. (2007). Developing Effective Assessment in Higher Education: A practical guide. Berkshire: Open University Press.

Boud D., Molloy E. (2013). Feedback in Higher and Professional Education. Understanding it and doing it well. Abingdon: Routledge.

Brookhart S.B. (2007). Expanding views about formative classroom assessment: a review of the literature. In J. H. McMillan (Ed.), Formative class- room assessment: Theory into practice. New York: Teachers College Press.

Brown, S., Rust, C. & Gibbs, G., (1994). Strategies for Diversifying Assessment in Higher Education. Oxford: Oxford Centre for Staff Development.

Foschi, L.C., Cecchinato, G., & Say, F. (2019). Quis iudicabit ipsos iudices? Analisi dello sviluppo di competenze in un percorso di formazione per insegnanti tramite la valutazione tra pari e l'autovalutazione. *Italian Journal of Educational Technology*, 27(1), 49-64. doi: 10.17471/2499-4324/101

Grion V., Serbati A., Tino C., & Nicol D. (2017). Ripensare la teoria della valutazione e dell'apprendimento all'università: un modello per implementare pratiche di peer review. *Giornale Italiano della Ricerca Educativa*, X (19), 209-229.

Grion V., Tino C. (2018). Verso una "valutazione sostenibile" all'università: percezioni di efficacia dei processi di dare e ricevere feedback fra pari. *Life-long Lifewide Learning*, 31, 38-55.

Kearney, S. (2013). Improving engagement: the use of "Authentic self- and peer-assessment for learning" to enhance the student learning experience. *Assessment & Evaluation in Higher Education*, 38(7), 875-891.

Kollar, I., & Fischer, F. (2010). Peer assessment as collaborative learning: A cognitive perspective. *Learning and Instruction*, 20(4), 344-348.

Lynch, R., McNamara, P. M., & Seery, N. (2012). Promoting deep learning in a teacher education programme through self- and peer-assessment and feedback. *European Journal of Teacher Education*, 35(2), 179-197. doi: 10.1080/02619768.2011.643396

Poce, A. (2015). Tecnologia critica, Creatività e Didattica della Scienza. Milano: Franco Angeli.

Sambell K., McDowell L., Montgomery C. (2012). Assessment for learning in higher education. Abington: Routledge.

Secundo, G., & Mele, G., & Del Vecchio, P., & Elia, G., & Margherita, A., & Ndou, V. (2021). Threat or opportunity? A case study of digital-enabled redesign of entrepreneurship education in the COVID-19 emergency. Technological Forecasting and Social Change. 166. 120565. 10.1016/j.techfore.2020.120565

Sluijsmans, D. M. A., Brand-Gruwel, S., & van Merriënboer, J. J. G. (2002). Peer assessment training in teacher education: Effects on performance and perceptions. *Assessment and Evaluation in Higher Education*, 27(5), 443-454. doi: 10.1080/0260293022000009311

Tessaro, F. (2014). Compiti autentici o prove di realtà? *Formazione & Insegnamento*, XII (3), 77-88. doi: 107346/-fei-XII-03-14_07

Topping, K. (2017). Peer Assessment: Learning by Judging and Discussing the Work of Other Learners. *Interdisciplinary Education and Psychology*, 1(1), 1-17.

Topping, K.J. (1998). Peer Assessment between Students in Colleges and Universities. *Review of Educational Research*, 68(3), 249-276.

Vickerman, P. (2009). Student perspectives on formative peer assessment: an attempt to deepen learning? *Assessment & Evaluation in Higher Education*, 34(2), 221-230.

Wiliam, D. (2011). What is assessment for learning? *Studies in Educational Evaluation*, 37, 3-14.

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

THE ADOPTION FACTORS OF EDUCATIONAL HUMANOID ROBOTS: THE CASE OF CROATIAN SECONDARY SCHOOL TEACHERS

Snježana Babić, Faculty of Informatics, Juraj Dobrila University of Pula, Croatia
Monika Lenić, Elementary School Vrbani, Croatia
Darko Etinger, Faculty of Informatics, Juraj Dobrila University of Pula, Croatia

Abstract

Humanoid robots are, to an increasing extent, being used in education. Due to the sensors, actuators, cameras, speakers, and special programs that are the leading equipment of most educational humanoid robots, teachers are enabled to create a more personalized learning environment, which can improve the quality of teaching and increase the involvement of pupils in the teaching process. Implementing educational humanoid robots in classes depends on teachers' acceptance of this innovative technology. This study investigated the perception of secondary school teachers on the benefits and challenges of using educational humanoid robots in their teaching processes as factors that can influence their adoption of this innovative technology. In this regard, a survey was conducted among 154 Croatian high school teachers, almost all of whom were not users of educational humanoid robots in the teaching process. The results of the study conducted in this paper can contribute to understanding the adoption factors of educational humanoid robots by secondary school teachers and develop strategies for implementing this innovative educational technology.

Keywords:

Educational humanoid robots, adoption, benefits, challenges, secondary teachers, Croatian

Introduction

In general, humanoid robots can perform certain pre-programmed activities, communicate with humans, and receive commands from their users. From a technical point of view, this type of robot is equipped with sensors, speakers, cameras, and actuators and very often has the shape of a human body. Several categories of these robots on the market today are designed for specific areas of activity, for example, humanoid healthcare robots, social humanoid robots, and educational humanoid robots. (Choudhury et al., 2018). Today, humanoid robots with social skills have been used in different fields of education, such as foreign language education, science education, and special education (Sisman et al., 2019). As an example, Pepper and NAO are humanoid robots designed to interact with humans used in education, healthcare, and research and can perform multiple actions. Compared to other educational technologies, the key advantage of humanoid robots in teaching is their social and physical presence and individual teaching capabilities, which can improve learning outcomes (Belpaeme and Tanaka, 2021). Ekström and Pareto (2022) emphasize that educational humanoid robots are didactic tools and social actors because they can "add social interaction" to the educational environment. Implementing robotics-based activities in the teaching process can enable teachers to apply constructivism, constructionism, and inquiry-based learning that include collaboration, creative thinking and problem solving, and active learning to improve teaching and learning (Chalmers et al., 2021). Considering the complexity of implementing educational humanoid robots in classes, Mishra et al. (2021) proposed a multidisciplinary framework for the use of humanoid robots in an educational environment that integrates the following four perspectives: (1) technological (human-robot interaction); (2) pedagogical/didactic, (3) effectiveness of humanoid robots (psycho-social); (4) ethical implications of using humanoid robots. Researchers in this field have identified numerous benefits and challenges of using humanoid robots as teaching and learning assistants. The results of qualitative research conducted by Ahmad et al. (2016) show that language teachers in primary and secondary schools, after using the NAO robot, perceived that the NAO robot could be helpful in language teaching due to its ability to answer frequently asked questions in class, the

possibility of monitoring the child's memory, the ability to adapt to the child's personality and emotions in real-time, and the possibility of adapting to different cultures. The authors also concluded that a user interface design that is easy to update with new lessons would be a factor that would make it easier for teachers to use the NAO robot in the classroom. After testing the robot Pepper as a storyteller in a real context in two modalities, De Carolis et al. (2021) concluded that the synthesized voice of the robot, in combination with non-verbal behaviour, had a more positive effect on the emotional experience of children (from 8 to 9 years) and creating the impression of easier learning compared to the first modality, when a human voice narrated the story. Pepper played "only the role of a device", i.e. when the robot was a kind of audiobook. In the example of the use of the NAO robot as a teaching assistant in primary school, the results of Mubin et al. (2019) found that the children were more active in class, but there was no significant difference in test scores. Furthermore, Karakosta et al. (2019) found that the robot Kaspar positively impacted children diagnosed with autism spectrum disorder behaviours in specific domains such as communication and interaction, prompted speech, unprompted imitation, and focus/attention. According to Sisman et al. (2019), students' attitudes towards using humanoid robots in an educational environment are influenced by their perceptions of enjoyment, anxiety, and engagement. Alhashmi et al. (2021) found that teachers expressed concern and desire for ease of use of robots in class, while students expressed satisfaction with using humanoid robots as co-teachers in class. The results of the research conducted by Woo et al. (2021), in a sample of studies between 2000 and 2020 that examined social robots in classrooms, show that there is no solid evidence that social robots are more operative than human teachers. Until then, there has been very little research on ethical and safety issues. Furthermore, Fridin and Belokopytov (2014) determined that teachers' intention to use NAO robots in teaching is strongly influenced by their perceived usefulness. Therefore, as already mentioned in this paper, the results of numerous studies have shown that teachers perceive numerous benefits of using humanoid robots as assistants in learning and teaching; for example, it helps in the development of communication skills and the development of teamwork skills (Burbaite et al., 2013; Fridin and Belokopytov, 2014; Khanlari, 2015; Chevalier et al., 2016), students are more creative, it stimulates good emotions, the robot is easy to use (Fridin and Belokopytov, 2014; Reich-Stiebert and Eyssel, 2016), improves students' interpersonal skills (Khanlari, 2015), develops logical and creative thinking (Chevalier et al., 2016), robots bring added value in education, increase student activity in classes, increase student motivation (Burbaite et al., 2013; Reich-Stiebert and Eyssel, 2016), encourage innovative pedagogical practices and can facilitate the education of students who encounter difficulties during the regular curriculum (Kradolfer et al., 2014). Also, research has shown that teachers perceive significant technical, economic, and logistical challenges to introducing humanoid robots into teaching (Belpaeme and Tanaka, 2021). In this regard, as an example, teachers perceive a lack of time to start the robotic activity during the lesson, inadequate access to supporting materials, lack of technical and teaching support, and lack of technical and pedagogical knowledge (Burbaite et al., 2013; Almisis, 2013; Kradolfer et al., 2014). Based on the experience of implementing a NAO robot in an elementary school, Gaber (2021) concludes that the main challenge for implementing a NAO robot in the classroom is its cost (e.g. a NAO robot costs between 8000 and 16000 USD) and the additional cost for the professional training of the user of the educational humanoid robot. Also, the author points out that there is a need to research challenges related to the implementation of educational humanoid robots in classrooms, which relate to problems such as safety and the need for professional training of teachers. In general, the results of the research by Babić et al. (2020) showed that Croatian high school teachers' intentions to use information and communication technologies (ICT) in their teaching are influenced by their attitudes and perceptions of educational values, computer anxiety, self-efficacy, subject characteristics, previous experience with ICT, technical and pedagogical education, and use of ICT. Based on the theoretical research, it is evident that there was a justified need to conduct research in this context in different educational environments. In the continuation of the paper, the methodology of the conducted research and the key findings of the conducted research are described. In the end, the most important conclusions of this work are given. It is essential to emphasize that almost all respondents were non-users of a humanoid robot in the teaching process.

Methodology

This paper examines Croatian secondary teachers' opinions about the benefits and challenges of using humanoid robots in teaching and identifies the adoption factors. Based on a voluntary and anonymous approach, the research was conducted from May to June 2021 for the master thesis of the co-author of this paper (Lenić, 2021). The questionnaire was created using an online Google Forms questionnaire forwarded to the Croatian Facebook group “School Staff Room”, WhatsApp and Viber. Some secondary school principals distributed the questionnaire by e-

mail or posted it in virtual groups (e.g., Yammer). A new questionnaire containing 37 closed questions was created for this research. Answers to 13 questions related to adoption factors of humanoid robots are modulated on five points Likert scale (1 = completely false; 2 = mostly false; 3 = neither true nor false; 4 = mostly true; 5 = completely correct). Some items in this questionnaire have been adapted from unified theory of acceptance and use of technology - UTAUT (Venkatesh et al., 2003), then some items are defined according to the researched literature (Alimisis, 2013; Burbaite et al., 2013; Fridin and Belokopytov, 2014; Kradolfer et al., 2014; Khanlari, 2015; Chevalier et al., 2016). In this research paper, only the selected results of the conducted study (Lenić, 2021) are presented.

Results and Discussion

Participants

A total of 154 respondents (Croatian secondary school teachers) participated in the research (75.97% women and 24.03% men). Most respondents were between 31 and 40 years old (29.9%), followed by those between 41 and 50 years old (26.6%), between 51 and 60 years old (24.7%), 5.8% of them were under 30 years old, while 4.5% of them were over 60 years old. Most respondents had completed higher education (75.3%), higher vocational education (14.3%), and slightly fewer respondents (10.4%) had secondary vocational education. As for the subject area, most respondents were teachers from scientific-mathematical and professional fields (56.5%), social-humanities (19.5%), language-communication (13.6%), IT-technical occupations (6.5%), art (1.9%) and other fields (1.9%). Most respondents had between 21 and 30 years of teaching experience (28%), between 4 and 10 years (27%), between 11 and 20 years (25%), less than three years (14%), and 6% of them had 30 years or more of teaching experience. Most respondents were teachers working in vocational schools (96.02%), while 27.90% worked in grammar schools and 4.5% in other schools. The results of processing the collected data show that the most significant number of respondents never used educational robots in class (92.2%), and 90.3% of them did not attend any form of education, nor did they educate themselves on the topic of using educational humanoid robots in the teaching process. Most respondents self-assess their knowledge about using humanoid robots in the teaching process as insufficient (44.2%) and sufficient (39.6%). In comparison, 16.2% state that they know more about educational humanoid robots.

Findings

The results of the analysis of the data collected in this research on the factors of acceptance of educational humanoid robots by Croatian secondary school teachers are divided into benefits and challenges, which are shown in Figure 1 and Figure 2. A 5-point Likert scale was used to measure the items shown in the mentioned figures.

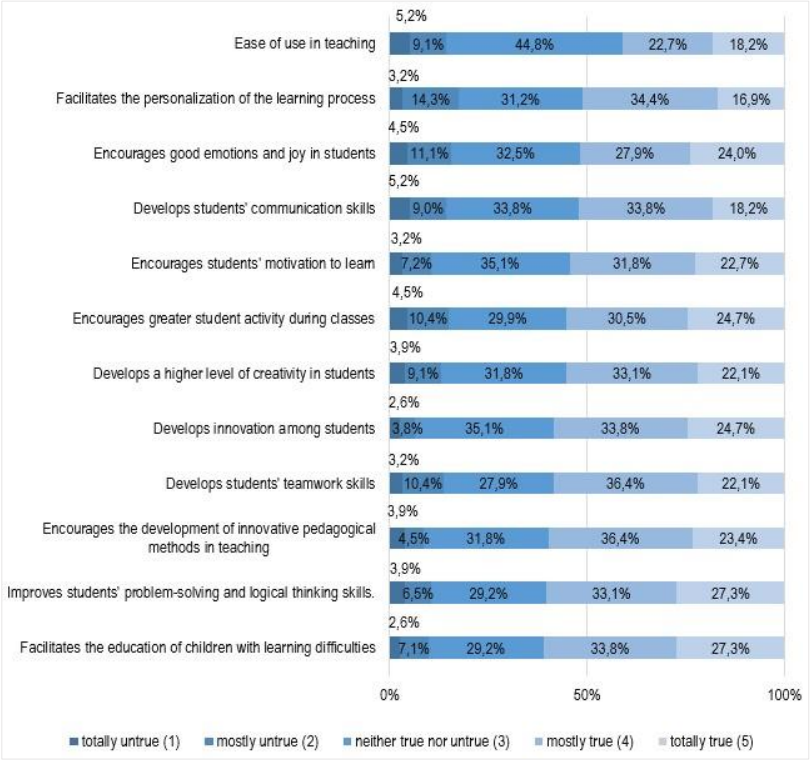

Figure 1. Respondent response percentage for the samples of Croatian secondary school teachers (N = 154) concerning their perceived benefits of educational humanoid robots (according to Lenić, 2021)

As can be seen in Figure 1, most participants (61.1%) in this study believe that the use of educational humanoid robots helps facilitate the education of children with learning disabilities, and 60.4% of them think that this innovation in teaching can improve students' problem-solving and logical thinking skills (60,4%), developing students' innovation (58.5%), and that improve pupils' teamwork skills (58.5%). Furthermore, the results show (Figure 1) that 59.8% of the participants agreed with the statement that the use of humanoid robots as teaching and learning assistants encourages the development of innovative pedagogical methods in the teaching of high school teachers. Arithmetic means (shown in Figure 1) indicate that 55, 2% of participants consider that robots can encourage more excellent student activity during classes and develops a higher level of creativity in students, and 54.5% of them think that humanoid robot as teaching and learning assistants encourage students' motivation to learn. The results of the collected data (Figure 1) showed that only half of the participants generally agreed that the use of a humanoid robot in class could develop students' communication skills (52%), facilitates the personalization of the learning process (51.3%), encourage good emotions and joy in students (51.09%). Interestingly, almost one-third of respondents could not decide in response to all the statements presented in Figure 1. Most of them, 44.8%, were undecided in response to the statement about the ease of using an educational humanoid robot. This is confirmed by the result of the arithmetic means (M=3.40, SD=1.08), which indicates that the participants were, on average undecided. In addition, from the results given in Figure 1, it is evident that the most significant number of respondents do not agree that the use of humanoid robots as assistants in teaching and learning in the classroom facilitates the personalization of the learning process (17.5%), they encourage good emotions and joy by students (15 .5%), promote more significant student activity during class (14.9%).

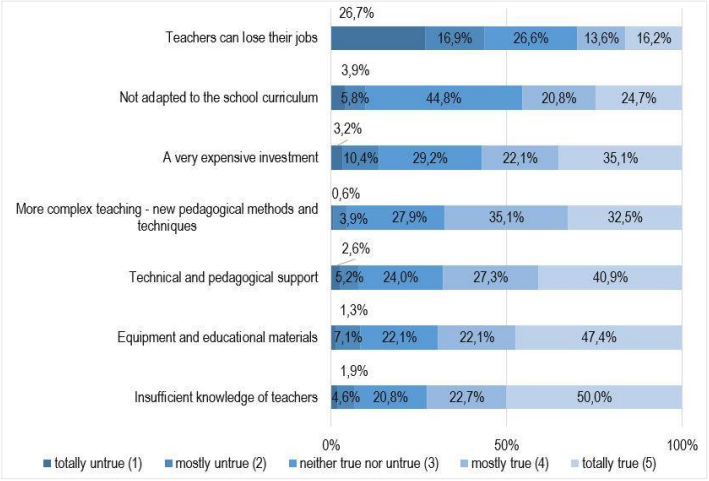

Figure 2. Respondent response percentage for the samples of Croatian secondary school teachers (N = 154) concerning their perceived challenges of educational humanoid robots (according to Lenić, 2021)

The results presented in Figure 2 show that the majority of respondents (72.7%) believe that high school teachers do not have enough knowledge to use humanoid robots in class, 69.5% of them believe that they do not have adequate equipment and educational materials and that they do not have technical and pedagogical support for the use of humanoid robots in teaching (68.2%). Also, most Croatian secondary teachers (67.6%) believe that teaching with educational robots would be more complex, considering the use of new pedagogical methods and techniques. The arithmetic mean (M=3.75, SD=1.18) shows that, on average, the respondents agree that using humanoid robots in teaching is a costly investment (57.1%). Only slightly less than half of the respondents (45.5%) agreed with the statement that the use of humanoid robots in classes "is not adapted to the school curriculum". In comparison, 44.8% of them remained undecided, and only 9.7% of the participants believed that this item was "mostly untrue" and/or "totally untrue". Then, 43.5% of respondents believe they cannot lose their jobs if humanoid robots are used as assistants in teaching and learning. In comparison, almost a third of respondents (29.8%) believe that implementing humanoid robots in education may result in losing a teaching job, and 26.6% of them were undecided (see Figure 2). On average, the Croatian high school teachers who participated in this research (M=3.54; SD=1.28) stated that they intend to use educational humanoid robots in the near future if they can do so. In this regard, 53.3% of them agreed that in the near future, they intend to use a humanoid robot as an assistant in teaching and learning. In comparison, 27.9% were undecided, and only 18.8% did not declare their intention to use a humanoid robot in their teaching.

Limitations of the Study

The limitations of this study are reflected in the number of research participants and the number of adoption factors. For the sake of generalization, research based on our findings should be carried out in the whole country (national pilot study), as well as in an international context, to determine the difference in the perception of secondary school teachers about the advantages and disadvantages of this innovative educational technology in different educational settings, especially, considering different educational areas. The number of adoption factors should be expanded, with other factors related to its cost of implementation in the educational context and secondary school teachers' competencies for using humanoid robots in teaching. Despite the limitations, the findings offer an understanding of specific benefits, challenges, and recommendations for better understanding the determinants of acceptance of humanoid robots in secondary education.

Recommendations

Our findings can help researchers as a foundation for future research and all practitioners who want to develop strategies for implementing humanoid robots in educational environments. Based on the results of this study, below are the requirements when deciding on the wider implementation of humanoid robots in Croatian secondary education:

- Pedagogical and technical training of secondary teachers
- Technical and pedagogical support
- Defining the role of the humanoid robot in the teaching process so that teachers can be sure that their jobs are not threatened
- Defining the educational values of humanoid robots so that secondary school teachers develop a positive attitude towards their use
- Extra funding would be required - educational humanoid robots, educational materials, professional training for all stakeholders
- Development of innovative pedagogical methods and techniques for implementing humanoid robots in teaching.

Conclusion

Humanoid robots as assistants in teaching and learning are innovative educational technologies in education. It takes time for them to be accepted by all stakeholders of the educational process; among them is the key role of the teacher. In this paper, the factors of adoption of educational humanoid robots in classes by Croatian high school teachers were specifically investigated, and 92.2% of them stated that they were not users of this innovation. Furthermore, 83.8% of respondents said that they do not know how to use educational humanoid robots in class. Moreover, the collected data results show that Croatian secondary school teachers perceive the advantages and challenges of using humanoid robots in teaching. For example, 61.1% of participants believe that a humanoid robot can facilitate the education of children with learning difficulties. This is consistent with the results of other studies mentioned in this paper. In addition, it should be emphasized that almost a third of Croatian high school teachers hesitated in their answers to statements related to the perception of the educational value of humanoid robots in class, which can be connected to their lack of knowledge of this innovative educational technology. The intention to use humanoid robots in courses in the near future was expressed by slightly more than half of the respondents (53.3%), while 27.9% could not decide. Finally, the research results showed a need to develop strategies for training secondary school teachers to use educational humanoid robots.

References

Ahmad, M. I., Mubin, O., & Orlando, J. (2016). Understanding behaviours and roles for social and adaptive robots in education: teacher's perspective. *Proceedings of the fourth International Conference on Human Agent interaction*, 297-304. doi:10.1145/2974804.2974829

Alhashmi, M., Mubin, O., & Baroud, R. (2021). Examining the use of robots as teacher assistants in UAE classrooms: teacher and student perspectives. *Journal of Information Technology Education: Research*, 20, 245-261. doi: 10.28945/4749

Alimisis, D. (2013). Educational robotics: Open questions and new challenges. *Themes in Science and Technology Education*, 6(1), 63-71. Retrieved from https://files.eric.ed.gov/fulltext/EJ1130924.pdf

Babić, S., Sučić, S. K., & Sinković, G. (2020). Understanding the factors that influence secondary school teachers' intention to use e-learning technologies for Teaching After the COVID-19 Pandemic. *Proceedings of the 43rd International Convention on Information, Communication and Electronic Technology* (MIPRO), 848-853. doi: 10.23919/MIPRO48935.2020.9245433

Belpaeme, T., & Tanaka, F. (2021). Social robots as educators. *In OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, 143-160. doi: 10.1787/1c3b1d56-en

Burbaite, R., Stuikys, V. i Damasevicius, R. (2013) Educational robots as collaborative learning objects for teaching Computer Science, *Proceedings of 2013 International Conference on System Science and Engineering (ICSSE)*, 211-216. doi: 10.1109/ICSSE.2013.6614661.

Chalmers, C., Keane, T., Boden, M., & Williams, M. (2022). Humanoid robots go to school. *Education and Information Technologies*, 1-19. doi: 10.1007/s10639-022-10913-z

Chevalier, M., Riedo, F., & Mondada, F. (2016). Pedagogical uses of thymio II: How do teachers perceive educational robots in formal education?. In *IEEE Robotics & Automation Magazine*, *23*(2), 16-23. doi: 10.1109/MRA.2016.2535080.

Choudhury, A., Li, H., Greene, C., & Perumalla, S. (2018). Humanoid robot-application and influence. *Appl Sci Res Rev* 5:17. doi: 10.48550/arXiv.1812.06090, Retrieved from https://www.primescholars.com/articles/humanoid-robot-application-and-influence-95412.html

De Carolis, B., D'Errico, F., & Rossano, V. (2021). Pepper as a Storyteller: Exploring the Effect of Human vs. Robot Voice on Children's Emotional Experience. *In IFIP Conference on Human-Computer Interaction* (471-480). Springer, Cham. doi: 10.1007/978-3-030-85616-8_27

Ekström, S., & Pareto, L. (2022). The dual role of humanoid robots in education: As didactic tools and social actors. *Education and Information Technologies*, 1-36. doi: 10.1007/s10639-022-11132-2

Fridin, M., Belokopytov, M. (2014). Acceptance of socially assistive humanoid robot by preschool and elementary school teachers. *Computers in Human Behavior*, *33*, 23-31. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0747563213004652

Gaber, M.A.M. (2021). Exploring the challenges and benefits of implementing humanoid robots in classrooms. Athena International Journal of Education. 01 (04), 6-11. Retrieved from https://athenaedujournal.com/uploads/issues/files/file_4078_6499_996.pdf

Karakosta, E., Dautenhahn, K., Syrdal, D. S., Wood, L. J., & Robins, B. (2019). Using the humanoid robot Kaspar in a Greek school environment to support children with Autism Spectrum Condition. Paladyn, *Journal of Behavioral Robotics*, 10(1), 298-317. doi: 10.1515/pjbr-2019-0021

Khanlari, A. (2015) Teachers' perceptions of the benefits and the challenges of integrating educational robots into primary/elementary curricula, *European Journal of Engineering Education*, 41(3), 320-330. doi: 10.1080/03043797.2015.1056106

Kradolfer, S., Dubois, S., Riedo, F., Mondada, F. i Fassa, F. (2014) Social Robotics. A Sociological Contribution to Understanding the Use of Robots in Schools: The Thymio Robot, (eds) Social Robotics. ICSR 2014. Lecture Notes in Computer Science, 8755, 217-228. Springer, Cham. doi: 10.1007/978-3-319-11973-1_22

Lenić, M. (2021). Educational robots: master thesis, Faculty of Informatics, Juraj Dobrila University of Pula, 62, Retrieved from https://repozitorij.unipu.hr/islandora/object/unipu:6055

Mishra, D., Parish, K., Lugo, R. G., & Wang, H. (2021). A framework for using humanoid robots in the school learning environment. *Electronics*, 10(6), 756. doi: 10.3390/electronics10060756

Mubin, O., Alhashmi, M., Baroud, R., & Alnajjar, F. S. (2019). Humanoid robots as teaching assistants in an Arab school. *In Proceedings of the 31st Australian Conference on Human-Computer-Interaction*, 462-466. doi: 10.1145/3369457.3369517

Reich-Stiebert, N., & Eyssel, F. (2016). Robots in the classroom: What teachers think about teaching and learning with education robots. In International conference on social robotics (671-680). Springer, Cham. doi: 10.1007/978-3-319-47437-3_66

Sisman, B., Gunay, D., & Kucuk, S. (2019). Development and validation of an educational robot attitude scale (ERAS) for secondary school students. *Interactive Learning Environments*, 27(3), 377-388. doi: 10.1080/10494820.2018.1474234

Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D. (2003). User acceptance of information technology: toward a unified view. Journal MIS Quarterly: Management Information Systems, 27(3), 425–447. doi: 10.2307/30036540

Woo, H., LeTendre, G. K., Pham-Shouse, T., & Xiong, Y. (2021). The use of social robots in classrooms: A review of field-based studies. *Educational Research Review*, 33, 100388. doi: 10.1016/j.edurev.2021.100388

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

SHE'S A WOMAN WHO UNDERSTANDS: THE WINNOVATORS PROJECT

Sonja D. Radenkovic, Union University, Belgrade Banking Academy – Faculty of Banking, Insurance and Finance, Serbia

Vladan Devedzic, University of Belgrade, FON – School of Business Administration, Serbia

Mirjana Devedzic, University of Belgrade, Faculty of Geography, Serbia

Abstract

This paper describes the WINnovators, an EU Erasmus+ 3-year project that has started in late 2021. The main objective of the project is to enable young women from vulnerable groups, women who live in isolated geographical areas and women with a low standard of living to get the quality education in different areas of STEM/STEAM aiming to enlarge their entrepreneurial skills by providing them with the e-learning content in such a domain. In this way, by using modern learning technologies and informal learning young women can define their own process of lifelong learning to compensate for what they have missed in the traditional education.

Keywords:

Informal education, disadvantaged learners, youth, entrepreneurial skills.

Introduction

According to the UN agenda for sustainable development (UN, 2015), there are 17 goals, 169 targets and 244 indicators for progress measurement integrated in the three dimensions of sustainable development: the economic, social and environmental. One of the goals – Goal 4 – refers to the improvement of quality education for all, as well as to promoting lifelong learning by using modern ICT technologies. The relevant EU ministries and EU neighbourhood countries have adopted educational development strategies to improve the educational process by applying ICT in teaching and learning for disadvantageous learners.

In addition, the recent Covid-19 pandemic has shown that many learners have less access to quality education because they live in low-income societies, as well as in societies where online learning faces difficulties related to low bandwidth and instable Internet connection. Regarding the post-pandemic investigations – e.g., (Zhu & Liu, 2020) – the world of education is moving towards online education, which means that hybrid/blended education arrangements, i.e. appropriate mixtures of online and offline teaching and learning activities best reflect the current needs of education at different levels.

On the other hand, informal education in the space of e-Learning provides some "missing links" that schools usually omit in the teaching they provide (Eshach, 2006). To disadvantaged learners, it might fulfil some of the educational needs that bring such learners closer to their peers who do not suffer from disadvantages in their education. Although this typically does not provide an absolute levelling of opportunities, it certainly opens new avenues for disadvantaged groups to better employability.

This paper presents the initiative taken within the WINnovators project (https://www.winnovators.eu/) funded by the EU Erasmus+ program in the area of education. The main objective of the WINnovators project is to enable access to a quality teaching and learning process for disadvantaged learners, specifically young women from rural areas who, for objective reasons, did not get an appropriate knowledge within the regular education at HEIs. The project aims at improving their entrepreneurship, innovation, and leadership locally.

The WINnovators Project at a Glance

WINnovators – Boosting entrepreneurial and STEM/STEAM capacity of young Women in higher education institutions for sustainable development and INnovation – is a three-year project funded by the EU Erasmus+ program in the area of capacity building in the digital, entrepreneurial, STEM / STEAM innovation and sustainability fields, for the benefit of young women in rural areas, higher education students and teachers. In this context, STEM / STEAM refers to the creation of innovative educational materials, which encourage innovation, critical thinking and problem solving using knowledge from science (S), technology (T), engineering (E), art (A) and mathematics (M) (White, 2014).

The WINnovators project targets young women between 19 and 29 years from rural areas and outskirts regions that are facing socio-economic difficulties because of the lack of experience and skills and the absence of mentors and partners with whom they can further develop their own innovative business approaches. Such young women fall into a risk category because of the lack of opportunities in their regional neighbourhoods to engage with people who can accelerate their innovation ideas locally.

The WINnovators challenge is to promote equity to such young women with economic obstacles (the women with a low standard of living, low income, and dependence on social welfare system), as well as young women with geographical obstacles (young women from remote or rural areas; women living in small islands or in peripheral regions). The Winnovators project team believes that by empowering them in their rural communities may make the difference and revise their ideas to leave to the cities and abroad. It is important for balanced development in many countries to sustain equal development in rural areas so that the role of the countryside is not only to provide for cities.

Key Elements of the WINnovators Project

A study among female entrepreneurs in the countryside has found that the majority of female entrepreneurs are 36-65 years old and only one third are younger than 35 years (Menzies, T.V. et al., 2004). An interesting finding from this study is that having children does not seem to be a constraint for women in starting their own business. The Winnovators project tries to increase opportunities for women to gain new experience and knowledge, as well as to test their own business capacity.

The main WINNovators project output will be co-development and implementation of innovative teaching and learning approaches and concrete policies for capacity development in the digital, entrepreneurial, STEM/STEAM innovation and sustainability fields, from which young women from rural areas and HEI students and educators would mutually benefit in the short and long run. Specifically, the project results are divided into four different parts that are mutually integrated (Figure 1):

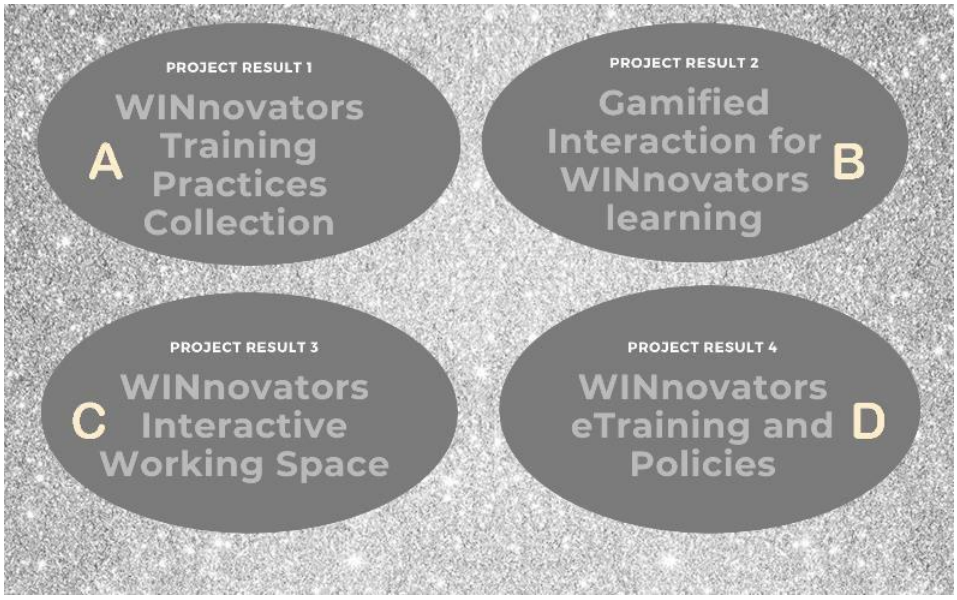

Figure 10. WINnovators project results

- *WINnovators Training Practices Collection (Figure 1A)* aims at contributing to transformation of educational practices in Higher Education, as well as at providing the students concrete instruments and experiences to act as capacity development agents in their communities and create an actual value as part of their HEI learning practices.
- *Gamified interaction for WINnovators learning (Figure 1B)* includes specific capacity building actions through the development of an educational Open Innovative Ecosystem (OIE) that is based on gamification. The gamification principles are expected to contribute to the creation of entrepreneurial, STEM/STEAM digital skills of young women at risk of marginalisation in rural and outskirts communities.
- *WINnovators Interactive Working Space (Figure 1C)* is an e-learning platform and a set of valuable learning resources for both the teachers and the students who take part in the WINnovators project. The interaction is enhanced by a gamified approach to promote STEM, innovation and entrepreneurship among students and young women involved in higher education and providing help to the targeted learners.
- *WINnovators e-Trainings and Policies (Figure 1D)* offer specific learning opportunities for young women at risk of marginalisation from rural communities and outskirts and suggests valuable measures to policy makers in order to tackle the lack of cooperation and capacity building activities between policy makers, students and businesses.

The WINnovators Gamified Web Platform

WINnovators aims at implementing new teaching and learning approaches, such as gamification, to support capacity building in the digital, entrepreneurial, STEAM and STEM fields, by especially targeting under-represented groups (such as girls and women from rural areas), thus fostering gender equality. To this end, the WINnnovators team is working on the development of a competence-based gamification system for the WINnovator web platform (Figure 2).

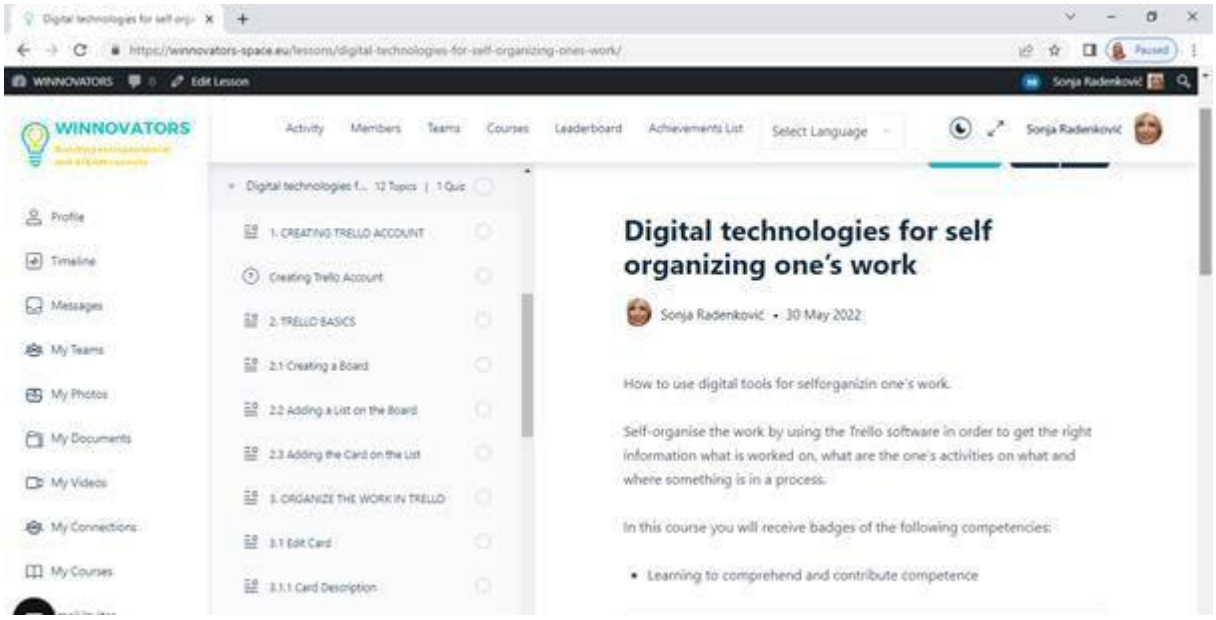

Figure 2. The WINnovators web platform

According to Domínguez et al. (2013), the use of gamification in educational settings represents a best practice that succeeds in engaging groups of people, both in higher education and among vulnerable groups of young women and motivates them to achieve their goals. In fact, it involves them at an emotional level, by increasing their competences and by helping them to develop a sense of autonomy and make progress in what they are doing. This is both an element of innovation and a booster for the development of entrepreneurial skills, which is one of the main objectives of the WINnovators project. Gamification involves adding specific game features and/or game mechanics to a non-game context to make it more motivating and thus more successful in facilitating learning.

The WINnovators gamification system introduces a badge award system (Figure 3), with each badge representing a competency from the WINnovators competence framework – a carefully worked out, detailed set of competencies. It promotes among HEI students and young women from rural communities the joint capacity and agency to develop entrepreneurial, digital innovation and sustainability-aware people. The WINnovators competence framework integrates several competency frameworks: Dig.comp 2.1, GreenComp, Sustainability competencies, Entrepreneurial competencies (Vlok, 2012), Innovation competencies and Project management competencies. The competencies that the targeted learners attain will reflect the learning activities, and teamwork interactions in the WINnovators gamified web platform that includes a set of self-study learning modules for achieving the WINnovators competences. Two learning modules have been developed so far: "STEM/STEAM entrepreneurship communities for young women" CHALLENGES and "STEM/STEAM entrepreneurship communities for young women" GENERAL LEARNING RESOURCES. The difference between CHALLENGES and GENERAL LEARNING RESOURCES modules in WINnovators is that GENERAL LEARNING RESOURCES are intended for self-studying, whereas CHALLENGES are more interactive and assessment-oriented. For accessing the learning modules, learners need the equipment such as mobile phones, Internet connection as well as access to a data collection server.

Competencies are used for developing specific badges in the WINnovators gamified web platform, which also acts as a specific assessment system in the WINnovators project. Badges will be awarded for completing self-learning activities and team interactions of the HEI students who help conduct the learning process, and young women from rural areas. There will also be badges for passing the final tests in the form of quizzes and/or individual/group projects. The ECTS credit system is not included in the process of awarding the badges from the WINnovators gamified web platform, because it is not envisioned as a formal HEI learning. Collecting badges from five different competency areas (Learning to be, Learning to value, Learning to live and work together, Learning to comprehend and contribute, and Learning to empower and lead) allows the learners to achieve three different levels - Bronze, Silver, and Gold WINnovator.

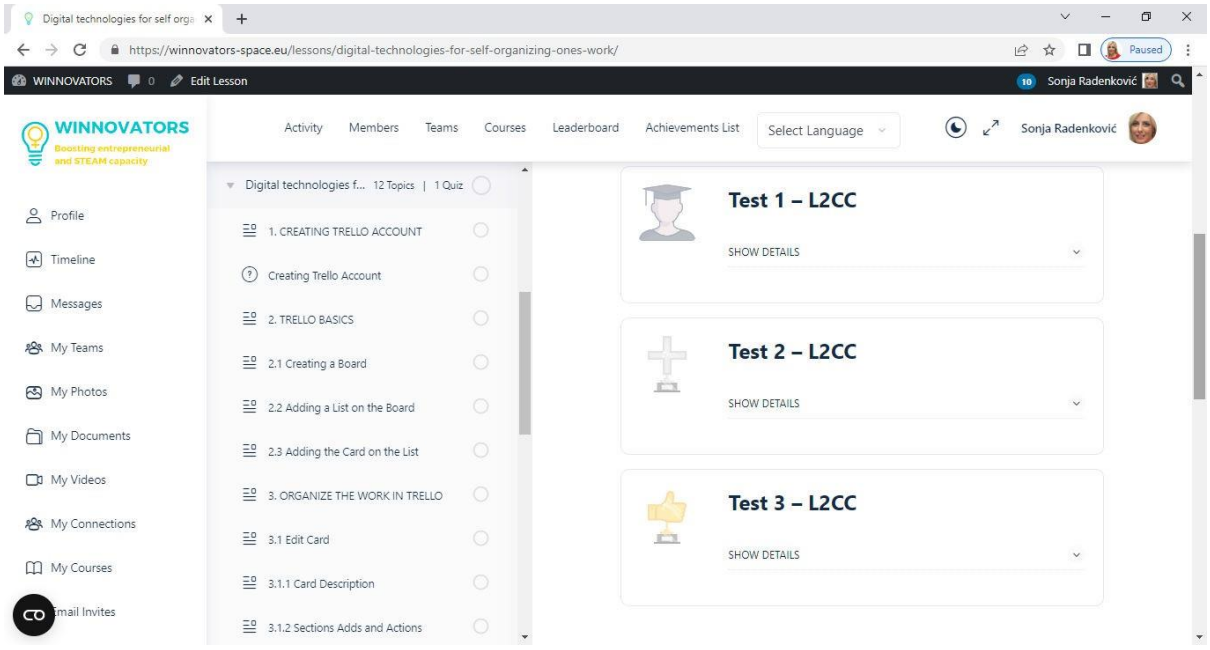

Figure 3. The WINnovators badge system

Discussion

The motivation of the WINnovators project development team in running this project is to bring interesting and important learning contents closer to learners who need them. To this end, the project provides critical skills related to using the Internet to disadvantaged young women who might not be aware of them. The skills taught in the WINnovators project are nowadays compulsory for an active and responsible digital citizen. These skills are listed among the required skills that employers are currently looking for and will be looking for in the forthcoming years. They will be useful not only for a brief period of time, but also for lifelong learning and employability (World Economic Forum 2020).

In addition, the WINnovators project wants to develop and increase entrepreneurial spirit with the targeted learners. In some cases, the innate feeling for entrepreneurship can be enough, but training young people in sustainability, finance, digital marketing, and modern AI technologies can raise their entrepreneurship to a much higher level. Informal learning through innovative e-Learning technologies can be an eye-opener for many young women in rural areas. The WINnovators project intends to introduce certification of the efforts of young women who complete the training courses developed by the project teams. Gamification elements (e.g., badges) introduce digital certificates and micro credentials that employers nowadays more and more recognize as evidence of informally acquired competences fostering employability.

The WINnovators project implicitly prepares disadvantaged women in rural areas for lifelong learning by involving them in a process of operationalizing newly acquired skills in sustainable ways. The tangible output of the project is its e-Learning platform used for storing learning materials and for enabling active learning through educational social networking activities (collaboration, group work, discussions, and the like).

An important feature of the project is the active participation of youth workers (typically HEI students) in training courses that the project runs, in preparation of learning materials, in networking activities, in dissemination of the project results, and in policy-development activities related to the targeted groups of disadvantageous young women. Involving young women in all the project activities is an advantage, since there are many similar courses on the Web that anyone can take.

Finally, the WINnovators project offers training in skills that are not just career skills but can positively affect other aspects of life like communication, healthcare, social skills, everyday activities, etc.

Conclusion

The project described in this paper targets somewhat different groups of learners and allows assessing somewhat different pedagogical contexts that share similar learning scenarios and experiences. The most important among them are related to increasing young women's employability prospects through learning informally about topics of importance for their careers and for living in modern society in general, as well as raising awareness of different kinds of knowledge, tools, technologies, and lifelong learning approaches underlying distinct aspects of living in the real world.

Note, however, that this project does not guarantee employment to young women who attend the training and complete the courses developed by the project teams. Employment, entrepreneurship, and career building are still on the young women themselves. The project acts as an enabler in developing critical skills that come useful in career building for the targeted young women (Devedzic & al., 2022).

From the pedagogical and methodological points of view, the project relies on active participation of youth workers. In the results achieved by the project so far, this decision has proven to be beneficial for the youth workers and the targeted learners. These youth workers are typically recruited from college students. They are of age close to that of the targeted learners, and presumably have a good grasp of the fields of interest to the targeted learners. Thus, they can represent a good link at the operational level (Devedzic & al., 2022).

The project is still ongoing, and there are no statistics yet related to running the training. However, initial reactions from young, disadvantaged women who have received the news about the project, as well as the informal pilot tests organized by the project teams are very encouraging.

Acknowledgement

This paper results from the authors' work on the WINnovators project funded by the Erasmus+ program of the European Commission. The European Commission support for the production of this publication does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

References

Eshach, H., (2006). Bridging in-school and out-of-school learning: Formal, non-formal, and informal education. Journal of Science Education and Technology, 16(2), pp.171–190.

Devedzic, V., Radenkovic, S., & Devedzic, M. (2022). Shine a Light – E-Learning Initiatives from Two EU Projects. In M. B. Nunes & P. Isaias (Eds.), *Proceedings of The International Conference on E-Learning 2022* (pp. 3-9). IADIS.

Domínguez, A., Saenz-de-Navarrete, J., Luis de-Marcos, L., Fernández-Sanz, L., Pagés, C., Martínez-Herráiz, J. et al. (2013). Gamifying learning experiences: Practical implications and outcomes. Computers & Education 63 (2013). Elsevier

Menzies, T.V., Diochon, M., Gasse, Y. (2004) Examining venture-related myths concerning women entrepreneurs. Journal of Developmental Entrepreneur ship, 9(2): 89–107

Zhu, X. & Liu, J., (2020). Education in and After Covid-19: Immediate Responses and Long-Term Visions. Postdigit Sci Educ 2, 695–699 (2020). https://doi.org/10.1007/s42438-020-00126-3

Vlok, A. (2012). A leadership competency profile for innovation leaders in a science-based research and innovation organization in South Africa. Procedia - Social and Behavioral Sciences. 41. 209–226. 10.1016/j.sbspro.2012.04.025.

White, D., (2014). What is STEM education and why is it important? Florida Association of Teacher Educators Journal, 14(1), pp. 1-9. Retrieved from http://www.fate1.org/journals/2014/white.pdf

World Economic Forum (2020), The Future of Jobs Report 2020. Retrieved from https://www.weforum.org/reports/the-future-of-jobs-report-2020.

United Nations (2015). Sustainable Development Goals – 2030 Agenda. Retrieved from https://unfoundation.org/

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

HYBRID SYSTEM FOR PERSONALISED TEACHING: MOODLE P

Carlo De Medio, Università degli studi di Roma TRE, Italy

Abstract

In recent years, one of the most discussed topics in the field of education is the customization of courses and content. Many intelligent systems have been developed to solve this problem. This paper aims to present the hybrid system MoodleP, which starting from the re-engineering of the Moodle_LS system and the integration with a second system for retrieving learning materials Moodle_REC implements the functions of path customization within an e-learning environment. The material recommendation system functions dedicated to teachers allows them, through an innovative user model, to obtain materials more congenial to their teaching style optimizing the subsequent learning process for students. The approach with which the system was evaluated will be presented and future developments will be discussed.

Introduction

In the growth path of adaptive and customization systems, one of the most important moments was the arrival of Web 2.0 or Dynamic Web (O'reilly 2009) where the way in which users approach content completely changes: the user goes from being a passive element, i.e. a simple reader of the web to an active one, i.e. he can interact by updating or producing material. From this point of view, there is no longer a distinction between 'author' who publishes documents and 'reader' who consults them: the central role is now the user. Moreover, in recent years, the web is changing again, leaving the floor to the Semantic Web: in this new paradigm, the focus is no longer on the user as content producer, but on the information contained in the documents or pages, making semantic links available.

Finally, it is a fact that the current web has relied on the new concept of social networking , which has been reported in various studies as a tool for sharing knowledge with e.g. in (Müller-Prothmann 2007) an in particular in (Limongelli et al. 2010, Micarelli et al. 2009, Deed and Edwards 2010, Benson et al. 2012, Nanni and Temperini 2012): this second paper presents the Moodle REC system, which uses an innovative user model that will be described in the following chapters, based on the decisions made by the community of teachers on the platform, who are able to search the most famous repositories of teaching materials and open educational resources for the materials most congenial to their teaching style, based on the idea that teachers with similar profiles will make similar decisions.

In a similar way but using a different user model the PLORS system defined in (Imran 2016) is able to recommend customized quizzes, self-assessment tests and discussion forums in addition to the learning materials. Unlike Moodle REC the user model is not based on the use of materials within the course but on the navigation information on the course and manually defined levels of expertise.

Another system based on the idea of social networking is Wiki Course Builder (Limongelli 2015), a system for constructing online teaching paths by exploiting the materials and links in Wikipedia. In addition, a community graph generated by the choices made by all teachers and easily searchable by filtering by subject area or teaching level has also been introduced.

Methodology

The tool developed from the Moodle_LS and Moodle_REC systems, i.e. MoodleP, aims to take care of the customization of pathways in both creation and use by modelling teachers and students. Starting from this central idea, the research questions are:

1. Is it possible to recommend learning materials when creating courses using a collaborative user model based on community decisions?

2. Is it possible to customize the learning path (different materials or sequence of modules) dynamically according to the students' interaction with the system?

To answer these questions, the MoodleP platform was implemented, based on the open source Learning Management System Moodle. To model the users within the platform, the Felder-Silverman Learning Style Model was used, a model with four dimensions associated with each student and each material: active/reflective, sensing/intuition, visual/verbal and sequential/global. Each learning style can take values from 11 to -11; this model is widely used as it is easy to use and update within online platforms. At platform registration, we initialize the model by means of a questionnaire developed by the authors. Each time a user performs a test in the platform, based on the results, we label the material with the user's learning styles or calculate the ecuclidean distance between the vector of the 4 learning styles associated with the user and the material.

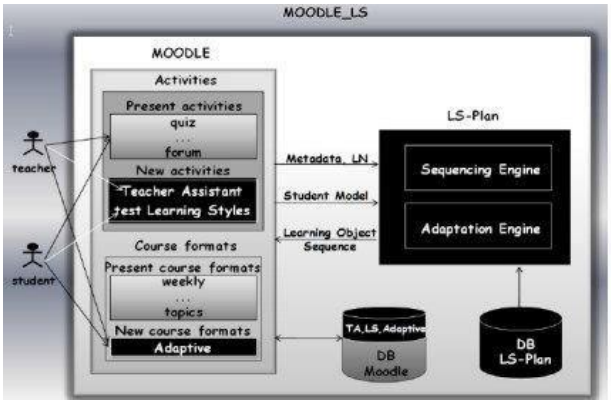

Figure 1. Moodle LS architecture

For each teaching module, there may be materials with the same learning content but with different styles. The system is able to present for each learner the material most congenial to his or her needs. In addition, we have provided a metadata module for topics that allow tagging operation on the concept defining teaching prerequisite and teaching successor in order to move from a simple linear online course to a concept map (Fig.3).

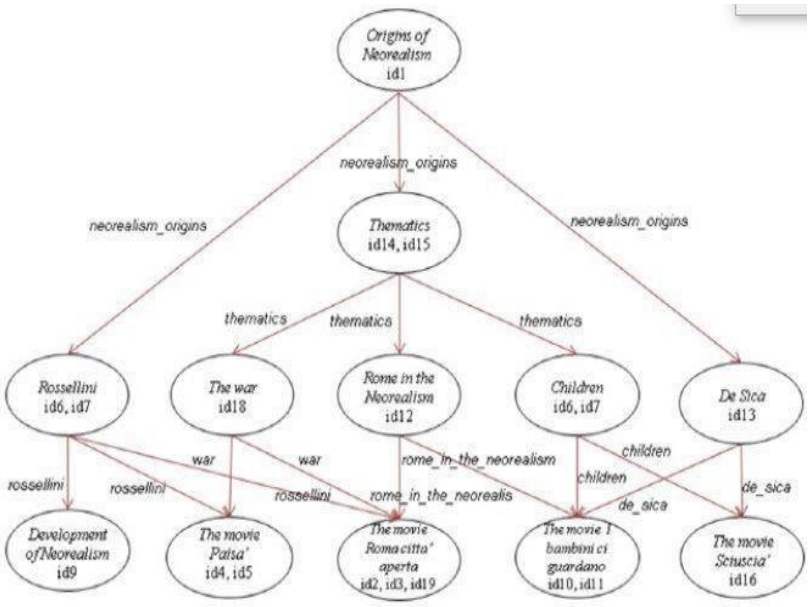

Figure 3. Course concept maps

The system via the LS_PLAN plainifier is able to reorder the course modules and in some cases eliminate some of them (recognized prior knowledge) or reintroduce some (missing prior knowledge) in order to optimize the learning process as is shown in Fig. 1. Finally, at the course creation stage, the model generated at runtime of the Moodle_REC (Fig. 2). platform was introduced: the model is represented by a vector of similarities with all the other lecturers. To generate this value each time it is used, the structures of the set of all courses created by the teacher are compared with the set of courses created by each teacher. The score is increased by one unit for each common material used; using the concept of prerequisite/successor, if a material is used in the same sequence within a course (e.g. M1 before M2 in both courses, Mi=material number i) the score will increase by 2 and so on for longer sequences (M1->M2->M3 score increases by 3)(Fig.4). This model is used to reorder the materials obtainable directly within the system via a query from the most important repositories of Learning Objects and Open Educational Resources.

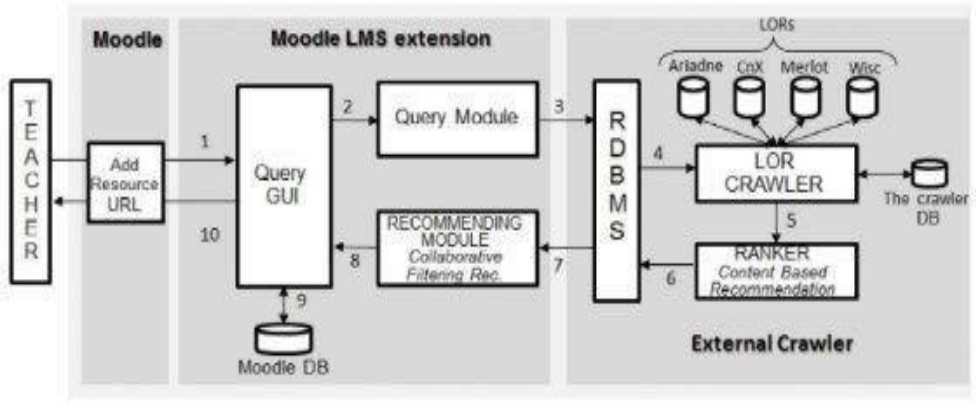

Figure 2 Moodle_REC architecture

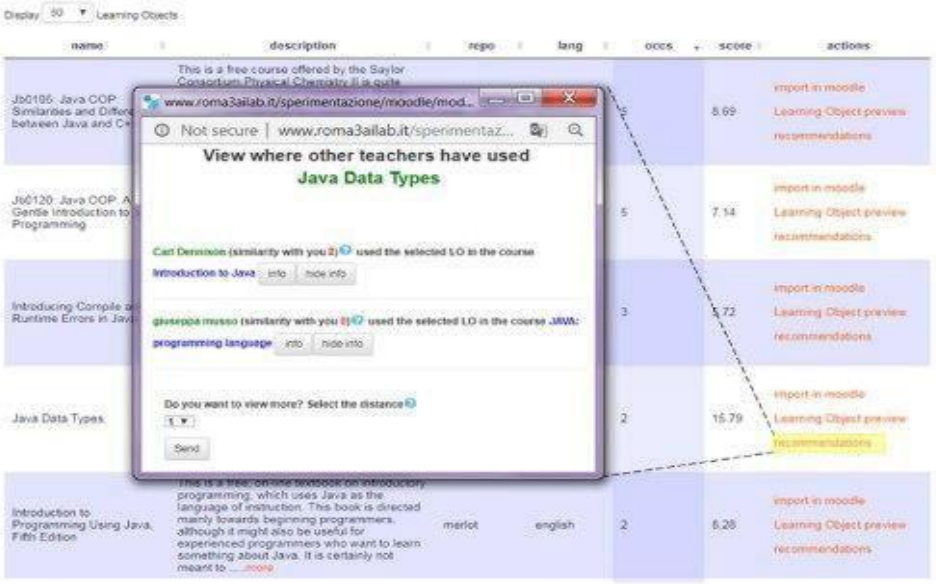

Figure 4 Moodle_REC User Interface

Results

To evaluate the system, the MoodleP system was tested with 28 university-level lecturers via a call on MIUR's SOFIA platform. The recruited lecturers were asked to create a course using the integrated material retrieval system on one of the following four macro-areas: mathematics, religion, programming or biology. Using the Moodle platform logs, the following data were collected:

- the number of new courses .
- the number of system recommendations followed/not followed,
- the number of LOs retrieved from the system,
- the distribution of LOs retrieved.

There are several methods for evaluating recommendation systems in the literature divided into two macro areas of measurement; statistical accuracy metrics (Mean Square Error (RSME), Mean Absolute Error root mean square error (RSME), Mean absolute error (MAE) and correlation) and Decision support accuracy metrics (Precision, Recall, F.Measure).

The sperimentation suffered from the well-known cold start problem in fact as shown by the curve in fig. 3 as the number of courses on the platform increased, so did the recommendations followed. The expected results were not satisfactory in this case as shown in Tab. 1; this was partly expected as to have a sufficiently large community of teachers it would be necessary to connect different instances of this platform and start a large-scale experiment, the next step in the project.

Precision	Recall	F1-measure
0.22	0.39	0.28

Table 1: The Evaluation measures of Precision, Recall and F1.measure

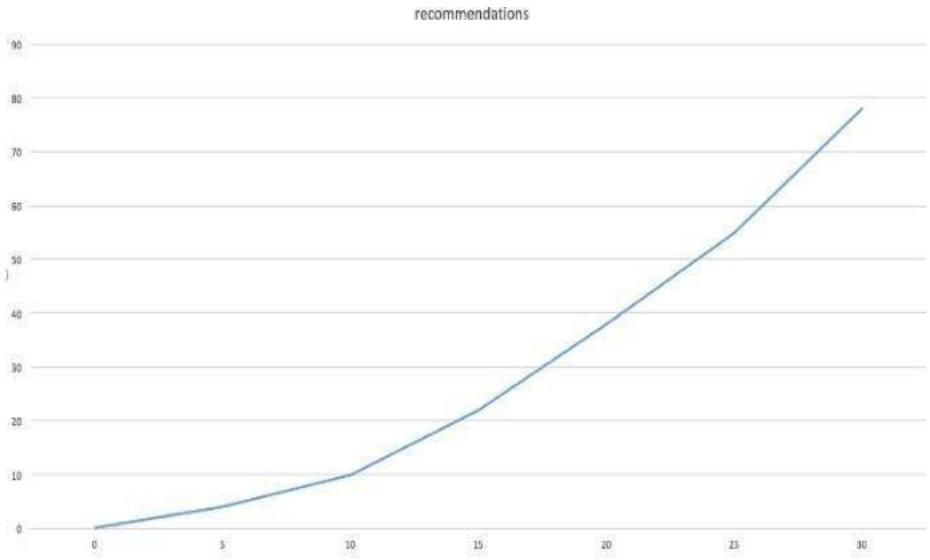

Figure 3 Results of MoodleRec use: the x-axis represents the number of courses in the system; the y-axis represents the number of recommendations followed by the teachers.

A System Usability Scale (SUS) questionnaire (K. Orfanou 2015) was used to assess usability Structured in 10-item satisfaction questionnaire was submitted:

- How much did the system help you find teaching materials?
- Were you helped by the teaching community?
- Did you use all the web archives?
- Did you use the recommendations produced by the system?
- Did you use the community functions?
- How many courses did you create?
- How long have you used the system?
- Are you satisfied with the overall use of the system?
- How satisfied are you with the courses created with the system?
- Do you think that the course creation mechanism is a good method,

The values for the answers to questions 1,3,5,7, and 9 were recorded by subtracting 1 from the value while for the missing items the value was calculated by subtracting 5 from the recorded value. Finally, the value was multiplied by 2.5 to obtain the SUS value for the evaluation. As expected in the literature a value below 50 indicates a failure while above 80 A evaluation. Moodle REC scored 70 points in the test showing promise. Finally, in order to check the consistency of the SUS questionnaire, we calculated the Cronbach's alpha, obtaining $\alpha = 0.85$.

Discussion

This work presented a hybrid platform capable of following teachers and students in the complex process of creating/using teaching materials. The system allows the users to find Learning Objects and Ores from internet and organize them in topics and courses. It also provides a graphical interface to simplify the material selection process. The course graph (concept map) allows teachers to compare, easy reuse of the materials within the

courses; also, students will be able to consult the course map and receive guidance on which modules to follow next and which materials to choose in order to optimize the learning process. In order not to introduce noise into the data (technology gap), the first trial was started with only teachers recruited via the SOFIA digital platform, so as to have teachers who had no problems with online platforms. The system, designed to optimize the teaching and learning processes within the digital teaching environment, was positively evaluated through the SUS questionnaire tool () scoring 70 points in the proposed experimentation; furthermore, the analysis of the recommendations made by the system showed a curve that grows exponentially with the number of courses (increasing population on the platform). Furthermore, the figures for accuracy P=0.22, recall R=0.39 and measurement F=0.28, although low when put in relation to the curve in Fig. 3, predict that as the number of active users on the system increases, these values increase, indicating more accurate recommendations.

References

Limongelli, C., Lombardi, M., Marani, A., Sciarrone, F., and Temperini, M., “A recommendation module to help teachers build courses through the Moodle Learning Management System”,

New Review of Hypermedia and Multimedia, vol. 22, no. 1–2, pp. 58–82, 2016. doi:10.1080/13614568.2015.1077277.

Müller-Prothmann, Tobias, Social Network Analysis: A Practical Method to Improve Knowledge Sharing (July 2, 2007). HANDS-ON KNOWLEDGE CO-CREATION AND SHARING; PRACTIVAL

METHODS AND TECHNIQUES, A. S. Kazi, L. Wohlfahrt, P. Wolf, eds., pp. 219-233, Knowledge Board, Stuttgart, 2007., Available at SSRN: https://ssrn.com/abstract=1467609 or http://dx.doi.org/10.2139/ssrn.1467609.

O'reilly, Tim. What is web 2.0. " O'Reilly Media, Inc.", 2009

Carlo De Medio, Carla Limongelli, Filippo Sciarrone, Marco Temperini, MoodleREC: A recommendation system for creating courses using the moodle e-learning platform, Computers in Human Behavior, Volume 104, 2020, 106168, ISSN 0747-5632, https://doi.org/10.1016/j.chb.2019.106168.

Felder, R.M., Silverman, L.K.: Learning and teaching styles in engineering education. Eng. Educ. 78(7), 674–681 (1988).

Imran, H., Belghis-Zadeh, M., Chang, TW. et al. PLORS: a personalized learning object recommender system. Vietnam J Comput Sci 3, 3–13 (2016). https://doi.org/10.1007/s40595-015-0049-6

C. Limongelli, F. Gasparetti and F. Sciarrone, "Wiki course builder: A system for retrieving and sequencing didactic materials from Wikipedia," 2015 International Conference on Information Technology Based Higher Education and Training (ITHET), 2015, pp. 1-6, doi: 10.1109/ITHET.2015.7218041 Schunk, D. H. (2004). *Learning theories: an educational perspective* (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

K. Orfanou, N. Tselios and C. Katsanos International Review of Research in Open and Distance Learning, 16 (2015).

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

IMMERSIVE LEARNING AND THE USE OF A CONVERSATIONAL AI APPLICATION

Jonas Bäckelin (MA. Student), Educational Technology at Linnaeus University, Sweden

Abstract

This paper investigate the usefulness of immersive learning and a conversational AI application for on-the-job training of local IT-support personnel in a Swedish municipality. The objective was to use diagnostics from participants and incorporate recorded variants approved by disciplinary experts to prevent a bottleneck effect in the competency supply chain. The design considerations to create new platforms for skills development were to solve complex issues with high-value data, to create knowledge from a realistic integrated experience and to regularly improve the answers in the knowledge repository. During the dialogue scenario local IT-support personnel was trained to discern abnormalities in workflows and processes when using our middleware platform. The data collection was used for big data analytics to extract meaningful insights, hidden patterns and unknown correlations from disciplinary experts. The conversational AI application was used to implement a competency development model for active participatory learning and the disciplinary experts got to approve recorded variants from participants to improve the answers in the knowledge repository. The conclusion was that immersive learning and the use of a conversational AI application can be used to transfer the tacit knowledge embodied in assumptions, values, judgments, and consequences from experts to novice learners. The potential of immersive learning with embodied conversational avatars was recognised, but not achieved during this study since the AI-powered dialog authoring tool had limited training data and the interaction was not seamless.

Keywords:

Immersive Learning, Conversational AI Application, On-the-job Training, Platforms for Skills Development.

Introduction

Methodological advances (i.e., micro learning, social-emotional learning, gamification, experiential learning) for competency development and the adoption of Artificial Intelligence (AI) has open new opportunities for transferring disciplinary and subject specific procedural knowledge. One competency development model for on-the-job training is conversational learning. The implementation is often done as roleplay, where the learner is trained in an imaginary situation with no drastic consequences from mistakes or failure. The conversational AI application that was used for this dialogue scenario was developed by a Swedish start-up called Fictive Reality[11]. Their approach to immersive learning is that failing is the best way to learn and knowledge retention is improved when being immersed in a virtual room while talking to an avatar.

Fictive reality is a AI-powered immersive learning experience platform (LxP) that is content independent and delivered using software as a service (SaaS). One main design features of the application is to let the content creator extract high-value data and use cases into a knowledge repository, which enable big data processing to create an AI-generated transcript for the training session. The functioning of the system is to analyse the answer and to try recognising the participants intent with fuzzy matching (Tian et. al. 2020). This will allow the AI to understand several variations from only ten examples, which sometimes is referred to as an AI-powered dialog-authoring tool. The data can come from many different sources, but this study used recoded variants from disciplinary experts or manually accepted answers from participants. Another feature of the Fictive Reality app was the possibility to deliver diagnostics that produce a rating of attitude, use of fillers, and hesitation. The application use immersive learning with embodied conversational avatars (ECA) to create a realistic integrated experience for the participants. According to Edgar Dale's (1946) *Pyramid of Learning*, only 50% of possible learning retention is achieved through passive learning and declines without the use of active learning. Finally, the Nonaka and Takeuchi's (1995) *Knowledge Spiral Model* address the notion of explicit and tacit knowledge. Their research claim

[11] Read more about the AI-powered authoring tool from Fictive Reality https://www.fictivereality.com/

that explicit knowledge is often found in shared training material or knowledge repositories, while tacit knowledge is highly personal and is only learnt through experience. Since the turnover rate of competence and skills has increased in our society, there was a need for the design to regularly improve the answers in the knowledge repository stored in the application.

Previous research related to this virtual reality learning platform has involved student projects focusing on roleplay-based training using customisable content and intelligent dialogues for developing soft skills (i.e. problem-solving, decision-making and stress management). Their development area was to improve the dialogue and realism of the conversational AI (Arnaud, 2021). Another development area is to improve the analysis of user's behaviour to give the participant feedback on how to improve things such as posture, speech, wording, eye contact and stress-levels. This was developed into a virtual coaching feedback function and can be shared with the trainer for assessment purposes. Automated AI-technology has also been used to recreate job simulations to scan and filter large quantities of job candidates without taking up time for the recruiter, which also remove potential bias during the interview (Fictive Reality, 2021). According to a pilot study called "The effectiveness of virtual reality soft skills training in the enterprise" (Eckert & Mower, 2020) there is potential to make users more efficient to act on what they've learned after training and be able to learn faster than traditional classroom training. It is also suggested that the users are more focused than during traditional e-learning exercises and become more emotionally connected to the content, which improves knowledge retention.

Rationale of this study

The training simulation aimed to develop a dialogue scenario for local IT-support personnel at schools in a Swedish municipality. If successful, the conversational AI application can become a knowledge repository where the expert knowledge set could be transferred to local IT-support personnel. This would help them to solve complex issues for end-users on executive-level (i.e., school leaders and administrators). The main objective was to use diagnostics from participants and incorporate recorded variants approved by disciplinary experts to prevent a bottleneck effect in the competency supply chain for local IT-support personnel in the participating municipality. The solution was to evaluate if a conversational AI application can be used to transfer tacit knowledge embodied in assumptions, values, judgments, and consequences from experts to novice learners. This require that the system can use big data analytics to extract meaningful insights, hidden patterns and unknown correlations from disciplinary experts. The study also involved an evaluation of the usefulness of the Fictive Reality application as a competency development model for active participatory learning and immersive learning. Finally, on-the-job training will only be attractive for the organisation if the quality of the knowledge repository is maintained over time. The research question investigated in this qualitative study was:

RQ: Can immersive learning and a conversational AI application be useful for on-the-job training of local IT-support personnel in a Swedish municipality?

The three design considerations that was tested during this study based on requirements for the competency development model was to deliver diagnostics and incorporate recorded variants that allow workers to solve complex issues with high-value data [C1], to create knowledge from a realistic integrated experience [C2] and to regularly improve the answers in the knowledge repository [C3].

Method

Design-based research (DBR) has been described by Feng Wang and Michael J. Hannafin (2005) as *"a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories"* (p.6-7). This specific dialogue scenario was a scripted training using the "Answer" mode of conversation in Fictive Reality. The local IT-support personnel [n=340] participated in a preparation course and a few of them [n=3] was then tested on questions about IT-architecture and problem solving in the developed training simulation. The dialogue scenario created for conversational learning was used with the intention to improve performance and facilitate learning. This required that the learners had the opportunity to learn a specific knowledge set from a training material given before working with the conversational AI application. To evaluate the prototype of this solution, the concept *knowing* was understood as applying

knowledge or learning how to do something and *competence* was understood as the capability to perform in a given task environment. This can also be described as extending the repertoire (i.e. knowing) as compared with improving performance (i.e. competence).
After the preliminary design phase, where disciplinary experts [n=2] recorded ten variants of correct answers, the prototyping phase was conducted as two micro-cycles. The first cycle involved recording the participants [n=3] answers and the second cycle involved adding correct recorded variants to the knowledge repository by the disciplinary experts. Finally, the reflective phase collected comments on *the usefulness of the system* from the semi-structures interviews with the participants and the experts after they filled out an online survey. The survey "Evaluation of Training Application" was designed based on a SWOT-analysis of the participants experience with this instruction:

> *"In Fictive Reality you find the scripted training for Certifiering av Lokalt IT-stöd (in Swedish). Please press View to see, hear and read the scenario (step 1). Then select Speak to act out the scenario (step 2). During the revision, please fill out the following questions (step 3). 1) Please comment on the usefulness of the system, 2) What strength do you see with the system? 3) What weakness do you see with the system? 4) What opportunities do you see with the system? 5) What threats do you see with the system? 6) Please let me know if you have any comments below!"*

Preliminary Design Phase

The preliminary design phase included the development of the knowledge set, the dialogue scenario and the training scenario. Tacit expert domain knowledge can, according to the Dutch philosopher Herman Dooyeweerd, be elicited based on describing approximately fifteen modal aspects of reality (Basden, 2020). Most knowledge repositories contain quantitative, analytical, formative, and lingual aspects of a situation, but the focus of this dialogue scenario was tacit knowledge embodied in assumptions, values, judgments, and consequences of using that knowledge (Basden 2002). This personal knowledge can be shared as an organisational resource when solution are generated and a common understanding is formulated (Crossan et al., 1995). The *knowledge set* can then be codified into "how-to" and "best practice" instructions and the topic for this training simulation was to discern abnormalities in workflows and processes related to the middleware platform. As mentioned before the participant should in the end be able to solve complex issues for end-users on executive-level with the help of our middleware platform. Using big data analytics (BDA), these competences can be implemented to compensating for performance deviation and the local IT-support personnel extend their skills to make new decisions which will lead to new performance (Liu, 2020). The feedback from this process can then then be used to build new shared knowledge and generate additional training data into a knowledge repository (figure 1).

Figure 11. BDA and knowledge support for business decisions (Liu 2020).

The preparation course covered ten different topics related to the core competences for our local IT-support personnel. The computerized examination test did randomly pick real-world tasks from a question bank, which upon passing grade allowed participants to qualify for the next part of the certification. To get ready for the in-person examination with one of the IT-controllers, the participant got to use the dialogue scenario in Fictive Reality for conversational learning. This *dialogue scenario* also included practice scenarios on different topics that prepared them for the final part of the certification (figure 2).

Figure 2. The process for working with the training material.

The specific situation in the developed conversational *training simulation* with Fictive Reality was related to the topic IT-architecture from the preparation course. It described the functionality of our middleware platform from the perspective of issues addressed by personnel working as local IT-support. The introduction phase of the scenario explains to the learner that he or she was going to get questions about IT-architecture, digital devices and technical troubleshooting.

Prototyping phase

The Fictive Reality application uses a conversational AI to control the embodied conversational avatar during play sessions and the *Content Creator* need to supply at least ten variants or more of the same topic to make the AI create the training simulation. The application can be used on a PC or Mac, but for maximum immersion, it is recommended to use a head-mounted display (HMD). It is also complemented by a web app to allow browsing, dialogue creation and administration.

The implementation of the dialogue-based training was initially developed from key aspects in the knowledge set by manually adding text answers in the column *"The player should say…".* More realistic variants was then generated from recorded play sessions with disciplinary experts. The experts then had to pick suitable response and behaviour from recorded variants from participants to extend the training data. The application can only add approved answers by the content creator as correct. During the training process, the incorrect or partly correct answers must be discarded. The final step was when the application provides diagnostics and rating as virtual coaching feedback to the player (figure 3).

Figure 3. The process of training the AI-powered authoring system.

When the dialogue was recorded the application allow participants to listen back for memory consolidation. The approved recordings can then be used as a knowledge repository with high-value data for solving complex issues in the organisation. Since this training simulation was in Swedish, when the phonetic variants from different participants was included the quality of the speech-to-text interpretation improved and became more accurate. Every time the dialogue scenario was changed the avatar needs to be retrained.

Reflection phase

The Fictive Reality application need feedback to develop an understanding of what is classified as a suitable response and could also be used to decide how the avatar should behave. This practice scenario was scripted training following a fixed order, but diagnostics form the virtual coaching feedback was activated. The diagnostics of participants answers need feedback from disciplinary experts to adjust levels and expectations when delivering rating. The application allows experts to disagree with the AI rating and can then store feedback that can be used in the future to further improve the functionality. The collected data from the reflection phase was from three participants in the survey and from two disciplinary experts. The usefulness of the system was at this early stage not seen as realistic to real-world situations. Also, the local IT-support personnel normally collect a lot of contextual information (cf. rich data) to fully understand the performance deviation of the middleware system. The strength with the Fictive Reality application, was the possibility to deliver diagnostics based on performance instead of only evaluating quality of the content. During a demonstration for the participants it was shown how recorded variants were added to the dialogue scenario and this was experienced as something that increased usefulness of the application. The weaknesses mentioned related to the lack of functionality (i.e., speech-to-text) when using Swedish language for the dialogue, but also the diagnostics from the virtual coach were experienced as inconsistent. The disciplinary experts could tell that only partly correct answers given by the player was approved by the system and

they would have liked the possibility of branching answers into three groups of variants (i.e., correct, partly correct, and fail) to make the virtual coaching more adaptive. Another highly appreciated function with the Fictive Reality application was using the gamified learning as an immersive experience in a VR-environment. The retention of the key aspects from the knowledge set was experienced as very high compared to the multiple-choice questions in the preparation course. The application also inspired disciplinary experts to re-conceptualize their understanding of on-the-job training and gave them motivation to deploy automation processes during the on-boarding process to save time. Finally, the threats expressed by the participants were focused on increased time for administration of the recorded variants and quality control during the retraining of the system.

Conclusions

In this study of a conversational AI application to implement immersive learning, the Fictive Reality application was used as a competency development model for active participatory learning during on-the-job training. The results indicate that *knowing* how to use the middleware platform to solve complex issues for end-users on executive-level was hard to capture in a scripted training with fixed dialogue. If the key aspects had been related to customer service or diagnostic questions with a large data set of solutions to several known issues, maybe the training session could have been more adaptive and easier to develop. Still the *competence* from training in a simulation of a real-world situation was seen as valuable.

The first design consideration [C1] was that the Fictive Reality app allow local IT-support personnel to solve complex issues with high-value data. Some responses indicated that the conversational AI application probably would be more useful after more training of the system with recorded variants, but one participant preferred more traditional machine learning models (c.f. KB DSS) to extract actionable insights from large and complex datasets. The second consideration [C2] was that the Fictive Reality app allow local IT-support personnel to create knowledge from a realistic integrated experience. From the analysis of the survey answers, there was not much support for the argument that the training sessions using immersive learning actually did improve the skills in realistic situations where the knowledge set was required. The greatest weakness mentioned in the interviews, was that the content creation and updating the topics took valuable time from traditional training where IT-controllers interacted physically with end-users. One preferred competency development model that they were missing, was to allocate synchronous time with the experts to share ideas or exchange experience as well as to discuss possible solutions with peers. The third design consideration [C3] was that the Fictive Reality application allow disciplinary experts to improve the answers in the knowledge repository in the next iteration. The Fictive Reality application that was studied was more focused on facilitating learning and improving performance (i.e. skills development) rather than extending the repertoire (i.e. knowing). The participants believed that the training simulation can be used for reducing the overall cost of skills development with some more training of the system. The dialogue scenario would probably also benefit from an integration with an electronic performance support systems (Dalkir 2011). It was believed that the data collection through diagnostics could in the future be used for big data analytics to extract meaningful insights, hidden patterns and unknown correlations from disciplinary experts. Finally the participants experienced that the use of a conversational AI application was useful to transfer the tacit knowledge embodied in assumptions, values, judgments, and consequences from experts to novice learners.

References

Periodicals

Basden, A. (2002). The critical theory of Herman Dooyeweerd?. *Journal of Information Technology, 17(4*), 257-269. doi:10.1080/0268396022000017770

Crossan, M., Lane, H., White, R. E. & Djurfeldt, L. (1995). Organizational learning: Dimensions for a theory. *International Journal of Organizational Analysis, 3,* 337-360. doi:10.1108/eb028835

Nonaka, I., & Takeuchi, H. (2007). The knowledge-creating company. *Harvard business review*, *85*(7/8), 162. doi: 10.1057/jibs.1996.13

Tian, J., Tu, Z., Wang, Z., Xu, X., & Liu, M. (2020). User intention recognition and requirement elicitation method for conversational ai services. In *2020 IEEE International Conference on Web Services (ICWS)*, 273-280. doi:10.1109/ICWS49710.2020.00042

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational technology research and development, 53(4),* 5-23. doi:10.1007/BF02504682

Books

Dale E. (1946). *Audiovisiual methods in teaching*. New York: Holt, Reinhart & Winston.

Dalkir K. (2011). *Knowledge Management in Theory and Practice*. 2nd ed. London: The MIT Press.

Liu, S. (2020). *Knowledge Management: An Interdisciplinary Approach for Business Decisions*. London: Kogan Page Publishers

Webpages

Arnaud, C. (2021). Virtual Reality Learning Platform - Student Project done in collaboration with the Stockholm-based start-up Fictive Reality. Retrieved from https://kth.powerappsportals.com/sv-SE/student/view-job/?id=644c3b88-57a7-eb11-89ee-0003ff306703 [2022-09-04]

Basden, A. (2020). The Dooyeweerd Pages: Aspects of Reality as We Experience It. Retrieved from http://www.dooy.info/aspects.html [2022-03-07]

Eckert, D., & Mower, A. (2020). The effectiveness of virtual reality soft skills training in the enterprise: a study. Retrieved from https://www.pwc.com/us/vlearning [2022-09-04]

Fictive Reality (2021). On the forefront of recruitment: How AI innovates recruitment tactics. Retrieved from https://www.fictivereality.com/post/on-the-forefront-of-recruitment-how-ai-innovates-recruitment-tactics [2022-09-04]

Towards Smart and Inclusive Learning Ecosystem
EDEN Research Workshop Proceedings
2022 Research Workshop | Dubrovnik, 19-20 September, Croatia
ISSN: 2707-2819

OPEN AIR OF TECHNOLOGY IN A CLOSED WORLD

Tatjana Stibilj Batinić, Health School Zagreb, Croatia

Vjeran Švaić, University of Applied Health Sciences Zagreb, Croatia

Martina Sesar, School of Road Traffic, Zagreb, Croatia

Abstract

According to the World Health Organization (WHO, 2020) findings from the 2017/2018 Health Behavior in School-aged Children (HBSC), 15-year-olds who report at least 60 minutes of moderate-to-vigorous physical activity (MVPA) in Croatia daily, for girls is only 12 % to 13 %, with direction of no significant change 2014-2018, and 25% to 21% for boys in the same period. As teachers at Health School Zagreb and the School of Road Traffic in Croatia incorporated pre-pandemic digital technologies into teaching, projects, and student social life, encouraging student leisure programming, we met the sudden Lockdown in December 2020 ready for the 5-day Christmas challenge. Computer sciences knowledge is best learned through every subject in school and is also applicable through PE, where working with applications, creating Word documents, screenshots and Google tables contributed to the students' increased motivation to move on a daily level and to professors in innovative ways of evaluating student activities and achievements. The project is of sporting and educational character and has won award by the European Commission's #BeActiveAwards competition in the Education category. Every school is encouraged to "travel" the distance from town of Zagreb Croatia to the home of Santa Claus in Finland (2373.34 km). The total distance tracked by mobile apps of all the participants of our Health School Zagreb within a 5-day challenge was 7937.6 kilometers, with an average of 40.1 km (± 17.4) covered by a single student. Our study involved altogether 212 (N = 212). Usage of mobile apps were equally accepted among all students. The use of technology in terms of deepening knowledge, where the student creates conclusions, synthesizes, and analyzes cooperatively through work- makes meaning. The aim of this paper is to determine the impact of challenge, use of mobile apps to go outdoors during the time of online virtual classes.

Keywords:

ICT in lockdown, **physical activity** projects, inclusion, mobile app in PE and health culture online

Introduction

What are the perspectives of IT literacy in teaching? What is the role of technology in education? Where is the application possibility? What technological standards do teachers need to have? What technological competencies of experts are desirable? How we as teachers turned on digital technologies even before the pandemic in student social life by encouraging joint activities and individual and group contributions through classes and projects at the Zagreb Health School and the School of Road Traffic? We asked these questions through our research (Stibilj Batinić and Švaić, 2015) to feel the role of technology in education and what technologies are used in during those past conditions of the project related to teaching and programming active leisure time of students. Then, 75.5% of research participants spent 1-3 hours a day on the Internet, 96.2% of students in that research had access to the Internet and even then, the Internet was becoming the dominant source of information and use of new technologies (compared to school and public libraries). Competencies needed for digital maturation were in development, one hundred percent of participants already had a home computer and mobile phone, which means that the socio- economic conditionality of access to IT information was no longer an obstacle. The digital transformation in educational institutions has started to improve material conditions in schools. Therefore, living in time and applying modern technologies necessary to maintain high quality work resulted in projects, strengthening technical teaching and student competencies. Technology helps us work with students with special educational needs. Blind andpartially sighted students, as well as hearing impairment students are also enrolled at the Health School Zagreb. The knowledge of teaching with technology creates opportunities for students with disabilities and gifted, our students are sensitized to equal

opportunities for all, additionally through projects in which the School of Road Traffic is involved. New questions have arisen ... Do we know Generation Z? The sociological profile of today's young generation in Croatia can be described based on research results of young people in Croatian society going through a period of crisis and significant changes thus provided insight into phenomena and processes in modern society, locally and globally (Ilišin et al., 2012). We have been in crisis education for over two decades, so we researched the motivation to exercise (Švaić et al., 2013) intrinsic and extrinsic factors, to get to know our students even better and create innovative ways of teaching. Leading interdisciplinary projects in and out of school, we nurtured the school's openness to the local community through collaboration with museums and inclusive education. By leading a series of projects from collaborating 2-5 schools nationally and internationally (E-medica in collaboration with CARnet- Croatian Academic and Research Network), we developed information and communication technology skills, created knowledge by connecting and connected by creating knowledge at the national and international level. From the very beginning, The Health School has been participating in the project of health schools of the Republic of Croatia called the E-medica Festival. Year-round projects result in presentations of student projects, held every year. All projects are openly presented and remain on the web as public teaching material. We strive for quality teaching based on modern knowledge, the development of professorial autonomy and creativity from the position of social and scientific interest as pointed by Stibilj Batinić et al. (2016). Scientific knowledge related to technology and motivation for movement based on research in teaching, was the basis of our work. And then came Lockdown. Learning through work, the curious perspective students, and the usefulness of what has been learned in schools for future work- have prepared us like a springboard for the "new normal". Student attitudes towards learning physical education (PE) and health culture are very interesting because of the feedback on its usefulness for students present and future. Students love studying PE, whenever they can, they practice in class, it is useful for their leisure activities and allows them to use what they have learned in their free time, acknowledged by Švaić et al. (2019). Then came the 2020 pandemic, online teaching, and the creation of digital teaching materials. We as teachers, further improved all our knowledge on the CARnet and EDEN (European Distance Learning Network) webinars. As teachers on both schools, we followed students on Teams, Yammer, Moodle-Merlin platforms. Created classes and continued projects through technology. **Using an evidence-based systematic review Pradal Cano et al. (2020) analyzed studies on mobile applications to foster physical activity and reported that applications were effective in increasing physical activity in 13 of the 14 studies.** We decided to get involved in the "Walk around the Earth" Project organized by the School Sports Association of the City of Zagreb. The project is of a sports-educational nature and has been chosen among three finalists at the European level in the European Commission's "BeActive Awards" competition and is the first project from the Republic of Croatia to be a finalist in the Education category since the award was presented. The project is implemented through a series of challenges in which students, parents, school staff and other participants master the given route by walking, running, inline skating or cycling **with help of applications.**

Methods

At the end of the first semester, the "Christmas Challenge" was organized in 2020/2021. The aim of the Christmas challenge was that in five consecutive days (from 7/12 to 11/12 to 23:59) each school, with the participation of as many students as possible, crosses the distance from Zagreb to the home of Santa Claus near the Finnish city of Rovaniemi (2373.34 km). Students were encouraged to take a consecutive 5-day challenge by getting outdoors and to track their covered distance with the mobile app by using any activity like plain walking, running, cycling, inline skating, or a combination of those activities. They used free apps to monitor and track their activity: SportTrack, Strava, Runkeeper, Endomondo, FitNotes, GoogleFit, Samsung Health. Students of the Health School won the first place in this project. Our study involved altogether 212 (N=212) participants of which 186 female students (87.7%) and 26 male students (12.3%), from freshmen to senior high school year (Tables 1 and 2).

		Frequency	Percent
Valid	Male	26	12.3%
	Female	186	87.7%
	Total	212	100.0%

Table 1: Descriptive statistics by gender

		Frequency	Percent
Valid	Freshman (1st grade)	85	40.1%
	Sophomore (2nd grade)	49	23.1%
	Junior (3rd grade)	60	28.3%
	Senior (4th grade)	18	8.5%
	Total	212	100%

Table 2: Descriptive statistics by year of study

This convenience sample was taken from Health School Zagreb with students from four different fields of study: pharmacology technician, physiotherapist, medical and sanitary technician (Table 3). The activities used are shown in Table 4, together with the number of non-participations due to sickness, isolation, or self-isolation.

		Frequency	Percent
Valid	PharmTech	88	41.5%
	Physio	58	27.4%
	MedKoz	46	21.7%
	SanTech	20	9.4%
	Total	212	100%

PharmTech - pharmacology technician; Physio - physiotherapist; MedKoz - medical cosmetician; SanTech - sanitary technician

Table 3: Descriptive statistics by field of study

	DAY1	DAY2	DAY3	DAY4	DAY5	Total	Percent
Bike	3	2	1	3	3	12	1.1%
Inline skating	4	0	0	1	1	6	0.6%
Isolation	6	5	5	4	4	24	2.3%
Running	5	6	3	2	3	19	1.8%
Self-insulation	1	1	1	2	2	7	0.7%
Sickness	9	13	19	25	32	98	9.2%
Walking	163	166	163	163	153	808	76.2%

Walking and bike	11	10	7	4	5	37	3.5%
Walking and inline skating	0	0	2	1	0	3	0.3%
Walking and running	10	9	11	7	9	46	4.3%
Total	212	212	212	212	212	1060	100.00%

Table 4: Percentage of applied activities and non-participation

Results

Walking, as an activity, was practiced by 76.2% of the students while only 11.6% were involved in a more vigorous activity i.e.running, cycling, inline skating or some combination of more than one activity. The rest making 12.2% had been in some way prevented for participating in the challenge (Table 4). The total distance tracked by mobile apps of all participants within the 5-day challenge was 7937.6 kilometers, with an average of 40.1 km (± 17.4) covered by a single student (Table 5).

	N	Min.	Max.	Mean	St.Dev.	NOISE
DISTday1	195	0.1	29.9	8.4	4.3	1638.3
DISTday2	194	0.0	26.2	8.2	3.8	1581,7
DISTday3	189	0.1	40.6	8.0	4.2	1508.7
DISTday4	185	0.9	58.6	8.9	5.5	1649.4
DISTday5	179	0.6	43.6	9.0	4.9	1617,8
DISTtot	198	4.3	131.0	40.1	17.4	7937.6

DISTday1-day5 - distance covered from day 1 to day 5; DISTtot - total distance covered in 5 days; SUM - distance covered by all participants

Table 5: Average distance in km covered by student in the 5-day challenge

GENDER		N	Mean Rank	Sum of Ranks
DISTtot	Male	26	99.44	2585,50
	Female	172	99.51	17115.50
	Total	198		
Mann-Whitney U		2234,50		
Z		-0.006		
Asymp. Sig. (2-tailed)		0.996		

Table 6: Mann-Whitney U test between gender

After evaluating the normality of distributions of the variables used in this study using skewness and kurtosis values, QQ plots, Histogram and Kolmogorov Smirnov test we rejected the null hypothesis and decided to use non- parametric analysis. We hypothesized that there will be a significant difference between male and female participants with male participants being more active and thus covering more distance than female students. However, after applying Mann-Whitney U test we were surprised that no statistical significance (p=0.996) difference was found between the two

groups (Table 6). **Implications of those findings is that the female students would be active same as male, which would be of enormous importance.** Similarly, we hypothesized that there will be a significant difference between the subgroups of students selected by the year of study with the older students covering more distance than the younger ones.This too has not, to our surprise, been confirmed by the statistical analysis. The Kruskal- Wall test showed no significant difference (p=0.417) between groups of freshmen, sophomore, junior and senior students (Table 7).

GRADE		N	Mean Rank
DISTtot	Freshman (1st grade)	81	91.46
	Sophomore (2nd grade)	41	103.88
	Junior (3rd grade)	60	106.84
	Senior (4th grade)	16	101.47
	Total	198	
Chi-Square		2,839	
df		3,000	
Asymp. Sig.		0.417	

Table 7: Kruskal-Walli test between the years of study

According to World health Organization (WHO, 2020) findings from the 2017/2018 Health Behavior in School-aged Children (HBSC), 15-year-olds who report at least 60 minutes of moderate-to-vigorous physical activity (MVPA) in Croatia daily, for girls is only 12 % to 13 %, unfortunately with direction of no significant change in period 2014- 2018, and 25% decreasing to devastating 21% for boys in the same period. During our study, we have been documented consecutive daily activity for average distance in km covered by student (Table 5), what is more than 60 min recommended per day (WHO, 2020). Emphasis of the role of technologies and applications in the given case is to tackle the transformative approaches in creating learning environments, application of ICT (Information and Communications Technology) in educational process, broadening pupil digital skills in useful way, with the students increased motivation to move on a daily level and to professors in innovative ways of evaluating student activities and achievements. Outcomes of repetitions every day: through screenshots of graphic app thus in groups creating Word documents; forming Google tables and personally writing data; comments in their sentences afterwards, in their eyes and certainly in applying learnt activities to achievements with wonderful results in such a tremendous circumstance! Students were led to learn through experience, learn to know themselves cooperatevely activating with classmates. The 5-day challenge resulted in 7937.6 kilometers, with an average of 40.1 km (± 17.4) covered by a single student. Students and teacher alltogether felt enthusiasm which virtualy fly us to great results during the time of online virtual classes. Through use of technology, students grew from what they did and continue to do so nowadays giving teacher feedback for last year and a half. Today, consequently our students are taught and motivated to move throughout the week as part of increasing their physical activity to 60 minutes per day. Intraconnection and interconnection to community with recognized health kinesiology and ICT purpose for everybody, we (teachers and students) were and are all connected. If technology can support all this, welcome!

Conclusion

In this study, the results obtained, show a correlation between technology and physical activity. This is in accordance with a large literature review by Pradal-Cano et al. (2020). Scientists in various fields of science are increasingly pointing to the use of mobile applications for the purpose of education, disease prevention and promotion of physical activity in the wider population of people. Today it is impossible to imagine formal and non- formal education without using computers and new technologies (Matasić and Dumić, 2012). We can proudly say that our students crossed on average more than enough distance to promote health benefits proposed by Bravata et al. (2007), and that it had been done during the Lockdown period. There is no difference in gender and age in the statistical processing conducted, so we have another reason why mobile technology has a positive effect on the education and physical activity of all. Pathways to Schools Success is proposing a new, expanded vision for how to promote inclusion

and school success for all. This vision deals essentially with three intertwined conditions - engagement, achievement, and well-being - which should be improved simultaneously, so that we can genuinely promote better educational outcomes for all children and young people and raise their chances to be successful, in education and in life, focus on questions such as how to create supportive learning environments at school, how to promote better mental and physical health and emotional well-being (EU, 2022). This is exactly what we have been able to promote by working in our schools since 2020.The use of technology benefits students and teachers, but only used in terms of deepening knowledge, active participation in expanding knowledge, where the student is a co-creator of the process that out of the desire for knowledge, interrogates and draws conclusions, synthesizes, and analyzes cooperatively with others and applies through work - gain meaning. (Stibilj Batinić and Švaić, 2015). Therefore, students acquire knowledge by applying ICT skills for future work and life. Possibilities and influences of using mobile applications on student physical activity in times of confinement and their application in openness, reshaping the present into the future is possible as long students create habits, attitudes, motivation and sense of purpose and meaning. This strengthens not only physical but also psychological resilience and contributes to mental health by nurturing healthy lifestyles.

References

Bravata, D. M., Smith-Spangler, C., Sundaram, V., Gienger, A. L., Lin, N., Lewis, R., Stave, C. D., Olkin, I., & Sirard, J. R. (2007 *re*). Using pedometers to increase physical activity and improve health: a systematic view.*JAMA, 298(19), 2296–2304.* https://doi.org/10.1001/jama.298.19.2296

European Union (2022).An official website of the European Union. https://europa.eu/youth/year-of-youth_hr?topic=Health%2C%20well- being%20%26%20sports#eu-policies

Ilišin, V., Bouillet, V., Gvozdanović, A., & Potočnik, D. (2012*).* Young people in times of crisis.*Institute for Social Research, Friedrich Ebert Stiftung, Zagreb.*

Matasić, I., & Dumić, S. (2012). Multimedia Technology in Education. Medijska istraživanja, 18 (1), 151-151. https://hrcak.srce.hr/85389.

Pradal-Cano, L., Lozano-Ruiz, C., Pereyra-Rodríguez, J. J., Saigí-Rubió, F., Bach-Faig, A., Esquius, L., Medina, F. X., & Aguilar-Martínez, A. (2020). Using Mobile Applications to Increase Physical Activity: A Systematic Review *International journal of environmental research and public health, 17(21), 8238.* https://doi.org/10.3390/ijerph17218238

Stibilj Batinić T., & Švaić V. (2015). Application of new technologies in programming active leisure time of students - IN SPE. *Proceedings of the 24th Summer School of Kinesiology of the Republic of Croatia, Poreč, June 30 to July 4, 2015 (pp. 97 - 102) Zagreb: Croatian Kinesiology Association.*

Stibilj Batinić T., Švaić V., Bjelić G., Sesar M., & Gržalja A. (2016*)*.Social movements - Quo vadis, adolescents? *Proceedings of the 25th Summer School of Kinesiology of the Republic of Croatia, Poreč, June 28 to July 2, 2016 (pp. 130 - 135), Zagreb: Croatian Kinesiology Association*

Švaić, V., Bjelić, G., Glad, T., & Stibilj Batinić, T. (2013). Eppur si muove - Adolescent motives and physical activity *. Proceedings of the 22nd Summer School of Kinesiology of the Republic of Croatia, Poreč, 2013 (pp. 171-176), Zagreb: Croatian Kinesiology Association*

Švaić V., Stibilj Batinić T., Bijelić G., Sesar M., & Gržalja A. (2016). Modernization of physical education and health education. *Proceedings of the 25th Summer School of Kinesiology of the Republic of Croatia, Poreč, June 28 to July 2, 2016 (str. 395 - 400) Zagreb: Croatian Kinesiology Association*.

Švaić V., Stibilj Batinić T., Sesar M., & Nucak V. (2019). Does physical and health culture affect my present and my future?! TZK - I know the usefulness here. Proceedings *of the 28th Summer School of Kinesiology of the Republic of Croatia, Zadar, June 26 to June 29, 2019 (str. 104 - 109) Zagreb: Croatian Kinesiology Association.*

World Health Organization. Regional Office for Europe. (2020). Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 2. Key data. World Health Organization. Regional Office for Europe. License: CC BY-NC-SA 3.0 IGO. https://apps.who.int/iris/handle/10665/332104