Technical Innovation in Blended Learning – Concepts for the Creation of High Quality Continuous Vocational Education Courses using Multiple Devices

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Abstract: The project Technical Innovations in Blended Learning (TIBL) aims to increase the training success (and outcomes) of C-VET trainees using "multiple devices" (computers, laptops, notebooks, tablets and smartphones) and with a blended learning approach. The tasks foreseen are: i) the development of blended learning training modules that will hopefully close expectation gaps between trainees and companies; ii) the creation of an easy-to-use toolbox delivered in open access aiming to support trainers to implement these modules or similar ones successfully; and iii) the implementation of a blended learning course "Train the Trainers" supplied as a MOOC course, based on Moodle as an OER, also using multiple devices. This contribution presents the project as well as the pedagogical principles underlying the courses. The project will focus on the delivering of content by multimedia material which can be used on all mentioned devices, and specific pedagogical techniques, like micro learning and flipped learning approach. The developed methods will be evaluated in real courses undertaken in formal education and in non-formal education within real enterprises.

1 INTRODUCTION

This ERASMUS+ project Technology Innovations in Blended Learning (TIBL) aims to develop continuous vocational education and training (C-VET) courses for training performed in formal and in non-formal C-VET education. These courses use blended learning as a technology enhanced method and focus on the use of multiple devices (used by the trainees in their everyday life) to develop professional competencies that will close the expectation gap between trainees and companies. The innovation in this project embraces the implementation of a trainee-focused pedagogical framework based on heutagogy, the development of an all-encompassing quality enhancement framework (including also the pedagogy approach) and the exploitation of various technical equipment (the multiple devices). The project is complementary to a Grundtvig Multilateral project by transferring the theoretical developed outputs to a practical implementation in a different (but similar) educational sector.

The partners of the project combine knowledge and experience from Vocational Education and Training (VET) institutions with the research and innovation potential of universities. In addition, a national organization for distance education is a partner. The partners in the project are:

The Fundación Escuelas Profesionales Sagrada Familia (SAFA), who also is the coordinator. SAFA is an important Spanish school foundation focusing on school and vocational education; the European Foundation for Quality in Blended Learning (EFQBL) is a VET and trainers' education organization; the Universita Degli Studi Di Roma La Sapienza, DigiLab, that is specialized in multi devices; the University of Aveiro that is specialized in innovation in technology enhanced training and the related pedagogy; and the Swedish Association for Distance Education (SADE), who are experts in distance learning and quality enhancement frameworks.

The outline of the project roadmap was agreed on the kick-off partner meeting in Wiener Neustadt, Austria (October 2017). The initial research phase

will focus on the theoretical frameworks mentioned above, which then further on will be developed. These frameworks will underline the implementation of an innovative pedagogical approach to C-VET courses. In a teaching event (in Seville, May 2017) the knowledge and necessary competences created in the previous phase will be presented and discussed with all partner institutions. Based on current existing frameworks for quality enhancement (Ossiannilsson, Williams, Camilleri & Brown, 2015), a suitable framework for TIBL will be developed in addition. Furthermore, the planning of the pilot courses will be created. In 2018, the pilot courses will be implemented, evaluated and amended. The results will be the impact to the creation of the trainers' toolbox. The coding (with Hypertext Preprocessor, PHP programming language) of the foreseen PHP programs will start in spring 2019, as well as the development of the transferability and quality evaluation guide. The project's results will be disseminated and published in several national multiplier events, in September 2019 as well as scientific conferences in these areas.

1.1 Blended Learning

Blended learning has become a mainstream approach to learning in higher education. Teachers are commonly drawing upon a mix of digital technologies and face to face approaches to enhance the learning outcomes of their students. The term itself *blended learning* has many definitions which are varied in the explanations. On behalf of ICDE Ossiannilsson (2017) wrote an insight paper on blended learning, its terminology, definitions, history etymology, implementation, and quality enhancement. She emphasized from the research study that blended learning designs have headed the list of trends in higher education the most recent five editions of the NMC Horizon Report (Adams et.al., 2017), partly because of their role in increasing the flexibility and convenience of students (Ossiannilsson, 2017).

Briefly, blended learning is the fusion of online and face-to-face contact between teachers and students. Blended learning environments include not only the physical presence of teachers and students but also the students' ownership and control of time, place, setting, path, and pace at which their learning takes place (Banditvilai, 2016). Blended learning concerns mindset and pedagogy more than it does technology. In educational programs, both formal and informal, the use of the blended learning model is accepted as the mainstream approach to learning in

schools, colleges, and universities across the globe inline with technological development and increased digitization.Thus, the ecosystem of blended learning must be embraced to ensure the quality of a culture of blended learning (Ossiannilsson, 2017).

The two most often cited definitions are provided by the Christiansen Institute and Wikipedia.The former defined blended learning as:

> *Blended learning is a formal education program in which a student learns; at least in part through online delivery of content and instruction, with some element of student control over time, place, path, and/or pace; at least in part in a supervised brick-and-mortar location away from home, and the modalities along each student's learning path within a course orsubject are connected to providean integrated learning experience*
> *(Christiansen, Horn&Staker, 2013 p.8).*

The latter definition is as follows:

> *Blended learning is a formal education program in which a student learns at least in part through the delivery of content and instruction via digital and online media with some element of student control over time, place, path, or pace. (Wikipedia, 2017).*

From the research study by Ossiannilsson (2017) it becomes also clear that the concept is culture and time dependent, and thus vary.

1.2 Innovation in the Project

There are three innovative columns carrying the project. The first addresses expectation gaps between trainees and the companies. Geetika (2017) mentiones different expectations of these two groups which leads to unsatisfaction in both.

The second pillar is a partly missing support of small and media enterprises (SMEs) in the fields of trainer education and an appropriate training aproach. The third column reprsents the tools. In Higher Education (HE) or School Education (SE) there exist numerous tools for blended learning, most of them well researched and published. Obviously the transfer to C-VET (or VET in general) is not working properly. This is the reason of the structure of the consortium to build a kind of knowledge alliance and to enable the transfer ef the experiences from the various institutions to the others.

1.2.1 Closing Gaps between Trainees and Companies

There exists an information and expectation gap between the trainees and the supplying companies. This phenomenon is well-known and can be found in literature (Geetika, 2017). This problem targets both trainees and enterprises and is discussed within the last ten years in Higher ducation (Beetham, 2014).

One of the problems is that modern training using multiple devices needs digital competences and a pedagogical model – but this is missing (in most cases). As an innovation the development and implementation of a trainee-focused pedagogical framework (including the strengthening of digital competences) is developed in the project as well as the delivering of the training by blended learning (this enables the easy clearing of problems and obstacles in the face-to-face sections).

1.2.2 Supplement of Small and Media Enterprises in the Training

This addresses the main target group of trainees and enterprises. The project addresses the problem that modern training of employees is often to complicated for little artcrafts or the smallest (tiny) enterprises.

As an innovation the training organisations get a proven training environment based on blended learning using multiple devices and can offer special courses (on a well-priced and time-saving base) for the various art crafts and "tiny enterprises".

1.2.3 Development of Tools

The development and implementation of an easy-to-use toolbox for trainers is a major outcome of the project. This web-based toolbox will support trainers in the course creation using a varity of multiple devices. It assists them to use the developed frameworks of pedagogy and quality enhancement, but also the form of microlearning. This all will allow just in time and personal learning. The main target group for this toolbox are trainers and training organisations.

The identified problem are trainers (and the training departments of bigger companies) fixed on traditional methods. An example of this traditional approach can be mentioned the replaccement of a printed book by an eBook. The toolbox is a strong support for trainers building a sustainable investment in quality and efficiency of training systems (ET 2020). It will be developed and implemented by using the EQAVET Quality Assurance reference framework.

The toolbox is a completely new developed and coded web-based tool and developed to assist trainers in course creation. The toolbox is based on the developed pilot courses but offers the necessary flexibility to create aids and basic material to assist the trainers (with a special focus on the pedagogical approach).

At the date of the submission of this paper, such a tool open for public use did not exist.

2 AIMS OF THE PROJECT

The project aims to develop C-VET training courses for training performed in formal and in non-formal C-VET education. C-VET in this context means continuous (or further) education of people working in a specific profession. These courses use blended learning as a technology enhanced method and focus on the use of multiple devices, provide two frameworks (for the pedagogical training approach and the necessary quality enhancement) and supply trainers and training organisations in course creation by a special web-based tool.

Three main aims will be addressed in the TIBL project: the access to training and the qualification of both trainees and trainers, open praxis in a digital area, and the equity for trainers and trainees. These principles are defined in the call of the European Commission 2017 (European Commission, 2016)

2.1 Enhancing Access to Training and Qualifications for All

The TIBL project addresses the chances for trainees to get better training supplying them with relevant and high-quality competencies (skills, knowledge) for their professional life, especially to keep the employability, and to keep track with innovations in their fields. The project develops modern technology enhanced training which can be work-place based as well as traditional self-paced training as described by Nq, Lam et. Alt. (2017).

The project implements courses using the potential of innovative and active pedagogies such as collaborative methods with a heutagogical approach (Blaschke, 2016; Ossiannilsson, 2017) where the learner is in the center of the learning. This will enable synergies between education, research and innovation activities, like the cooperation of a VET school with a VET training organization supported by two European Universities and the involvement of the partner with its association specialized in distance

learning and quality assurance and quality enhancement.

2.2 Open and Innovative Practices in a Digital Era

Blended learning and open, online, and distance education are typical for learning in the digital era, and the 21 centuries (Ossiannilsson, 2015; Ossiannilsson, 2017). The use of the complete variety of available devices as described above mirror the current digital oriented society, and how people live, work, and learn, and promotes a promising approach to modern digital based training. The project will promote the use of Information and Communication Technology (ICT) with a view to increasing the quality and relevance of education at all levels is always in the background of all project's activities.

The project is a response to the digital revolution (Schwab, K., 2016) by increasing (and using) digital competences at all levels of learning, including non-formal and informal VET education. This also gives the project an enormous transfer potential to other educational fields. The providing of the project's outputs as open educational resources (OER) is a contribution to Open Education movement UNESCO. (2015a 2015b)

2.3 Equality for Trainers and Trainees

Equality for trainers and trainees is a requirement from the European Commission and means 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. The project develops innovative and technology-based training methods which are also an innovation for trainers (and all kinds of organizations involved in education and training).

The project addresses mainly the continuous professional development of VET teachers and trainers (as mentioned in school as well as in work-based settings in SMEs). The developed software (Trainer's Toolbox) and the Massive Open Online Course (MOOC) enable trainers easily to use the tools and practices developed through the TIBL project in their training and to supply best the trainees.

Multiple devices are a fact in our daily use (Kabali, 2014). To use them for successful training, the user must be educated, must get motivated in the learning, and the appropriate environment must be available. An heutagogical approach enables the learner to control the learning and to adapt it to the personal needs. The training developed in this project takes the viewpoint of the learner to

- Supply the trainees best
- Ensure optimized training results
- Taking in account the necessary user education and a well-defined developed training environment

The pilot courses in the field of further vocational education and training will be performed with trainees not so well educated in ICT and will be evaluated with a special focus on the trainees' development in ICT.

3 MATERIALS AND METHODS

The literature review showed clearly the mentioned problems in various context. In the project the consortium creates the necessary quality and pedagogical frameworks and uses them to implement pilot courses both in formal C-VET (in the Vocational schools of SAFA, Spain) and in non-formal C-VET (in the continuous courses of the Sakralenergetiker in Austria) environments.

The method to create the pedagogical training framework follows tree steps. As a first step, areas are defined that influence the framework itself, the second step defines the training approaches with a special focus on heutagogy and multimedia based individual training and finally targets the quality assessment techniques. Additionally, trainer trainings are foreseen in the frame of the project and will enable successful online trainings of the trainees.

The quality enhancement framework will be developed in an analogous way by identifying the quality fields occurring in the training and developing the necessary guidelines, tools, and measurements.

3.1 Addressed Target Groups

The project addresses several defined direct and indirect target groups, which are

- Trainees involved in continuous vocational education (C-VET) both in formal education and non-formal)
- Trainers responsible for courses in C-VET
- Training organizations developing courses for C-VET
- Small and media enterprises (SMEs) interested in innovating their internal further education
- Decision makers, involved in training, and companies, which care for continuous

professional development (CPD) for their staff.

3.2 Trainers' Education

Gundar (2011) mentions that in the today's teaching skilled teachers are lacking digital skills. He addresses especially the skills of the use of mobile devices to be incorporated in the learning environments and activities. In VET training the situation is the same. Trainers must be well educated and supported to use not only mobile devices in the training but also all the other devices which are common for the typical VET trainee - often at the workplace.

The consortium is using the new developed digital competence frame of the European Commission (DigiComp, 2017) and will focus on the described key competences from tree different areas, which are Communication and collaboration, Digital content creation, and problem solving.

To address the trainees in the best ways, trainers must learn not just the properly use of the technical tools but must be able to use these within a framework of pedagogical methods. The project develops a pedagogical framework which can easily be used by the trainers. The toolbox is an appropriate web-based tool to support trainers with the tools, which are one results of the findings of this project. The use of the toolbox (and the related background of the toolbox) is available through a MOOC developed within the project and by the project team, which will be launched during the project period.

3.3 Multiple Devices

The use of multiple devices is a fact in VET training (Peters, 2007).

The innovation of the project is closely connected with the results of international studies claiming problems in currently used training and the feedback of companies (SME as well as bigger companies) concerning the difference between the expected outcomes of training and the real and final results.

4 FINDINGS

The first findings of the project are in context with the technical issues, the development of a pedagogical framework best fitting to employed C-VET learners, and the creation of the quality enhancement framework.

The pedagogical framework includes as a new pedagogical approach the trainees view. The project team focuses on the real needs, based from the current state of the art of literature, and proved by the feedback of the trainees of the pilot courses.

The framework will combine active learning, micro learning, especially in the distance learning, and the use of multimedia, especially interactive videos. This approach is even described by Bergmann (2017).

Sung (2016) mentioned that qualitative analyses of the use of multiple devices are still missing. Within the project currently used devices were analysed, and a list of features, mainly technic-based, were identified. This study is the bases of the development of multimedia-based material which will be able to be used on all multiple devices during the training. The study impacts as well into the implemented features of the Moodle (Moodle, 2018) platform which is used for the distance learning. The pre-decision has been made to use HTML5 as a page description language which is delivered by Moodle as a standard (Moodle, 2016)

The project is expected to gain feedback of real VET learners involved in blended learning courses using multiple devices. This feedback is used as an outcome to the development of the trainers' toolbox. This toolbox will hopefully merge practical use and inhomogeneous technical devises (Sung, 2016) as well as the expectation gap (mentioned in the beginning). The specific proposal for training methods like the use of multimedia content, interactive videos based on microlearning will bring a better training environment and motivate the trainees in their working life and conditions.

5 DISCUSSION

The first results point out that the use of technical devices is standard in VET learning and humans expect to use it for their learning. For the course as such, it is difficult to estimate in an inhomogeneous group which devices to be used. The course creator must care for an overlapping average of the provided material covering all used multiple devices.

The research pointed out that the technical features are due to both the devices, as such but also to the used operating system. The used learning platform Moodle basically delivers content in a HTML 5 format which is displayed at all devices offering standard tools to display the content. Further research and tests are thus necessary to define precisely which material can be delivered and used by

all devices. Other findings are the time factor in the learning process.

Time must be used efficiently by VET learners. The use of multimedia in combination of workplace based microlearning seems to be a promising approach. Following the approach of flipped learning for vocational and professional education and training (VPET) some considerations of Bergman (2017) will impact to the project, for example the use of multimedia based microlearning or interactive videos.

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REFERENCES

Adams, Becker, S., Cummins, M., Davis, A., Freeman, A., Hall Giesinger, C., & Ananthanarayanan, V., 2017. *NMC horizon report: 2017 higher education edition*. Austin, Texas: The New Media Consortium.

Banditvilai, C., 2016. Enhancing students' language skills through blended learning. *The Electronic Journal of e-Learning,14*(3),220–229.

Bates, T., 2015.Teaching in a digital age: Guidelines for designing teaching and learning for a digital age. [Weblogpost]. Retrieved from https://opentextbc.ca/teachinginadigitalage/

Bates, T., 2016. Are you ready for blended learning? [Weblogpost]. Retrieved from https://www.tonybates.ca/tag/blended-learning/

Bates, T., 2017. What is online learning? Seeking definition [Weblogmessage]. Retrieved from https://www.tonybates.ca/category/teaching-and-learning/blended-learning-teaching-and-learning/

Bergmann, J., Smith, S. T., Clair. E., 2017. *Flipped learning 3.0. The operating system for the future of talent development*. First edition. Irvine, CA: FL Global Publishing

Beetham, H., 2014. *Students expectations and experiences of the digital environment*. Available online at https://digitalstudent.jiscinvolve.org/wp/files/2014/06/Outcomes-from-Glasgow1.pdf.

Blaschke, L. M., Hase, St., 2016. *Heutagogy. A Holistic Framework for Creating Twenty-First-Century Self-determined Learners*. In Gros, B., Kinshuk, M., (Eds.): *The future of ubiquitous learning*. Learning designs for emerging pedagogies. Heidelberg: Springer (Lecture Notes in Educational Technology), pp. 25–40.

Christensen Institute, 2015. *Blended learning definitions*. Retrieved from /www.christenseninstitute.org/blended-learning-denions-and-models/

Christensen, C., Horn, M., Staker, H., 2013. *Is K-12 blended leaning disrupve? An introduction to the theory of hybrids*. Clayton Christensen's Institute for disruptive innovation.

Daniel, J., 2016. *Making sense of blended learning: Treasuring an older tradition or finding a better future?* Contact North Contact Nord Research Associate [Weblogpost]. Retrieved from https://teachonline.ca/sites/default/files/tools-trends/downloads/makingsenseofblended.pdf

DigComp, 2017. *Digital Competences Framework for Citizens*, https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework

EQAVET. *Quality Assurance reference framework*, http://www.eqavet.eu/qc/gns/home.aspx.

European Commission, 2016. *Erasmus+ Program guide*, download: https://ec.europa.eu/programmes/erasmus-plus/sites/erasmusplus2/files/2017-erasmus-plus-programme-guide-v2_en.pdf

Geetika, M., Venkatraman, A., 2017. *"The great divide": skill gap between the employer's expectations and skills possessed by employees*. In *Industrial and Commercial Training* 49 (4), pp. 175–182. DOI: 10.1108/ICT-11-2016-0071.

Kabali, H. K.; Irigoyen, M. M.; Nunez-Davis, R; Budacki, J. G.; Mohanty, S. H.; Leister, K. P.; Bonner, R. L., 2015. *Exposure and Use of Mobile Media Devices by Young Children*. In *Pediatrics* 136 (6), pp. 1044–1050. DOI: 10.1542/peds.2015-2151.

Moodle, 2016. *Join The Conversation On New Moodle HTML5 Media Player And Standards,* https://www.moodlenews.com/2016/join-the-conversation-on-new-moodle-html5-media-player-and-standards/

Moodle, 2018. https://moodle.org/

Ng R.YK., Lam R.YS., Ng K.K., Lai I.K.W., 2017. *Identifying the Needs of Flexible and Technology Enhanced Learning in Vocational and Professional Education and Training's (VPET) Workplaces*. In Wai Kit Will Ma, Chi Keung Alex Chan, Kar-wai Tong, Heidi Fung, Cheuk Wai Rose Fong (Eds.): New Ecology for Education -- Communication X Learning. HKAECT-AECT 2017 Summer International Research Symposium. 1st edition 2017. Singapore: Springer Singapore.

Ossiannilsson, E., Williams, K., Camilleri, A., Brown, M., 2015. *Quality models in online and open education around the globe: State of the art and recommendation.* The ICDE report series. Oslo: The International Council for Open and Distance Education.

Ossiannilsson, E., 2017. *Blended learning, The state of nations.* Oslo: International Council for Open, and

distance Education (ICDE): Retrieved from https://
icde.memberclicks.net/assets/RESOURCES/Blended
Learning ICDE Insight Paper 2017 compressed.pdf

Peters, K., 2007. *m-Learning: Positioning educators for a mobile, connected future*. The International Review of Research in Open and Distributed Learning, Available at: http://www.irrodl.org/index.php/irrodl/article/view/350/894.

Schwab, K., 2016. *The 4th industrial revolution*. Geneva: World Economic Forum.

Sung, Y., Chang, K., Liu, T., 2016. *The effects of integrating mobile devices with teaching and learning on students' learning performance.* A meta-analysis and research synthesis. In *Computers & Education* 94, pp. 252–275. DOI: 10.1016/j.compedu.2015.11.008.

Taylor, M., 2013. *Optimizing Pedagogy for Blended Learning,* Weinberg College of Arts and Sciences, https://web.madstudio.northwestern.edu/optimizing-pedagogy-for-blended-learning/

UNESCO, 2015a. *Education 2030 Framework for Ac* on: Towards inclusive and equitable quality education and lifelong learning for all. Paris: UNESCO.

UNESCO, 2015b. *UNESCO and Education 2030: Framework for action and sustainability development goals4,* SDG4. Retrieved from http://en.unesco.org/sdgs