EMVITET- PROJECT DEVELOPING EDUCATION 4.0 COMPETENCIES - IMPACTS AND EXPERIENCES DURING COVID-19

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ABSTRACT

The aim of this article is to describe the direct and potential impacts Erasmus+ Capacity Building Higher Education (CBHE) - Project called "Empowering Vietnamese VET teachers for transformation towards Education 4.0" (EMVITET)- after one year of implementation. Additionally, the survey findings also summarized the institutional and teachers' personal experiences during the Covid-19 pandemic, which pushed Vietnamese institutions to rapidly transform their education to online environments. Qualitative data were collected with online questionnaires from six partner institutions and 35 teacher participants. The findings indicate that both individual teacher participants and partner institutions were given a boost to improve Education 4.0 competencies thanks to the participatory and collaborative approach of the EMVITET- project. The project was perceived as an useful external source for supporting the institutions' management in organizing demanding online education during Covid-19 pandemic.

Keywords: *Education 4.0, Educational change, Teacher learning, Erasmus+- project*

1. INTRODUCTION

The EMVITET Erasmus+ Capacity Building Higher Education (CBHE) project focuses on creating a new learning ecosystem for Education 4.0 in Vietnam. The project relies on a dynamic and participatory approach in building solutions for student-centered and competence-based education (Kunnari, Ho, & Nguyen, 2019). Digital technologies and environments are core elements in forming platforms and spaces for authentic learning, collaboration, sharing and networking.

The first common publication of the EMVITET project explained the core concept of Education 4.0:

"Education 4.0 shifts mindsets and approaches in learning and teaching. Digitalisation enables learning to occur anywhere which makes learners key actors of their own learning. Teachers change their role to facilitators of learning. Instead of focusing so much on degrees, learning concentrates on relevant competences. Education 4.0 refers also to ecosystems of educational institutions and the world of work, which produce innovations and evolve in the change. It means that in education we do not just adapt to changes, but we actively build our own meaningful future. In Education 4.0, the traditional ways of implementing education are not enough, but we need to rethink learning and education to match the needs of the changing world." (Kunnari, Ho, & Nguyen, 2019)

Education 4.0 competencies

For sustainable transformation towards Education 4.0, it needs to be clear what it means in practice. In order to facilitate the process and guide the competence development, Education 4.0 (Edu 4.0)

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competencies for teachers were determined and divided into three main areas called:

- Pedagogy in Edu 4.0
- Digital Technologies in Edu 4.0
- Learning Ecosystem in Edu 4.0.

The first competence area Pedagogy in Edu 4.0 refers to competencies with which teachers can design and implement competence-based and student-centred education to match the needs of Industry revolution 4.0, such as offering realistic tasks and authentic learning settings, stimulating students' own responsibility of the learning process, especially students' reflective learning ability, taking a teacher facilitating role, and being able to deploy different competence-based assessment methods (Koenen, Dochy, & Berghmans, 2015). Further, a socio-constructivist perspective (e.g., Lave & Wenger, 1991; Salomon & Perkins, 1998; Vygotsky, 1978) was also emphasized here to develop students' learning. The nature of Education 4.0 is demand-driven, where teachers need to be able to recognize and reflect continuously evolving competence demands of the changing world of work and design students' learning process accordingly. Teachers need to have the ability to put their students in the centre and act as facilitators of learning, not just as individual teachers but working together with their colleagues.

The second competence area, Digital Technologies in Edu 4.0 refers to competencies with which teachers can effectively use technology to enhance and transform teaching and learning practices towards Education 4.0. Digital Technologies in Edu 4.0 was set a competence area because it can enrich students' learning and inspiration. With digital technologies, it is also possible to engage students and work-life representatives in ecosystem creation by building affordances to common projects and spaces for innovation. Some example competencies are: Teachers have the ability to apply digital technologies to support learners' self-regulated learning, ownership and peer learning; be able to build blended and online learning processes that enrich learning experience though, for instance, the effective use of Learning Management Systems (LMS) in students' guidance and assessment. With digital technologies, it is also possible to engage students and work-life representatives in ecosystem creation by building affordances to common projects and spaces for innovation.

The third competence area, Learning Ecosystem in Edu 4.0 refers to new kinds of learning communities between students, teachers and work-life partners. It highlights the importance of emotional intelligence (see Goleman 2001, Mayer & Salovey, 1997). In order to build authentic learning ecosystems, teachers need to have good competencies in self-awareness and self-regulation in building successful interactions. According to Mayer and Salovey (1997), "emotional intelligence is the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth." Edu 4.0 teachers need these skills in many levels in building learning communities with students, colleagues, managers and other stakeholders beyond their institution. Hence, social awareness and dialogical skills in creating concrete solutions for Industry-Education collaboration in Education 4.0 are the focuses of this competence area.

These Education 4.0 competencies require a deep level understanding of human learning processes and the ability to build them in practice in online and real-world learning environments. However, theoretical knowledge, or even practical knowledge, is not enough. Education 4.0 competencies need to be seen in a holistic way, as combinations of knowledge, skills and attitudes (e.g. European Commission, 2016; Eraut, 1994) or combinations of knowing, doing and being (see, Barnett 2009). Teachers' attitudes towards the new paradigm of Education 4.0 are crucial. Furthermore, they need to find

their new way of 'being' as a teacher in Education 4.0 with a continuously learning '*growth mindset'* (see, Dweck, 2012, Kunnari, 2018). Hence, the current study investigates teachers' perceived usefulness in the light of these competencies.

The process of EMVITET-project

The process of EMVITET project is based on development cycles (work packages, WPs) following a participatory action research approach (Kemmis & McTaggart, 2005). As a capacity-building project, individual teacher participants and educational institutions from Vietnam develop their competencies from their individual starting points. (For more detailed description of the partners and the project see Introduction). The first "WP 1 preparation" started at the beginning of 2019 with self-evaluation, kick-off meeting and building all the digital environments and common guidelines for collaboration. Further, the educational managers of the institutions visited Finland and built a common vision on how to support the development process. In September 2019, "WP 2.1. Establishing" started with the EMVITET teacher participants' study visit to Finland. During this three- weeks intensive and active learning period, teachers were introduced to a wide variety of Finnish educational practices in Education 4.0. The teachers were also facilitated to form institutional teams, called homegroups, to support collaboration in development. After the study visit, the teachers continued experimenting and disseminating new practices in their own work context together with their homegroups. At the end of 2019, common workshops were organized in Vietnam in which the homegroups demonstrated the outcomes in establishing Edu 4.0 development.

The first months of 2020 were reserved for WP 2.2. Piloting of Edu 4.0 practices. The EMVITET teachers were already in good progress with their activities when Covid-19 pandemic started to spread in early February 2020. This pandemic dramatically changed the situation in all Vietnamese schools as campuses had been closed for the break then continued to close without a plan for reopening. Thanks to the project input, teachers who are involved in the EMVITET helped their institutions to organize trainings on various topics that were needed for online teaching and learning, and online student assessment. With the support of teacher training, the six institutions were able to quickly offer online classes for students during the months of February 2020 till August 2020. With the new semester of school year 2020-2021 started around October 2020, those institutions have continued enhancing their online teaching and learning. One of the Vietnamese partners, HCMUTE, has institutionalised its policy which allowed the teaching and learning to be organized online for three out of its 15-week semester.

The data of the current study is collected during the Covid-19 pandemic so it reflects the general impacts of the EMVITET project so far and also the EMVITET teachers' and institutions' perceived capacity to adopt and innovate Education 4.0 teaching and learning practices.

The aim of the study

The aim of this study is to describe how the EMVITET partner institutions and the teacher participants have experienced the impacts of the EMVITET project after one year of implementation in developing Education 4.0. The other aim is to describe how they experienced the situation with Covid-19 pandemic when educational institutions in Vietnam needed to be closed and start to work online.

The research questions are:

1. How have the EMVITET partner institutions experienced the impacts of the project in institutional, teacher, student and ecosystem level?
2. How have the EMVITET teachers experienced their development in Education 4.0 competencies in pedagogy, digital technologies and learning ecosystem?

3. How have the EMVITET institutions and teachers experienced the Covid-19 pandemic when developing Education 4.0?

2. METHODS

This study is a qualitative case study (Yin, 2014), in which the EMVITET project forms the 'case'. It also represents practice-based research or practitioner research, which refers to 'workplace research or development work within a professional field, that is carried out by practitioners, who are personally involved with the professional practices, actions and activities of the field' (Heikkinen, de Jong, & Vanderlinde, 2016). The participants of the study are the EMVITET project partners as practitioners, who reflected and described their experiences. Furthermore, three authors of the article are personally involved in coordinating and facilitating the project. The focus of the study is on describing what have been the general impacts of the project and how participants have experienced the development of Education 4.0 during the Covid-19 pandemic.

The data for this case study were collected after one year of project implementation during the Covid-19 pandemic. At first qualitative data was collected from 35 EMVITET teacher participants in March 2020. All the participants had teaching positions and some of them worked also as managers. A second survey focusing at an institutional level was collected from six Vietnamese partner institutions in April- May 2020. Both data were collected with online questionnaires, which contained open questions with different themes related to institutional and individual teachers' development in Education 4.0.

The study utilizes qualitative content analysis in analysing the experiences. Qualitative content analysis can be viewed as a mixed-method approach in the process of analysis as it consists of both qualitative and quantitative elements: the qualitative creation of categories and the quantitative identification of frequencies from the text passages (Mayring 2014, 10). The method of analysis had an inductive emphasis (eg. Elo & Kyngäs 2008) understood as a way of categorizing the data before predetermined categories. However, the research aims directed the broad context of the analysis from the perspectives of pedagogy, digital technology and the learning ecosystem.

The data concerning teachers' responses and institutional responses were analysed separately according to the themes in the questionnaires. The data was coded as small units where one response could include different meaning units. The meaning units such as words, sentences and paragraphs can be seen as parts of the units of analysis that can be meaningfully interpreted in relation to the formed categories (Schreier, 2012, 131; Graneheim & Lundman, 2004). The analysis process of the teacher questionnaire data proceeded from the identification of limited and fuller answers where the latter included more detailed descriptions of the elements in question. After the first phase of coding, the meaning units were categorised under broader categories. The quantification included the exploration of how many participants had brought out the elements under a certain category. For the institutional questionnaire data, the process of analysis proceeded similarly, however no quantification of the data was done due to the small number of the institutions.

3. FINDINGS

The findings of this case study demonstrate the EMVITET teacher participants' and their institutions' experiences about the impacts of the project in developing Education 4.0. Furthermore, it describes how they experienced the Covid-19 pandemic situation when rapidly moving to online teaching and working. In the following sections, we first present the general institutional level experiences and individual teacher participants' experiences in terms of the development in Education 4.0 competencies. Then we move on to present teachers' experience in the Covid-19.

Project impacts: an institutional view

In order to answer the first research question, the data of the six partner institutions were used. The findings summarize the experienced impacts in terms of the following categories: institution, teacher, student, and learning ecosystem.

Project's impacts at an institutional level

According to the institutional responses, the EMVITET project had an considerable impact on the institutions' capacities to develop Education 4.0. The partner institutions mentioned especially pedagogical practices and development of online education, management practices, facilities and devices, and industry collaboration. Table 1 summarizes the responses in two aspects: the institutions' capacities to develop Education 4.0 as well as the institutions' concrete achievements in relation to the different capacity areas.

Table 1. *The EMVITET project's impact on the institutions' capacity to develop Education 4.0 and institutions' concrete achievements*

EMVITET project's impacts	Institutions' capacity to develop Education 4.0	Concrete achievements in the development of online education or online working
Pedagogical practices and development of online education	• increased knowledge • possibility to share experiences and materials • training of staff • increased motivation and inspiration • research initiatives	• knowledge about online learning • application of digital tools • conduction and participation in online teaching and learning • workshops, online meetings, seminars • creating an environment for sharing • conducting research (e.g. how to encourage teamwork, manage online learning) • a positive spirit in working online • have a vision about Education 4.0
Management practices	• changes in leaders point of views (education based on Education 4.0), clearer vision • modifications in curriculum • redesign of academic programs (flexible, practice-oriented, with project-based and work-based learning)	• establishment on advisory boards and councils • online administration management • development of policies regarding online learning • user manuals
Facilities and devices	• fulfil the online learning conditions (internet, lab rooms, multimedia rooms) • investments in establishing learning management systems • institutional capacity in hosting more full online courses by building an institutional supported virtual learning environment	• assistance with technology and content development • solidarity in support • effective support • development of physical facilities and learning management systems • institutional purchase of online tools and applications licences
Industry collaboration	• strengthen the connections with external businesses	• connect with businesses in building curriculum • workshop with business partners

Project's impacts at a teacher level

All the partners indicated that the project had a clear impact on teachers' learning. The teachers had learned to recognize, understand and develop the different aspects of Education 4.0. They had learned about different methods and tools and of their effective application. For instance, the following quote suggested that the application of the newly learnt knowledge and skills have changed teaching practice: *"With the motivation of applying this useful knowledge and skills to class, they have actively shifted their traditional teaching methodology to digital pedagogy."*

The partner institutions mentioned the project's impact in terms of the change of teachers' mindset and diverse applications of teaching methods. It was mentioned that the teachers had changed their views about traditional teaching methods recognizing the importance of student-centred approach. They recognized the teachers' new abilities in preparing lessons towards active learning, reducing teacher-centred presentations, giving situations for students to discuss and solve problems in teaching activities. Lectures were described to have become more interesting, lively and active. Student-centred approach was highlighted in the responses. Several specifications of the teachers' learning were given such as competence development in blended learning, problem-based learning, project-based learning, experiential learning, case-based learning, flipped learning approach and dialogical collaborative knowledge construction. The partner institutions also mentioned the teachers' new skills in developing curriculum and models for university-business collaboration. Furthermore, they mentioned that the teachers were able to improve assessment practices with digital tools, develop performance assessment, peer and self-assessment, and the use of ePortfolio.

Furthermore, internal collaboration within institutions had strengthened. Some of the partner institutions highlighted the teachers' new abilities in sharing experiences and knowledge about Education 4.0 with other teachers within an institution e.g. by benchmarking, hosting webinars to train other teachers with some digital tools, organizing workshops and discussions. Institutions described that the homegroups had managed to work as authentic teams: *"Our EMVITET teachers have collaborated so well. They actually make up a perfect team. They effectively work together to build up the training program, allocate jobs for each member and provide mutual support during the program*

Project's impacts at a student level

According to the responses, the project had promoted the implementation of a student-centred approach. Through the change, the students took a more active role in their learning as the next quote illustrates: "*changing the method of teaching with a student-centred philosophy, students gradually change their learning habits, actively participate in discussion activities and have a habit of planning… Based on the active content, methods and teaching activities, students have a positive change in their sense of individual learning and development."*

The responses focused largely on online learning. According to the responses, online learning brought new learning possibilities for the students. One of the conveniences had been the flexibility of online learning where studying could happen from anywhere through different tools and materials. Through online tools, the organization of teaching and learning became clear. The students had also developed important technological skills through online learning, which can be beneficial for their future work. According to some of the responses, the students had also taken more responsibility for their own learning. It was recognised that

online learning can motivate the students in a new way through attractive and interesting learning material. It was also mentioned that the conditions for online learning differ among students, therefore more experiences and sharing among both teachers and students is needed in order to improve the quality of online learning.

Project's impacts at a learning ecosystem level

Regarding the learning ecosystem building, the institutions were asked to evaluate how the project has influenced the collaboration between partners and collaboration with the industry.

The industry-education collaboration has diverse forms. Some are related to curriculum development, such as collaborations between a school, a company and a local authority to build joint curricula or improve existing curricula by acknowledging the industry needs and receiving feedback. Other aspects were related to the cooperation projects and forums, such as setting up projects with students, teachers and companies, organizing workshops to decrease the knowledge gap between the educational institution and industry, creating internships, job possibilities, organizing academic contests and scholarships for students, and establishing councils that external experts were invited to.

Improved collaboration between the EMVITET partners was mentioned in all the responses. The participants described different forms of collaboration activities which increase the sharing of experiences. These activities had been carried out through diverse forms and channels. Webinars, seminars and workshops were organized, which offered possibilities to reinforce the development of Education 4.0 through peer support and feedback. It seemed that collaboration was important to the institutions' staff: *"The project gives lecturers of participating schools the opportunity to share, learn and grow together through webinars".*

Almost all partner institutions also experienced that the project facilitated institutional collaboration with industries and other external stakeholders. One institution experiencing no improvement described that due to Covid-19, in general, businesses were facing difficulties in maintaining their activities, thus collaboration possibilities were limited.

The project impact – teachers' view

The second research question was related to how the EMVITET teachers have experienced their development in Edu 4.0 competencies. Individual teacher participants were asked to evaluate what they had specially developed regarding the three main Education 4.0 competence areas; Pedagogy in Edu 4.0, Digital Technologies in Edu 4.0 and Learning Ecosystem in Edu 4.0.

Development of Pedagogy in Edu 4.0

The participants were asked what they had especially developed related to student-centred learning, which illustrates the competence development of Pedagogy in Edu 4.0. Table 2 presents the different elements based on the teachers' responses. The elements involved enriching and engaging learning with digital technologies, interaction and collaboration practices, students' activation and taking into account the student perspective.

Table 2. *Elements of development in student-centered learning*

Development of student-centred learning	Number of participants describing the element	Quote example
Enriching and engaging learning with digital technologies	20	*"…I also make presentations with audio, video clips, samples, database to support students' learning activities."* *" I have uploaded the document to Google classroom, ask students to research and answer questions, or students can ask questions about issues they don't understand. We will solve those difficult issues together in the online lesson."*
Interaction and collaboration practices	14	*"…to interact directly to explain and answer students' questions, encourage students to discuss and share their knowledge with other members"* *"… Students discuss to find common goals then divide into groups to complete the set goals. At the end of the topic, students report the results and procedures, and other groups evaluate and learn from experience."*
Students' activation	14	*… I have asked my students to set their learning objectives and plans. Also, I direct students about self-study skills, self-assessment and support them do these by themselves. Besides that, I often encourage the student active in their learning through digital tools…"* *"Deploying teaching by the flipped classroom method. Enhancing discussion, critical thinking, creation and collaboration activities in the classroom. Increased support for each individual."*
Taking into account the student perspective	6	*"I have discussed with students the possibility of transferring to online courses in this situation and instructed them on how to learn online with new ways. I also allow them to decide how to present their results."* *"Before teaching, lecturers have to understand students' ability to find suitable methods for teaching, evaluating and meeting the requirements in the current situation (Online Learning). In addition, in the teaching process, lecturers should collect feedback from students regularly in order to timely modify teaching methods or plans to bring the best results."*

The most mentioned element was enrichment and engagement of learning with digital technologies. The teachers either stated increased creation of online materials or described in more detail the material they had created e.g. videos and lectures with audio. In developing students' learning, they had also mentioned the increased students' collaborations and interactions between teachers and students, which is a really important aspect aligned with the socio-constructivist perspective of learning (Lave & Wenger, 1991; Salomon & Perkins, 1998; Vygotsky, 1978). The third element was related to students' activation with different methods. Teachers had transformed theory-based teaching towards students' learning by activating students' own thinking before, during and after teaching sessions, and providing practical situations. Also guiding for self-study and actions for supporting student's self-regulated learning were brought out as ways to help students become the owner of their learning. Furthermore, acknowledging student perspective in developing teaching and learning practices

was also mentioned. Concrete examples are: listening to the students' needs and preferences, taking into account their previous knowledge when designing teaching, collecting feedback and supporting the students in the process of employing online learning.

Development of Digital technologies in Edu 4.0

The participants were asked what they had specially developed regarding Digital Technologies in Edu 4.0. In order to illustrate different aspects, the participants' responses were grouped under three categories: the use of learning management systems (LMS, learning platforms such as Moodle, Google classroom), the use of digital tools (such as Zoom, Kahoot), the use of video enriched teaching (see Table 3.). The descriptions varied from merely mentioning digital technology tools to full descriptions of the digital technology usage with some reflection, so each category is divided into two subcategories.

Table 3. *The use of digital technologies in teaching*

The use of digital technologies in teaching	**The use of learning management systems**	**The use of digital tools**	**The use of video enriched teaching**
Mentions	*"teaching and learning online with LMS (moodle)"* *"I am teaching online via LMS"* *"work on digital platforms and environment"* n= 11	*"I currently use ZOOM for online teaching"* *"Using digital tools and online learning methods"* *"I use: google classroom, Kahoot, google form, Power point, zoom, meet in my teaching"* *n=12*	*"Video online teaching skills"* *"interaction video"* *"I am using powerpoint 2019 to create video courses"* *n=4*
Descriptions	"*I have built some exercises and projects on the Moodle system for students, and guide students to self-study"* *"Redesigning online teaching activities on LMS: guide students to self-study, provide learning resources, create activities, evaluate and discuss"* *"I have applied Think-Pair-Share method and the digital platform of Google classroom (google tools) to organize and implement the classes in the last semester"* *n=16*	*"… I use Poll everywhere to collect students' feedback. I use Zoom to teach some lessons and interact with students"* *"…Besides that, I often encourage the students to be active in their learning through digital tools like Kahoot, poll everywhere"* *"Organizing face to face discussion via Zoom every week to check students the knowledge and answer their questions"* *n=17*	*"Previously the lecture was mainly written on powerpoint but now I inserted the voice to the lecture, collect more video files to make the lecture more lively"* *"Building learning resources for students to online study: record instructions and give short videos to help students learn easily"* *"…In order to help students to understand clearly, I give them short videos to explain the examples for each typical exercise type and these videos in the PowerPoint slide which are divided into small parts to suitable for each week"* *n=6*

The findings suggest that through the participation in the project, most of the teachers have used digital technologies to improve students' learning experience. Altogether 27 out of 35 lecturers mentioned that they have used learning management systems (LMS). Among them 11 participants mentioned the LMSs and 16 participants specified for what purposes they had used the systems. These included purposes such as: interaction, encouraging students' self-studying, redesigning teaching practices, managing the classes, implementing lessons and exercises, creating discussion possibilities, creating material for different competence levels. For the digital tools, 12 participants mentioned some digital tools and 17 participants described in more detail the use of tools such as: interacting with students, collecting feedback, answering students' questions, creating surveys, and supporting the students' engagement in their learning. Four participants also mentioned video enriched teaching and six participants gave more detailed specifications how they have supported the students learning through video enriched teaching.

Development of Learning Ecosystem in Edu 4.0

In this phase of the project, Learning Ecosystem competencies were more focused on building learning ecosystem within the EMVITET partners. The participants were asked how they had collaborated or supported each other. All the answers contained elements of collaboration to some extent. Majority of the answers were brief descriptions of collaboration. The answers contained elements of informal sharing of experiences and practices, common knowledge building through organized sessions and co-creation of new practices (see Table 4.).

Table 4. *Elements in relation to collaboration and support*

Collaboration and support practices	**Number of participants describing the element**	**Quote example**
Informal sharing of knowledge and practices	18	*"I and my colleagues regularly exchange experience and guide each other using digital tools"* *"Relating to collaboration with my colleagues, I have shared with my colleague the ideas of online teaching design, techniques to work with digital tools, sharing digital learning resources I am building and encouraging others to participate in online teaching."*
Common knowledge building through organized sessions	18	*"I have participated in some workshops in my faculty and university to share with my colleagues about how to design e-learning lessons and how to use some tools and application softwares."* *"Organizing seminars for lecturers to help them have basic concepts of Education 4.0 gives instruction about building online lectures on LMS, online interaction synchronously, screen recording and survey tools."*
Co-creation of new practices	12	*"We not only hold workshops for training our teacher about Education 4.0 but also build platforms, put forward a great many ideas to improve the style of work and connect with our industry partners together."* *"My team has 3 teachers, we designed common courses and we supported each other while delivering these courses."*

Many of the teachers described informal sharing of knowledge and experiences with their colleagues. This included more general sharing of experiences among the EMVITET teachers either with their colleagues in their own institutions or teachers working in other institutions. The teachers described that they had guided and supported each other, discussed good practices, encouraged and instructed others and given feedback. The teachers also described common knowledge building through organized sessions. These included participation and organization of workshops, seminars, webinars and such for the purpose of competence development and sharing experiences. Collaboration was also actualized through co-creation of new practices. The co-creation included development of teaching practices in collaboration, co-teaching, development of materials and tools and organizations of training and sharing sessions in collaboration. These different practices of collaboration and support were mainly related to the use of digital technology and designing and implementing online teaching.

Experiences regarding Education 4.0 development during Covid-19

The third research question focused on how the EMVITET institutions and teachers experienced the Covid-19 pandemic situation while developing Education 4.0. This research question is not totally separated from the experienced impacts described in previous sections. The findings of this last research question further demonstrate the contributions of the project as the Covid-19 demanded a fast transformation of education technology-supported teaching practices in Vietnam. The findings presented here focus on the teachers' and partner institutions' implemented practices, competence development possibilities, as well as needs and challenges.

According to the partners' responses, the transformation to online education was seen both as a necessity and as an opportunity. One institution described how the situation required the change to happen rapidly and how the timing of the project was quite optimal in adaptation: "*Frankly, before the pandemic, a majority of our teachers did not care much about digital tools as well as teaching online so they were not really engaged with webinars or workshops related to teaching online. It was somehow difficult to get them to actively study new digital tools and methodology. However, when all schools were closed, they started to change their minds. Teaching online turned into their concerns. It was the right time for EMVITET teachers to disseminate useful knowledge to the others*". Another institution further described the corona situation as an opportunity for developing online education: "*The COVID19 situation brought an opportunity for the teachers to apply what had been learned in Finland on designing online courses with clear strategies and more self-confidence. This situation was also giving the teachers not only the time but also the effort to build the online courses*."

There was variation in the institutions' capacities to build online education in the Covid-19 situation, as the partner institutions in the EMVITET project were in different development phases in developing online education. Some of the partners already had LMS and many digital tools and applications available, and they observed that many teachers already had the skills needed to build online education. They also described the building of programs, opening online classes and conducting an evaluation of effective online learning. Other partners were just starting to build LMS and expressed the need to be able to buy new licences for applications and software. They felt that especially the incomplete infrastructure created challenges for building online education.

Between the EMVITET teachers there was variation in how they described their experiences during Covid-19. Some of them only mentioned what different digital tools they had utilized, and the others highlighted developmental actions, for example, the need

to learn to use digital technologies in pedagogically meaningful ways in building students' engagement and activity. However, all the partner institutions mentioned positive experiences related to the teachers' peer learning and support. The EMVITET teachers were ready to share and rapidly develop good practices in Education 4.0. They organized training and workshops for staff in a demand-driven way regarding the use of digital tools and environments.

Many of the reported challenges were related to students' ability to manage when moving totally to online learning. The partners mentioned students' lack of experience in online learning, challenges in studying at home environment with distractions and unequal conditions such as a lack of necessary tools like laptops or Wi-Fi-connections. The teachers also mentioned challenges in motivating students to study in online environments. The changed situation required the students to have skills in adaptation, responsibility, self-discipline, self-study and learning management. The teachers were missing more intensive interaction with their students and the possibilities of knowing how the students were managing. Some partners mentioned also that students' absences were prolonged. A special challenge was experienced with study content that usually required practical training, as not all the learning activities were not possible to directly move to online environments. However, according to the partners' responses, the students' experiences in the Covid-19 situation varied whether they wished to be back in face-to-face teaching or were content with the online environments. Students' positive aspects of the changed situation included time efficiency (no travel time), flexibility in organizing teaching and learning, variety of tools, digital tools enabling interaction (easy and free discussion and sharing ideas), online learning and tools to support development of students' skills in self-study.

Especially in the Covid-19 situation, the teachers' capacity needs were related to digital pedagogy, online environments, instructional design and tools and online assessment. Some specified needs in relation to curriculum design, application of appropriate tools and skills in supporting interaction and students' motivation in online studying. Teachers were described to have prepared online teaching materials, shared information through peer support, applied soft skills and guided students and created conditions for online studying. *"I see the teachers in the EMVITET project have provided a lot of information related to teaching technology. That's good."* The availability of digital and technological support was also important. Furthermore, teachers brought out the institutional leaders' key role in encouraging and supporting the staff in building online education.

Despite the challenges of the new situation, some of the descriptions indicated that participants were content with gaining adequate information or skills in using certain tools as well as receiving support from the project: *"We can share practical experience and approaches to attract students' attention and interest in using online materials and resources. I think it is great that each partner can share their success story to others so we can learn from each other."*

4. CONCLUSIONS

The core element in the EMVITET project is teacher learning. When the project aims to create a personal experience for teachers of a learner-centred process, all teachers who are involved in the project are engaged in self-assessing their starting point and development through the support of peer learning and the support of organisational structures. Moreover, the corona situation also stimulated all partner institutions to take concrete action in helping teachers rapidly apply Education 4.0 pedagogical practices in the Vietnamese context.

The project acknowledges that for sustainable development, individual teacher learning, and organisational learning need to

be integrated (e.g., Clarke & Hollingsworth, 2002; Edwards, 2005; Fullan, 2016; Giles & Hargreaves, 2006; Kunnari, 2018). The reported findings provide solid cases, showing that the participatory and collaborative approach deployed in the project had a positive impact in achieving project goals, that is developing Education 4.0 competencies. As Education 4.0 requires systematic changes in the whole learning ecosystem, emphasis shall be continuously put on improving collaboration and networking between students, teachers, educational managers, industries and relevant stakeholders.

The impacts of the EMVITET-project have been observable. The teachers had developed the ability to implement teaching practice that focuses on student-centered and competence-based with digital technologies, while they are engaged in building online sessions for blended learning and/or develop full online programmes. Institutions have gained more experience at a management level to provide more and more resources to encourage academicians to use technologies in their classrooms realizing the higher education 4.0 and the industrial revolution 4.0. The actual digital teaching and learning experience has and will help individuals and organizations learn more about the tools and understand when, why and how technology can be used meaningfully. We believe through learning by doing, learning by networking and collaboration, teachers and institutions will be more confident, inspired and motivated in applying education 4.0 within a better-established learning ecosystem.

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