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PRE-SERVICE TEACHERS' EXPERIENCE OF TECHNOLOGY-ENHANCED PROJECT BASED LEARNING

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Abstract: *Pre-service teachers need to develop a thorough understanding of the technology, subject matter, pedagogy, and how these aspects work together. To help pre-service teachers integrate technology into teaching in meaningful ways, technology cannot be taught separately. This paper highlights 4 pre-service English teachers' actual experience of the process they went through as preparing digital audiobooks for teaching English to young learners. The data collected from a qualitative survey and semi-structured interviews which were then analyzed using an inductive content analysis. The prospective teachers mention the benefits of completing the project, i.e. critical thinking, collaboration, creativity, and technology skill to the development of their pedagogy and technology competence. Also, the pre-service teachers revealed that the experience shaped their identity and role as teachers in a digital learning environment. The data confirm technology-enhanced Project-based Learning is essential to teacher education in the 21st century era. Hence, teacher educators might need to navigate effective teacher training for ICT competency development.*

Keywords: *Project-based learning, technology integration, pre-service teacher*

INTRODUCTION

Education in the 21st century requires the adoption of learning approaches that instill students with critical thinking, creativity, communication, collaboration and digital competence. The keys to meet the requirement are technology integration and student-centered learning approach. So, teachers must integrate technology, subject matter and pedagogy in a systematic manner (Mishra & Koehler, 2006). In fact, at the global level, the United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Information and Communication Technologies (ICT) Competency Framework for Teachers as a reference for countries to develop competency frameworks, assessments and preparation of teacher education curricula (Çebi & Reisoglu, 2020).

However, researches showed that teachers' ICT competence in European and Asian countries are at low level (Gudmundsdottir & Hatlevik, 2018; Ismaili, 2021; Sánchez-Cruzado *et al.*, 2021). This situation is challenging due to the success of ICT implementation in classroom is mainly determined by teacher's perception, knowledge and skills. Similarly, student teachers in various teacher training institutions were found to have low digital competence. For example, pre-service teachers in Italy and Poland rated their digital competence low and highlighted the challenge to

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integrate ICT in some areas of learning and teaching (Tomczyk *et al.*, 2022). Likewise, pre-service teachers in Turkey were found to have moderate level of perceived digital competence (Çebi & Reisoglu, 2020). Meanwhile, a study reveal that very few pre-service teachers in Indonesia critically and creatively integrate various types of digital technologies in their professional practice (Wardani & Santosa, 2022).

The findings amplify the fact the while most prospective teachers are digital natives, their skills to integrate ICT tools in academic life is not an automatic process (Li & Ranieri, 2010). A survey to teacher trainees in three universities in Slovakia and the Czech Republic showed that the students need innovation in the curricula (Haskova & Zahorec, 2020). In another study, first year student teachers in Spain were found to yet achieve the digital competence (Casillas Martín *et al.*, 2020). Therefore, it is believed that digital competence should be promoted and taught explicitly in teacher education institution. Studies recommended adding practical activities, such as design activities and projects to facilitate the future teachers' digital competence development (Çebi & Reisoglu, 2020; List, 2019).

Indeed, the incorporation of Project Based Learning (PBL) in teacher education training promotes many areas of learning, including the development of digital competence. For example, English as a Foreign Language (EFL) prospective teachers showed higher level of Computer Assisted Language Learning (CALL) competency following PBL project (Tseng & Yeh, 2019). Similarly, 120 teacher candidates in Spain developed digital skill as well as higher-order thinking skill after designing projects for teaching English to young learners, such as digital mind map, interactive poster, digital storytelling and AR-based lesson (Belda-Medina, 2021). Lastly, PBL facilitated teacher trainees to form their role perception as digital-age teachers (Avidov-Ungar & Tsybulsky, 2021; Koşar, 2021).

While studies have provided empirical quantitative evidence on the efficacy of PBL to the development of prospective teachers' digital competence, the pre-service teachers' experiences during the accomplishment of the projects remain unexplored. Therefore, this study aims to explore the experience of 4 pre-service teachers in Indonesian university as they prepare audiobook for teaching English to young learners.

LITERATURE REVIEW

Teacher Digital Competence

Teacher digital competence is digital media literacy skill to perform tasks related to the use of the Internet, digital hardware and software to achieve pedagogical and educational goals. Furthermore, Spires & Bartlett (2012) elaborated three cognitive process in using digital media, i.e. finding, producing and communicating digital contents. Therefore, teachers not only need to be able to use the devices, but also critically and selectively consume and/or produce digital media.

Due to the complex nature of teachers' digital competence, a body of research recommends explicit teaching and training of digital competence at teacher education institutions. Likewise, in order to standardize the competence, UNESCO published the ICT Competency Framework for Teachers. Various frameworks have been developed to measure and diagnose teachers and

prospective teachers' digital competence today. Despite the unavailable global agreement of the framework for teacher digital competence, it has been generally accepted that digital competence is essential for teachers. Figure 1 depicts the concept digital competence of prospective teachers.
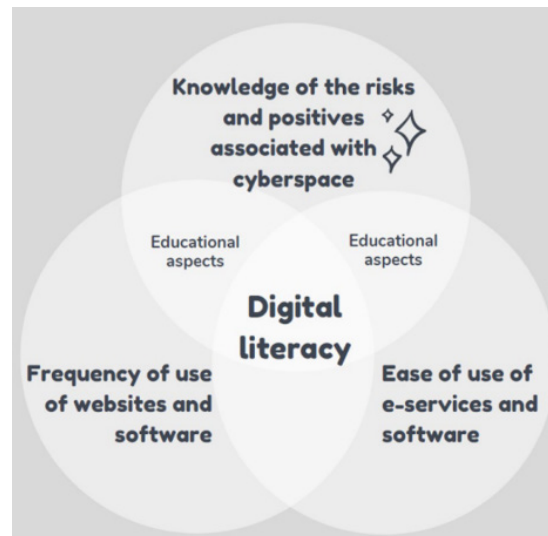
Figure 1. The concept of future teachers' digital competence (Tomczyk *et al.*, 2022)

Technology Enhanced Project Based Learning in teacher education

Learning will be most effective when students are involved in authentic tasks or learning by doing. This is because the most important evaluation of learning must be based on students' abilities to use knowledge in real-world contexts. One of the learning models reflecting such concept is PBL which requires students to plan and design authentic projects in group. Moreover, PBL not only requires students to understand information, but also foster collaboration and communication (Mitchell *et al.*, 2009). In order to optimize the learning experience, the Gold Standard of PBL should be acquired (see Figure 2). The Gold Standard of PBL consists of 7 elements, i.e. 1) *challenging problem or question*, (2) *sustained inquiry*, (3) *authenticity*, (4) *student voice and choice*, (5) *reflection*, (6) *critique and revision* and (7) *public product* (Thomas *et al.*, 1999).

Figure 2. The gold standard of PBL (Thomas *et al.*, 1999)

PBL has become part of educational practice since 1980s and remain increasingly popular in pedagogical development projects. Apart from that, the approach is strongly influenced by a communicative and student-centered approach which aims to motivate, form creativity, critical thinking, collaboration, independent learning, and other meaningful learning skills. Hence, the integration of technology in PBL is an ideal means to instill digital competence. In fact, students carry out all the cognitive process in using digital media as proposed by Spires and Bartlett (2012). First, students search for inspiration or project materials through internet-based search engines or other digital pages (Santhi *et al.*, 2019). Then, in the design and project preparation phase, students use various software, applications or sites (Dooly & Sadler, 2016; Lin *et al.*, 2015). Finally, feedback from teachers and/or other groups can be conveyed in cyberspace through comments columns on social media and/or other sharing sites (Lin *et al.*, 2015).

In addition, technology in PBL does not only serve as a tool for completing the projects. The keys to success in PBL are interaction and collaboration (Park & Hiver, 2017). ICT also extends the range of interaction and collaboration. For example, by using the international online collaborative learning web site, APEC Cyber Academy, students from various countries can collaborate and improves the quality of communication and strengthens cohesiveness following the feedback from group members (Lin *et al.*, 2015). Last, the use of technology for global collaboration can increase students' knowledge about learning material and increase awareness about global issues (Dooly & Sadler, 2016). Hence, technology-enhanced PBL creates opportunity for digital competence development.

Indeed, investigation of PBL integration in various teacher education contexts quantitatively showed great increase in many areas. It was found that that EFL pre-service teachers' CALL competency increased after involving in a PBL training (Tseng & Yeh, 2019). A recent study also reported how a technology enhanced PBL successfully helped 120 Spanish pre-service teachers to develop digital skills and higher-order thinking skills (Belda-Medina, 2021). Not only that the pre-service teachers' digital competence increased, technology-enhanced PBL also facilitated them to shape perception and roles as teachers in digital era (Avidov-Ungar & Tsybulsky, 2021; Koşar, 2021).So, informed by the theory of how PBL can promote understanding of key knowledge and skills as well as evidence on pre-service teachers' digital competence quantitative progress, this study aims at exploring the pre-service experiences during the completion of the project.

METHODOLOGY

Research Design

This study used narrative inquiry which gathers individuals' experience on certain phenomena (Barkhuizen *et al.*, 2013). The design in appropriate in capturing the experience of the participants during the project completion and how the experience would contribute to their digital competence as well as role perception of digital-age teachers. The research shades light on prospective teachers' experience in designing digital teaching resources for young English language learners, i.e. audiobook.

Participants and Classroom Context

This study was conducted in the academic year 2022 at an English Education Department at a public university in Indonesia. It involved four participants, including two male students i.e. Eko and Gaga, as well as two female students, i.e. Nina and Rani (pseudonyms). It was conducted in the Instructional Media and Activities of English for Young Learners course. The course is an elective course offered for 7th semester students. One of the course objectives is students to be able to evaluate and use effective media appropriate for young learners in EFL classroom.

For this research, four meetings were conducted to immerse the pre-service teachers in a Technology-Enhanced Project Based Learning. (Helm *et al.*, 2023)'s Project Development Phase was used in this study. Students were working in groups of four to design an audiobook. The first meeting was spent at discovering the features of audiobook and analyzing samples of audiobooks. Students were also familiarizing themselves with *Canva* and *Vocaroo*. The rest of the meetings were spent at developing the audiobook. In designing the audiobook, students utilized two software applications, i.e. *Canva* and *Vocaroo*. Students used storybook template available in *Canva*. They were given the opportunity to modify the story template when necessary. Then, they read aloud the story using *Vocaroo* and inserted the recorded audio to the page of the audiobook. Last, they closed the project by sharing their audiobook drafts in *Padlet* and gave each other comments to improve the quality of the audiobook. Following feedback from the class members, each group made revision then submitted the revised audiobook in the class' Learning Management System. Figure 3 presents the project development phase.

Figure 3. Project development phase

Data Collection and Analysis

To gain the participants' experience in creating audiobook for young English language learners, multiple personal narratives were gathered, i.e. oral narratives by means of interview and narrative frames. The participants explained their experience in each phase of the audiobook project development. They also shared their reflection on how the experience would shape their future professional teaching career. The narratives were told and written in bahasa Indonesia, the participants and author's mother tongue. Both interview and narrative frame were collected at the end of each phase of project development.

There were 12 written narratives in total and 120-minute interview transcription. Their narratives were analyzed for pattern and themes. Inductive analysis was conducted in three phases (Creswell & Guetterman, 2019). First, the data was coded by labeling the data. Then, the codes were examined for any redundant and overlapping data. Last, the codes were collapsed into broad themes. In order to avoid bias, member checking was done to validate the researcher's analysis and interpretation.

FINDINGS AND DISCUSSION

This study aimed at investigating the experience of four pre-service English teachers in technology enhanced PBL in which they designed digital audiobook using *Canva* and *Vocaroo*. Gaga and Rani were representatives of Group 1. Their audiobook entitled "My Family" (see Figure 4 for sample pages). The story tells about weekend activity of a family. Meanwhile, Eko, and Nina were representatives of Group 2 who developed an audiobook entitled "All the persons I can be" (see Figure 5 for sample pages). The story centers at description of occupations. As the pages unfold, readers can click on the green audio icon on the top of each page to listen to the story being read.

Figure 4. Sample pages of Group 1 audiobook

Figure 5. Sample pages of Group 2 audiobook

There were four themes emerged from the analysis of the participants' narratives, i.e. (1) critical thinking, (2) group dynamic, (3) creativity, as well as (4) technology skill and teacher role-perception. In general, involving in the PBL strengthen the pre-service teachers' digital competency. They continue to refine their digital skill as they were introduced to new educational tools. Likewise, developing the audiobook shapes their identity as future digital-era teacher. They value the hands-on experience offered by PBL in preparing them for future career.

Critical thinking: Young learners' needs and learning strategies

Engaging in a hands-on experience to develop audiobook for young English language learners has successfully trained the teacher trainees' critical thinking skill. The participants mentioned that they used their knowledge on characteristics of young language learners from previous courses to understand the young learners' need and learning strategies, i.e. the use of interesting visual elements and interactive story.

We understand that visual is an important element for young learners to help them understand concept, especially abstract concept. So, we looked for appealing story template in Canva.

(Rani)

Another group of participants decided to make adjustment to the template due to the lengthy pages. Interestingly, the participants modified the story to be more interactive to young readers.

The storybook template consists of many pages. We decided to eliminate some pages. We also modified the story to be more interactive. We added questions to stimulate the students prior to reading the story.

(Eko)

It can be seen in Figure 6 that the participants decided to add the question: "Who are they?" following the descriptions of the occupation. The question allows interaction with the readers.

Figure 6. Sample modification

Moreover, the reasons for story selection reflect the ability of the pre-service teachers to critically analyze the young learners' learning need. They highlighted the suitability of the topic to young learner's characteristics, i.e. family and occupation. The family members are introduced in a unique way, using the perspective of one of the character in the book. Meanwhile, the occupations introduced in the book were common and close to children's world. Not only introducing the names of the occupation, the story presents the tasks of each of the occupation.

We chose this storybook because it talks about family members and is easy for young learners to understand and remember. The language used in the story is familiar, simple, and repeated, making it easier for young learners to understand the story and remember the words and sentences. The story also can make interactive and exciting learning for the readers or young learners since the story's character will be asking some questions for the readers or young learners. The story not only talks about family members but also adds more words or vocabulary for young learners to learn. Moreover, the family members of story are well illustrated to help young learners to understand.

(Nina)

We chose this storybook because it talks about occupations which are close to the children's world. The story also tell about the tasks of the occupations.

(Rani)

Indeed, PBL would likely to increase students' critical thinking by sustained enquiry, authenticity as well as student voice and choice (Thomas *et al.*, 1999). The ability of the participants to critically analyze and evaluate as well as develop audiobook which is appropriate to young learner's development is corresponding to that of teacher candidates in Spain who successfully gained higher-order thinking skill following involvement in a similar project (Belda-Medina, 2021).

Group dynamic: Collaboration and communication

One important element of PBL is collaboration and communication. As proposed by Thomas *et al.* (1999) in their Gold Standard of PBL, students in PBL learning environment are fostered to voice their thought and opinion in regard to project development. The participants understand the value of collaboration and communication in the project development. In fact, there are times when

they have to deal with opposing opinions to increase the quality of the product. The experience also extended their empathy to accept and understand different point of views.

We need to deal with conflicting opinions. But the members are used to debating in other tasks, so it is not a big deal for us. It is good to discuss different opinions. We need to see other perspective.

(Gaga)

Finishing the project makes me realize the importance of empathy. We need to understand the characteristics of our group members.

(Eko)

However, collaboration sometimes does not work due to the lack of communication among group members. Some students were unresponsive to the collaboration process and caused delay in the project development.

Sometime we have to deal with members who lacks of response and make coordination difficult.

(Nina)

Moreover, technology was not only used to develop the project, but also in the closing project in which students share their audiobook draft in *Padlet* and provided each other feedback. Figure 7 shows sample of feedback given to Group 2. One group commented on the quality of the audio, i.e. pronunciation problem and text-audio mismatch. Nevertheless Group 2 received complement in the appealing intonation and interesting story line. In the interview, Group 2 representatives express their appreciation toward the feedback from their class members. They believe that feedback would improve the quality of the audiobook. They especially cherish the positive manner by which their class members delivered the feedback.
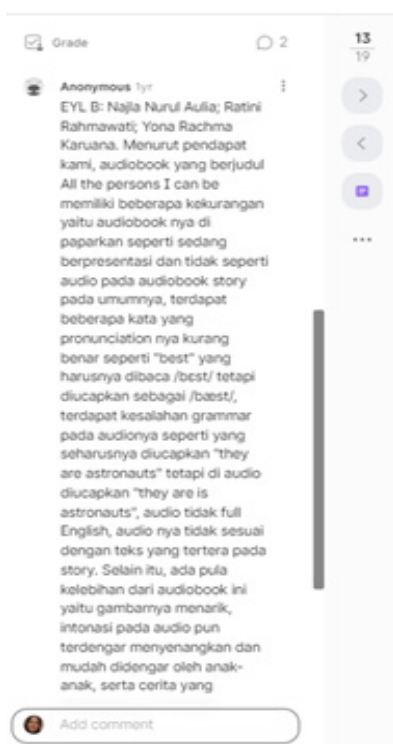
In our opinion, the audiobook entitled "All the persons I can be" has several shortcomings, namely that the audiobook is presented as if it were a presentation and unlike the audio in story audiobooks in general, there are several words whose pronunciation is not correct, such as "best" which should be read / bɛst/ but pronounced as /bæst/, there is a grammatical error in the audio such as it should be pronounced "they are astronauts" but in the audio it is pronounced "they are astronauts", the audio is not full English, the audio does not match the text in the story. Apart from that, there are also advantages to this audiobook, namely that the pictures are attractive, the intonation in the audio sounds pleasant and is easy for children to hear, and the story that is read is interesting.

https://padlet.com/karlinaevi/audiobook-ing7209-material-development-of-eyl-utb35rls388bbfzc/wish/2392392069

Figure 7. Feedback given to Group 2

Meanwhile, Figure 8 depicts the feedback given by Group 1. The group representatives raised concern in communicating their intention to improve class members' audiobook. They admitted it was challenging not to hurt their friends' feeling. Likewise, posting, commenting and receiving feedback in *Padlet* created new experience in the students' academic and future professional activities.

This story is quite interesting to teach to children because the text in this story rhymes which will be interesting and make it easier for students to read and understand the story. The illustrations or pictures in this book are very well described so that children will be helped and interested in reading and understanding the story. In our opinion, there are still parts in this story where the speaker in this audiobook is a little too fast when reading the story so that students will likely have difficulty listening and understanding the story being read. There are also many sentences in this audiobook that are abbreviated, which is best not to do because it is possible that students will have difficulty pronouncing and understanding some of these words. Then, there are still shortcomings, namely in terms of pronunciation of vocabulary that is unclear and inaccurate, for example for the words nearby and vehicles. The advice from our group is that when we still have doubts or don't really understand how to pronounce a word in English, we listen to examples in an electronic dictionary or from videos of how native speakers pronounce the words.
https://padlet.com/karlinaevi/audiobook-ing7209-material-development-of-eyl-utb35rls388bbfzc/wish/2389823577

Figure 8. Feedback given by Group 1

This finding shows that the experience expands the pre-service teachers' communication and collaboration skills (Park & Hiver, 2017). This study also extend to the previous research that communication conflicting opinions is possible in maintaining collaboration. The current research demonstrates the use of digital tool in all aspects of PBL. Digital tools used not only in developing the project, but also in providing feedback (Lin *et al.*, 2015).

Creativity

The whole project development phases require students to continuously use their creativity. In particular, the participants demonstrated their creativity in relation the beginning project. They used their creativity to discover the format and features of an audiobook.

We didn't know anything about audiobooks. So, we looked up some audiobooks in Internet.

(Eko)

Students' creativity was also improved as they were familiarizing themselves with the applications to build the audiobook, i.e. *Vocaroo*. They browsed the Internet to find tutorial videos on using *Vocaroo* and downloading the recorded audio.

We are all familiar with Canva. We design poster, edit photo, create presentation slides in Canva. But it was the first time to use Vocaroo. We had difficulties at first but we manage to overcome it

(Rani)

Likewise, encountered problems with pronunciation of English words in the story, the pre-service English teachers used their creativity to find information on the sound production and practice.

We were not familiar with pronunciation of some words. We looked up the correct pronunciation from Google then practice.

(Gaga)

It is interesting that the finding shows the participants' ability to solve problem in a creative manner. Indeed, as digital natives, these prospective teachers work closely with ICT and are able to use various digital tools with ease (Tomczyk *et al.*, 2022). In fact, they creatively utilize technology to solve technology-related problems (Wardani & Santosa, 2022). Throughout the project development, ICT has been used intensively and created many opportunities for the student teachers to foster their digital competence for professional purposes (Santhi *et al.*, 2019).

Technology skill and teacher-role perception

The participants' skill related to perform daily use of the Internet and software applications is unquestionable. However, they doubt their ability to use technology in both professional and academic activities.

I am confident with my technology skill. But I lack in ability in using technology to creatively design teaching materials.

(Gaga)

Indeed, in the 21st century education setting, teachers are expected to use their technology skill beyond using the digital devices. Teachers need to be able to consume and/or produce digital media in critical and selective manners (Spires & Bartlett, 2012). The student teachers' involvement in the audiobook development is likely to nurture their technology skill for professional purpose. They understand that using technology in professional setting requires further practice.

My technology knowledge and skill is quite good. But I think there are so many tools to know. I need to learn many tools to help me teaching later.

(Rani)

As the current literature informed, technology enhanced PBL is an ideal learning model to nurture student teachers' digital competence (Tseng & Yeh, 2019). They had many opportunities to use and explore various digital tools (Dooly & Sadler, 2016), collaborate virtually (Park & Hiver, 2017) as well as interact in cyberspace (Lin *et al.*, 2015). The experience is likely to contribute to the development of the prospective teachers' ability to utilize technology for various academic as well as professional settings.

The project made me realize that it is challenging to use technology for learning and teaching. Reflecting upon the current experience, I am unsure how to integrate technology in my future teaching practice. But I still have time to learn.

(Nina)

Furthermore, this study demonstrates that explicit training to use digital tools and innovation is beneficial. Students in teacher training require integration of innovation in the curricula (Haskova & Zahorec, 2020). Prospective teachers' digital competence, indeed, emerged through the practical activities (List, 2019).

The experience during audiobook development project also shaped the student teachers self-perception as future educators. For example, they acknowledge the school students' understanding of technology, so it challenges them to foster their technology skill. They also recognize that

technology is indispensable to today's digital education environment that they are required to be digitally competence.

Nowadays, school students know better about technology than the teacher. So, I think I need to learn more about educational technology. The experience gave me a visualization of my future career.

(Rani)

Honestly, I am not tech-savvy. But I guess it is required in the digital age. I need to push myself harder to be able to use technology for my teaching.

(Nina)

Indeed, previous researches show that PBL encourage future teachers to develop their perception related to teachers' roles in digital era. Engaging in an online PBL, pre-service teachers became aware of the tasks of teacher in digital learning environment (Avidov-Ungar & Tsybulsky, 2021). In a similar study, student-teachers "felt like a real teacher" when developing digital teaching materials (Koşar, 2021).

The research findings indicate that the grouped digital project development allows the student teachers to foster creativity, communication skill, collaboration and critical thinking.   In turn, the experience prepares the prospective teachers for their professional practice in digital-age education. Therefore, technology enhanced PBL facilitate pre-service teachers' digital competency growth.

CONCLUSION AND IMPLICATION

This research aimed at exploring four pre-service teachers' experiences in preparing a digital audiobook for teaching English to young learners and connecting how the experiences might benefit their pedagogy and technology competence. The students used different technology at every phase of PBL and provided reflections at the end of every phase. The conclusion is limited to the context of the participants of the current research. The participants' narratives showed that preparing for the project development facilitated the participants' critical thinking in analyzing young learners' need. Likewise, the prospective teachers' digital competence is practiced during the project development as they use technology to solve problems, communicate with group members, and interact with class members. Last, the experience shaped the pre-service teachers' awareness of the role of teachers in digital era. Therefore, technology-enhanced Project Based Learning successfully facilitated the pre-service teachers' pedagogy and technology competence.

Limitation of the current study should be acknowledged. Future research might consider involving students in more than one project developments to allow more engagements with various digital tools. Also, it would be beneficial to measure the students' digital competence or trace the development using statistical measurements. Finally, research might focus on students' interaction during project development to examine the students' communication skill as well as pattern in the interactions.

Last, the findings of this research can provide some pedagogical implications. Technology-Enhanced Project-Based Learning provides hands-on experience for pre-service teachers to develop competence for 21st century education. This research clarifies education practice to explicitly

teach technology skill through practical activities in teacher education institutions. Hence, teacher educators might need to navigate effective Technology-Enhanced Project-Based Learning for ICT competency development

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