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## **Students' English Learning Experiences on Virtual Project-Based Learning Instruction**

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### **Abstract**

Project-based learning is a learner-centered process that gives freedom to the students to design their own project works. Though numerous research results on the enactment of Project-Based Learning instruction have already been reported, only a limited number have reported its enactment in a virtual learning environment. This present research employed Interpretative Phenomenological Analysis (IPA), which unpacks the students' learning experience after being exposed to Virtual Project-Based Learning, henceforth Virtual PjBL. The researchers administered in-depth interviews with eighteen students who came from two different classes in an Islamic Higher Education in Indonesia. Findings show that five significant themes emerged from data collection and analysis; increasing active participation and motivation, developing critical thinking skills, participating in collaborative group discussion, developing skills in using digital tools, and building peer and lecturer communication. This result contributes to the earlier studies dealing with students' English learning experience of Virtual PjBL instruction. It also adds the pedagogical implications to the research related to Virtual PjBL enactment in Islamic higher education settings.

**Keywords:** Interpretative Phenomenological Analysis, Islamic higher education, learning experience, Project-Based Learning, virtual PjBL

## Introduction

What is Project-Based Learning? As an instructional model, Mergendoller and Thomas (2000) explained that Project-Based Learning, henceforth PjBL, focuses on the syllabus and curriculum of the language program, uses the question to be solved during the project work assignment, and demands the students' critical thinking in completing the project work. Pham (2019) pointed out that project-based learning emerges as an instruction that effectively meets the participants' needs in foreign language acquisition since PjBL focuses more on developing the learners' creative skills to motivate them to engage with learning altogether. The idea behind PjBL is to inspire students to learn by researching their passions and building ventures that will contribute to meaningful learning experiences (Wurdinger et al., 2007). When students have acknowledged their desires to use PjBL, teachers' positions become facilitators instead of instructors (Cook, 2009).

Nowadays, students have a strong interest in learning using technology. They tend to concentrate more on a course that is technology integrated. This present research was closely linked to the integration of PjBL to technology, and most project works in the observed virtual classrooms had technology components. It is so since digital platforms provide students with vast resources and a powerful way to coordinate, interpret, and exchange information (Heafner, 2004; Hung, 2005). In several cases, efficient incorporation of technical instruments was demonstrated to strengthen students' ability to coordinate, interpret, and communicate complex academic concepts (Barak & Dori, 2005). Therefore, since the usage and authoring of technology is a requirement and gives a positive result for PjBL (Becker & Ravitz, 1999; Ravitz et al., 2012), teachers must engage in learning activities with a PjBL characteristic and incorporate technology in meaningful ways to learn the nuances of implementing technology-enhanced PjBL activities. The Virtual PjBL instruction here was conducted through online Zoom meetings and Google Meet as the synchronous learning process. The lecturers also supported the Virtual PjBL through WhatsApp group and LMS as the asynchronous form of learning.

The exploration of learning experience and active learning in higher education is not new. Several studies conducted in the higher education context have shown that student-centered strategies, such as PjBL and learning-by-doings, are more successful in student learning and long-term performance. Several frameworks for examining PjBL have been developed, and much needs to be explored, particularly by incorporating technology in the projects. The quasi-experimental doctoral thesis by Zachoval (2011) is one of the few available studies that follow this trend. He researched the impact of a semester-length reading project in a third-semester Russian classroom and found that students' perception of reading improved and positively affected student reading habits. Therefore, he suggested that further research must be carried out to examine students' learning experiences of incorporating project-based learning into technology use, which further becomes the gap in this present research.

## Literature review

### Features of PjBL

The features of PjBL seem to be consistent among educators and researchers who studied and applied this teaching approach. Simpson (2011) assembled research on the standard features of PjBL as follows: "(a) inquiry process during the set period; (b) a student self-direction in which they plan, do and present the project work; (c) motivating critical thinking of the students that become the topic center of the project being assigned; (d) lessen the teacher control; (e) give

frequent comments from peers and facilitators; (f) utilizing digital tools and authentic learning resources; (g) working collaboratively instead of a competitive one; (h) using various social and management skills; (i) connecting ideas and acquiring new skills during different stages of projects; (j) producing meaningful artifacts that are presented in a public presentation; and (k) comprehensive assessment process from the initial stage to the very last performance stage.

In line with the above features of PjBL, Blumenfeld et al., (1991) pinpointed that the features of PjBL include the newest and various topic of projects, the problem arose in the project is authentic and complex, the students may complete the project collaboratively, and they are also free to choose the way to present their final presentations of the project itself. Sarifah (2017) also pointed out the characteristics of effective project-based learning that (1) the students are given a chance to investigate important ideas and question, (2) an inquiry investigation is underpinned the project work, (3) it is developed to meet the students' needs and interests, (4) the students are free to produce and present the project as creative as possible to draw their critical thinking skills, and (5) the topic selection of the project work is based on the students' real-world situation. Being exposed to PjBL, a construction-based and student-centered learning instruction, would allow students to transfer their knowledge to the real world in innovative and creative ways.

#### Virtual Learning Environment (VLE)

A Virtual Learning Environment (VLE) refers to an artificial information technology-built environment that facilitates student education (Britain et al., 1999; Suman et al., 2010). The virtual learning environment's features use to control, regulate, and increase its ability to avoid interaction with external influences. The implementation and advancement of technology for virtual reality in education have enhanced the current education teaching and learning modes. The virtual learning environment seeks to facilitate or control all facets of the teaching and learning network environment (Britain et al., 1999), including online interactions between students and teachers through online learning. VLE is a virtual learning network promoting virtual learning since it can be used as a virtual authentic world replication (Wang, 2018). Most of these systems are meant to replicate an online classroom environment and use technology to provide students with new resources to promote their learning. They seek to accommodate a wider variety of learning styles and priorities, foster collaboration and resource-based learning, and facilitate greater reuse and resource sharing. Using a web-based survey, Liu et al. (2009) have conducted an empirical investigation that explained how VLE characteristics ultimately influence learning efficiency. It directed the learners' control over the learning material and measured the learner contact and connection with the teacher and peers. The findings revealed that usability, navigational ease, and system interactivity help play various roles in achieving efficient learning performance. Next, their study showed how feasible different learning ideas can be incorporated into VLE design and how different learning perspectives can be formed in a VLE setting. Dealing with VLE characteristics, Mueller (2013) pinpointed that the main attribute of VLE is that it was a user-centered design. Thus, it focused more on the students rather than the teachers. Derboven, Geerts, and De Grooff (2017) suggested that in teaching in a virtual learning environment, it would be easier for teachers to handle fewer digital tools in teaching different contexts, rather than a bunch of various tools that difficult to practice.

#### PjBL in VLE

In Taiwan, Zhang et al. (2009) investigated undergraduate students' interactive learning experiences in the online PjBL environment. This case study design was gathered through

interviews with forty-eight students, field notes, findings from previous research in a virtual setting, an online dialogue of students, and the group artifacts. The results revealed the effects of exciting phenomena of cultural factors on the education system. Students encountered the advantages of PjBL over the intense six-week duration. Still, they expressed grave concern about the teacher's changed role and serious reservations about peer cooperation due to competitive educational traditions. Online interactive learning and PjBL have challenged cultural norms in Taiwan. Nevertheless, the study offers practical insights into collaborative online learning implementation and PjBL in higher education in Taiwan that inspired this present research.

In an Islamic higher education in Banjarmasin, South Kalimantan, some English for Islamic Studies (EIS) lecturers have implemented PjBL as their instructional model in the VLE setting. They highlighted that PjBL instruction in VLE has effectively boosted their students' English language skills and promoted their interest in learning this foreign language. One example of Virtual PjBL in EIS class was conducted in one EIS class at the Islamic Education Department. The lecturer assigned her students to make a video project delivering English preach, which talks about Islam. The students were divided into some virtual groups of PjBL, and the online project was completed in four active weeks. The lecturer noted the students' language skill development, the content of English knowledge, and Islamic character or traits that the students inserted in their videos. Another example of Virtual PjBL projects was conducted in the English Department in this Islamic university. In this class, the lecturer asked her students to create online posters discussing how to do *wudhu* and pray in English. The students felt attracted to doing this four-week project since these posters were rarely found written in English. The lecturers invited the students to design the posters as attractive as possible which the creativity also belongs to one of the scoring rubrics of the project being assigned. In short, these PjBL in VLE activity has driven the interests of the researchers of this present study to empirically explore the students' English learning experiences of Virtual PjBL enactment in teaching English for Islamic Studies course specifically and EFL classes generally in a virtual classroom setting. Furthermore, much previous research on PjBL reported the implementation of offline PjBL, but the report on the online PjBL issue is still scarce. Therefore, this research report dealing with the English learning experiences in Virtual PjBL would be a valuable contribution to further research on related PjBL issues.

### **Research method**

The researchers employed Interpretative Phenomenological Analysis (IPA), introduced by Smith et al. (2009), as the research design. IPA is a qualitative research analysis that explores the meaning of people's lived experiences (Smith et al., 2009). IPA is phenomenological since it discusses experiences on the studied phenomena. The researchers who use IPA are particularly interested in what happens when the flow of experience is particularly relevant for people (Spiers & Riley, 2019). Therefore, this design was beneficial for profoundly exploring the students' lived learning experiences in this research. It is also valuable to help the researchers follow each participant's stories of idiographical information and further examine their experience in more outstanding depth analysis (Rajasinghe, 2020).

Eighteen students in total voluntarily participated and filled in the consent form as the research participants. They were in their second year and came from two different classes; ten students from the Islamic Education Department and eight students from the English Education Department of the Faculty of Tarbiyah and Teachers Training. Two different English lecturers taught these students. Due to the COVID-19 pandemic, both classes were conducted online, and the lecturers continued to apply PjBL instruction in their virtual courses.

Table 1 presents demographic information regarding the participants' age and sex. The pseudonym was used for ethical considerations. In presenting the findings in the next section, the participants were coded with Student One (S1) to Student Eighteen (S18).

Table 1. Demographic information of the participants

| No | Pseudonym | Age (years old) | Male/ Female |
|----|-----------|-----------------|--------------|
| 1  | Guswin    | 21              | Male         |
| 2  | Pebri     | 20              | Male         |
| 3  | Gapuri    | 21              | Male         |
| 4  | Nadia     | 19              | Female       |
| 5  | Helmah    | 21              | Female       |
| 6  | Dinah     | 20              | Female       |
| 7  | Kurnia    | 20              | Female       |
| 8  | Andri     | 21              | Male         |
| 9  | Khairi    | 20              | Male         |
| 10 | Saufi     | 20              | Male         |
| 11 | Yoga      | 21              | Male         |
| 12 | Jamilah   | 20              | Female       |
| 13 | Ulfah     | 20              | Female       |
| 14 | Riska     | 21              | Female       |
| 15 | Saudati   | 21              | Female       |
| 16 | Siti      | 20              | Female       |
| 17 | Suci      | 20              | Female       |
| 18 | Rifqi     | 21              | Male         |

The researchers chose the in-depth interview technique to collect the data since one of the advantages of interview is that it can take offline or online form. Moreover, Moser and Korstjens (2018) highlighted that the researcher permits developing the interview guideline and revising it based on the analysis results during the research process. Next, the researcher selected in-depth online interviews to build a mutual trust relationship with the research participants (Bryman, 2012). The online interviews can also recall the interviewees for further information that is rarely done in face-to-face offline interview sessions—the online interview in this research was conducted through online Zoom meetings. By performing the interview, the researcher tried to explore the central themes to understand the meaning of what the participants said (Moser & Korstjens, 2018).

In this research, the interview guideline items cover the students' English experience in preparing the project, member participation, lecturer-student communication, challenges in completing the project work, and preparation for the presentation stage. The interview data were translated into transcription (verbatim) to find the answer to the studied phenomena. In short, in-depth interviews were used to explore participants' experiences and their perceptions, feelings, and thoughts after engaging the PjBL in VLE. In this qualitative study, there is no particular order in delivering the questions during the interview (Christensen et al., 2014) since the participants are free to answer the questions and express their feelings. The researchers used the guideline to open interview interaction with the participants (Patton, 2002) and let the probing arise during the interview process. Thus, the duration of administering the interview varied from one student to another. It took thirty to forty minutes on average to finish one interview process.

In analyzing the data, the researchers first analyzed the data using Thematic Analysis (TA) proposed by Braun and Clarke (2012) to be followed by Phenomenological Interpretative Analysis

(IPA) by Smith et al. (2009); Smith (2019). The extensive knowledge of participants and the interview technique resulted in the ideal data for both approaches. During the TA, the researcher maintained a list of vibrant interviews appropriate for a subsequent IPA review. In this way, the dual analysis provides a complicated and varied interpretation of student interactions exposed to PjBL. It can also be seen as a helpful example of a detailed analysis. It is valuable to help the researcher follow each participant's stories of idiographical information and further examine their experience in more outstanding depth analysis (Rajasinghe, 2020). To gain the trustworthiness of this research, the researchers administered the member checking technique to achieve the confirmability criteria. Member checking was beneficial in conducting a triangulation procedure and minimizing bias and error in the procedure of data collection and analysis (Harvey, 2015). After completing the verbatim of the interview, the researcher sent the transcript to the research participants to re-check their former responses or add further comments.

## Findings

Five themes emerged as this research's key findings: increasing motivation, developing critical thinking skills, promoting collaborative skills, developing skills in using technological tools, and building good communication. The following tables described the details of the students' English learning experiences through the Virtual PjBL instruction exposure.

### Increasing active participation and motivation

The attribute of taking participation actively emerged during the in-depth interview with the student participants. Lecturers provided a project work model in an online Zoom meeting and sent it through WhatsApp group. The students might think over their project work based on the model given. Most participants highlighted that they became motivated soon after the lecturers provided the model of previous project work. They also took the initiative in gathering online group discussions with the group members. In this finding section, the researchers only presented the most common comments from eighteen participants. The following are their comments:

|      |  |
|------|--|
| S 3  | The first thing I do is contact my group members to discuss our next steps   |
| S 4  | I contact my members via WhatsApp and create a personal WhatsApp group for my own group                                |
| S 8  | We have a discussion directly via google meet related to the sample of project work from the lecturer                  |
| S 12 | I directly contact my members and decide the appropriate time to discuss the project via zoom                          |
| S 13 | I do not want to waste time, I make a phone call with two of my group members and discuss our task                     |
| S 17 | We discuss our project work based on the provided model given by our lecturer  |
| S 18 | My group members prefer the sample of project work, we love making videos, and we decide to follow it as our guideline |

### Developing critical thinking skills

The second theme that emerged as students' English learning experience of being exposed to virtual PjBL was the experience of developing critical thinking skills by exploring new information to cope with their online project works. Most participants pointed out that they searched for information on the internet since the offline library was closed due to the COVID-19

spread. Only three of them used printed books as supported learning sources. The participants' comments are:

|      |   |
|------|---|
| S 1  | As usual, I seek information on google. We can get many materials from google                         |
| S 3  | The library is closed, we cannot go there to find books, so we search the information on the internet |
| S 7  | I use the internet to find relevant material concerning our project work                              |
| S12  | Our group used Youtube to find additional information needed for our task                             |
| S 15 | I use the internet to find learning materials, and I also use google translate                        |
| S 16 | After getting the topic of our project, we search for information on the internet                     |

#### Participating in collaborative group discussion

The students' experience engaging in a group discussion with the group members becomes another attribute emerging from the in-depth interview technique. The group discussion in the Virtual PjBL instruction happened through synchronous online zoom, google meet forums, asynchronous WhatsApp group, and google classroom. In the Islamic Education Department (IED), the lecturer assigned one group member to become the group leader and led the group discussion. Unlike PjBL instruction in IED, the lecturer in the English Education Department (EED) did not choose any group leader. Therefore, the group discussion in this class run simultaneously. Here are the participants' comments:

|      |  |
|------|--|
| S 1  | We work together to finish our project work on time. All members of my group actively participate and give a contribution.                         |
| S 2  | I, as the group leader, take the initiative to lead the group discussion via google meet; it is cheaper than zoom meeting                          |
| S 5  | In our group discussion, we discuss our tasks, divide our responsibility, and prepare for the final project presentation                           |
| S 6  | In the discussion in our group via zoom, I become the host of our online zoom discussion   |
| S 10 | I always participate in our discussions, and I want to do my best for our project  |
| S 11 | The group discussion is fun. I like it because we can chit and chat and do collaboration related on our project work                               |
| S 13 | I like this online project work because we can discuss the project online. It saves time, and we still can work together in an enjoyable situation |
| S 18 | We participate in group discussions, and we also discuss the project presentation  |

#### Developing skills in using digital tools

From the previous learning experience, it was clear that the students experienced and practiced more in utilizing the technology through this Virtual PjBL instruction since all of their projects took place in the digital form. They used the Canva application to design online posters, Kinemaster, Filmora, and Viva Video to edit the video projects, and a smart recorder and Google voice recorder to create a podcast. They claimed that they improved in technological skills during this online project completion. The participants' comments are as follows:

|     |  |
|-----|--|
| S 2 | Yes, I love doing online projects. It boosts my creativity in video editing    |
| S 5 | By doing the online project, I know how to use Filmora and other digital tools |
| S 7 | The online project is interesting. It requires us to adapt to new technology   |

|      |  |
|------|--|
| S11  | We prepare our best to do the presentation. We discuss it intensively. We add interesting sounds and texts to our video. It was fun! |
| S 14 | I improve my skills in using digital tools. My group members help me a lot. I like it.   |
| S 16 | Doing online projects have improved my skill in using Kinemaster and Viva video. I also learn to use Canva to draw a poster.         |

### Building peer and lecturer communication

The communication in this Virtual PjBL happened through WhatsApp group, Google classroom, online Zoom, and the Google meet platform. Lecturers created a general group for PjBL consisting of all students in the class and specific small groups. These small groups only contained 3 to 4 members of the group along with the lecturer. It was aimed to facilitate the communication between lecturer to student and students to students intensively. The students experienced that they prefer this small group to stay focused on their project work and maintain cooperative work with their peers. The following are their comments:

|      |   |
|------|---|
| S2   | We communicate with our lecturer via WhatsAppgroup and forum in google classroom  |
| S4   | I feel free to consult with my lecturer about the process that we do not understand   |
| S5   | The lecturer monitors our progress through google classroom. She also held a zoom meeting to ask about our problem in doing the project       |
| S9   | We share the problem in group discussion, and if we can not find the solution, we chat with the lecturer                                      |
| S 10 | I think the model and explanation from our lecturer are clear enough. But he still allows us to ask questions regularly in our WhatsApp group |
| S 11 | The lecturer communicates with us through WhatsAppgroup, zoom, and google meet.   |
| S 14 | Our lecturer ask our problem in doing the project work and offered the solution   |

### Discussion

The following figure illustrates the themes of the students' English learning experiences found in this research.

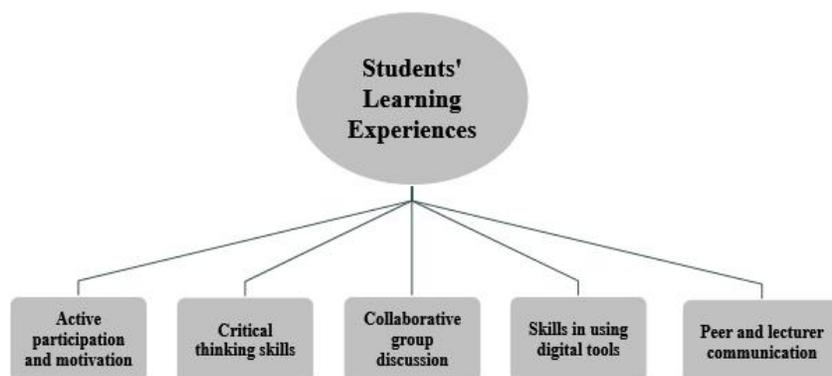


Figure 1. Students' English Learning Experiences

The scaffolding of project work held by the lecturers as a first step was beneficial to boosting the students' motivation and active participation. It helped and supported the students in the process of learning development (Gonulal & Loewen, 2018). The lecturers structuring activity in giving the project work has helped the students build a positive experience in starting the online project work. Previous research results in PjBL showed that showing a video as a sample of project

works (Ertmer & Glazewski, 2006) helped the students to design their own personal projects. In contrast with this finding, a study by Amissah (2019) highlighted that the participants in his study felt reluctant to be engaged in online PjBL instruction. The challenges found were a lack of teacher and student preparation, and the e-assessment process seemed difficult. Thus, it was essential for both lecturers and students to prepare well for the pre-project, whilst, and the presentation stage at the first place.

The participants agreed that they became motivated after examining the lecturer's model. It was clear that giving a clear model and instruction helped the students to get the picture of their tasks and encouraged them to start thinking of their own online projects. The emerging category was that they directly contacted the group members and gathered a discussion. It further indicated their positive attitude toward this Virtual PjBL instruction. Research by Akib et al. (2018) investigating the students' motivation in a gender-based classroom showed no significant difference between male and female students in terms of motivation in learning English. This result was consistent with the theme that all students indicated strong motivation to complete their project work.

The lecturers' provided model has boosted the students' interest in searching for more information on the internet. Since the COVID-19 pandemic, the internet has become students' primary learning source. Therefore, they searched for information needed to complete the project on the internet. Although the forms of online projects were different; drawing posters, recording audio, video making activities, all participants mentioned that they searched the information from the internet sources. The PjBL instruction has been integrated with the internet and social media for years, drawing many positive reviews among the students and teachers in higher education (Chu et al., 2017). A study by Lee and Tsai in 2004 regarding the use of the internet in PjBL also showed a significant result. They claimed that the internet in PjBL, called NetPjBL, has influenced the students' thinking styles and academic achievement. Besides, the students who were familiar with the internet use studied better than the others. In line with this view, Richards (2001) confirmed that PjBL might be used as a bridge to facilitate ICT integration in education across the curriculum in this Internet age.

The group discussion helped share each member's responsibility, promote collaborative skills, and give a meaningful experience to the students. They shared ideas, plans, and challenges during the discussion. In addition, they actively tried to find the solution to the problems concerning their project completion. Collaborative skills were essential to create successful teamwork (Verenikina, 2012) and shared responsibilities during project work completion. In addition, Lou and Kim MacGregor (2004) pinpointed that working in groups positively impacted students' collaborative skills in the Virtual PjBL instruction. The students participated in group discussions from the beginning to the end of the project work. It was reflected through the engagement in online dialogue and project presentation stage in their virtual class. They discussed and shared responsibility for dealing with the final presentation stage to get a good score for their project work.

In this Virtual PjBL instruction, the learning experience of being engaged with technology took two forms: using the internet as the primary learning source and preparing for the final presentation of their project works. Gunawan et al. (2017) pointed out that PjBL using virtual media has successfully promoted students' creativity and technological skills. In addition, they shared their knowledge and hints in utilizing technology and improving their creativity. It was also beneficial to help students successfully learn how to use the tools themselves and optimize these tools' use to create technology-enhanced PjBL activities (Koehler et al., 2013). In this research,

the students' improvement in using digital tools was reflected in their creativity in presenting the final project. For instance, in video-making activities, they tried to make it enjoyable by inserting attractive audio and songs. They also created colorful online posters to attract viewers.

From the building peer and lecturer communication theme, it could be derived that the lecturers acted as the facilitator of the project work. Both lecturers did a mentoring activity for the students but maintained the learning process as a student-centered learning approach. They only gave suggestions if the group members asked them to do so. In line with Alton-Lee (2003), teachers' mentoring and monitoring in and out of class were valuable for building meaningful learning experiences and supporting the students' progress in learning. Gurney (2007) also highlighted that building student and teacher communication was essential to effective teaching, especially using the PjBL approach. Nevertheless, Yunyta's (2017) research findings dealing with using PjBL in teaching speaking showed that the teacher's domination in mentoring the students has made the students passive and hesitate to speak. Thus, it resulted in the hostile experience of using PjBL instruction. Therefore, Febriyanti (2018) suggested that good language teachers must find the best role in the teaching and learning process to maintain good communication with their students. In addition, PjBL supports the student-centered learning approach, so the teachers must keep themselves on the right track.

Since the students were free to express their feelings concerning the project completion and actively engaged in online group discussion, they confirmed that they simultaneously increased their personal self-esteem during the in-depth interview. In this research, the students shared ideas in the group work, and most of them highlighted that they did not feel reluctant to express their needs and wants in the project work completion. Furthermore, it is vital to maintain the teachers' and students' interaction and communication in the class since it could create an exciting classroom atmosphere. Failure to keep it good would result in an unsuccessful transfer of knowledge process (Tunnisa et al., 2019).

To sum up, the finding of this research was in line with standard features of PjBL proposed by Larmer, Mergendoller, and Boss (2015) that good project work will allow students to learn 21st-century skills such as teamwork, critical thinking, collaboration, communication, and the application of technological tools. Beckett and Slater (2018) also pinpointed that engaging the students with technology in completing the project work has helped them focus on their new tasks. Last, Ravitz et al. (2012) also highlighted that good PjBL instruction must give relevant learning experiences either conducted online or offline. In addition, the significant implication of this finding is that the PjBL instruction might trigger the students to do an intensive inquiry process and focus the direction on them. These experiences would be meaningful for their lives and workplaces later on.

## **Conclusion**

From the present research result, it was clear that the students might gain more benefits by integrating digital technology into PjBL instruction. It was so since this proper combination provided a virtual real-world learning environment to the students. The Virtual PjBL instruction also demanded the students construct and work cooperatively under the project completion. They obtained many meaningful learning experiences by doing online project work. Moreover, many students engaged with Virtual PjBL highlighted that they had improved their digital skills while producing high-quality, collaborative artifacts.

Nevertheless, it would be essential to note some limitations in this research, which makes the result could not be generalized. First, although the student participants studied in two different

majors, the course is similar: English for Islamic Studies. Therefore, it needs further studies in a different context and subject area. Second, since this present research was conducted in a higher education setting, it would be best to repeat this study to different education levels and target audiences. Therefore, a recommendation is suggested to conduct experimental research dealing with the students' achievement by comparing the offline and online PjBL instruction. Another suggestion is to examine the impact of Virtual PjBL instruction on students' engagement and learning interaction.

The pedagogical implication of this research is to promote the extensive use of the Virtual PjBL in classroom activities since the result shows that it may stimulate the students' self-directed learning and boost their motivation to learn. Furthermore, this research also indicates that the PjBL can be conducted in virtual classrooms, and the students benefit from their learning experiences similar to offline PjBL.

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The authors declare that there is no conflict of interest in this work.

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