

# Readiness to Implement Project-Based Learning: The Influence of Knowledge and Attitude among Community College Lecturers

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## Abstract

Implementing project-based learning (PjBL) at community colleges can result in highly competent and competitive students. However, due to a lack of research, the level of readiness among community college lecturers to apply PjBL remains an issue. As a result, the aim of this study is to establish the level of readiness among community college lecturers in terms of knowledge, attitudes, and skills to implement PjBL. This study also seeks to ascertain the influence of knowledge and attitude factors on community college lecturers' ability to execute PjBL. This study was carried out using a quantitative approach and a survey design. Data was collected using a questionnaire. The study sample included 400 community college lecturers who were chosen using a stratified convenience sampling approach. Descriptive analysis was used to examine the mean scores of knowledges, attitude, and skills in implementing PjBL, while inference analysis using multiple regression tests was used to determine the contribution of knowledge and attitude variables to PjBL implementation skills. Both analyses were carried out using the SPSS Statistics for Windows 26.0 programme. The findings show that community college lecturers are highly prepared to apply PjBL. Overall, the knowledge and attitude variables contributed 64.1% to the skills in applying PjBL, with the knowledge factor having a larger effect than the attitude factor. The findings have an impact on lecturers in terms of preparedness and aid management in understanding the factors that influence lecturers' readiness. This understanding is crucial for planning and delivering appropriate support services to lecturers in their professional development.

## 1. Introduction

Not much information about the lecturer's readiness to adopt project-based learning (PjBL) at community college is available. PjBL is a learning and teaching strategy often utilised in polytechnics and community colleges to help students build 21st century skills (Malaysia Ministry of Education, 2018; Siti Noridah et al., 2018). According to Condliffe et al., (2017), PjBL is a rising teaching and learning technique that facilitates meaningful learning through active investigation of real-life issues and challenges. Furthermore, PjBL helps students to strengthen their thinking, communication, and teamwork abilities. Additionally, PjBL has been identified as a method that enhances students' conceptual comprehension and recall (BIE, 2019). This claim is

supported by research by Mohammed Abdullatif (2020), which revealed that PjBL enhances critical thinking, problem-solving, communication, teamwork, and creative thinking skills.

Although the PjBL strategy has been around for a while, the readiness of community college lecturers to apply this strategy accurately and successfully remains an issue. In a study, Sofian (2020) has highlighted how knowledge, attitudes, and skills influence readiness to execute a teaching and learning strategy. As a result, in the context of this study, readiness is defined as the ability of community college lecturers to adopt the PjBL strategy based on their knowledge, attitudes, and skills. According to Raja Norhafizah (2019) and Muhammad Aiman et al. (2017), the availability of knowledge, skills, and attitudes for adapting the teaching and learning strategy is required to foster 21st-century abilities. However, community college lecturers are more likely to conduct teaching and learning activities conventionally due to time constraints, work stress, resources, expertise, skills, and a readiness to adapt. According to Nor Hayati (2018), although the PjBL strategy has been implemented in the national education system, lecturers' confidence in adopting the strategy was diminished due to lack of exposure to essential pedagogical skills and knowledge. This is consistent with the findings of Ismail et al. (2017), Raja Norhafizah (2019), and Habok & Nagy (2016), who argued that lecturers' pedagogical knowledge and abilities are still lacking. Thus, this study was conducted to obtain a specific overview of community college lecturers' readiness to carry out PjBL as a teaching and learning strategy. At the same time, the findings of this study are intended to be used by the stakeholders to develop a training and professional development framework to improve pedagogical skills among the lecturers.

Even though the PjBL approach is widely used in teaching 21st century skills at all levels of education worldwide, studies on PjBL have focused solely on the effectiveness, suitability of implementation according to particular models, advantages and disadvantages of PjBL practise, but few studies have been conducted related to readiness in the context of educational institutions, teachers, and students (Kormaz & Kalayci, 2021; Mohamadi, 2018; Rahardjanto et al., 2019; Setyarini et al., 2020; Suryandari et al., 2021; Mursid et al., 2022). Similarly, in the context of community college, studies on the readiness of lecturers and PjBL were also found to be limited. Most studies in the period of 2018 to 2022 focused only on e-learning (Siti Azura, 2021; Zulkurnain, 2021; Siti Khadijah & Norzaini, 2021), graduate employability (Mohd Zairulniza et al., 2020; Jie & Ruhizan, 2022; Khairul Bariyah & Nurul As'shikin, 2018), lifelong learning (Mohd Rashidi et al., 2022; Hazwani & Nor Aishah, 2018; Najdiah et al., 2019) and innovation and commercialisation (Mohd Irwan et al., 2019; Hanin Falina 2020; Muhammad Arid et al. by 2020). However, studies on the teaching and learning strategy, particularly PjBL, are limited and only concentrate on students such as the studies conducted by Normurni et al. (2019), Wong & Kamisah (2018), and Rohaida & Marina (2020). There have been few studies on the readiness of community college lecturers for PjBL implementation. As a result, it is prudent to thoroughly examine the lecturers' readiness to apply the PjBL strategy to close the theoretical gaps left by previous research.

Lack of prior research on lecturers' readiness for PjBL implementation leads to an unclear perception of their level of knowledge, attitudes, and skills, as well as the impact these elements have on the implementation. Thus, the study is carried out in the context of Malaysian community college lecturers and aims to identify the influence of knowledge and attitude factors on the skills of implementing PjBL. Furthermore, the study intends to determine lecturers' degree of readiness in terms of knowledge, attitude, and skills related to adopting PjBL as a pedagogical approach to developing 21st century skills in students. Therefore, this study was conducted to answer these two questions: i) What is the level of readiness in terms of knowledge, attitude, and skills to implement PjBL among community college lecturers? and ii) Do knowledge and attitudes have an influence on the teaching skills of PjBL among community college lecturers? For the second research question, a hypothesis has been constructed to gain a clearer picture of the influence of knowledge and attitudes on PjBL implementation skills among community college lecturers. The null hypothesis of this study is: Ho1: There is no influence of knowledge and attitude on the implementation skills of PjBL among community college lecturers.

Overall, this study is divided into four components, the first of which evaluates current literature on PjBL and readiness for its implementation. Next, the methodology section which includes information about the methodology, design, data collecting, sample method, and data analysis for the study. Following that, the section of the research findings formulates the findings in accordance with the research question. The study was concluded with a discussion of the findings and recommendations for further research objectives.

## 2. Literature Review

This part will delve deeper into the literature on project-based learning, lecturers' readiness, the impact of knowledge and attitude on PjBL implementation abilities, and theory and models.

### 2.1 Project Based Learning

Project-based learning (PjBL) is an emerging student-centred teaching and learning technique that promotes meaningful learning by requiring students to actively explore problems and challenges from real-world situations (Condliffe et al., 2017). The PjBL model was developed in 1918 by William Heard Kilpatrick, who had

been inspired by philosopher John Dewey (Peterson, 2012). According to Kokotsaki et al. (2016), PjBL is a student-centred teaching strategy with three constructive features: context-focused learning, student active participation in learning activities, and attainment of learning goals through social interaction and knowledge sharing. Additionally, Guo et al. (2020) concur with this definition of PjBL. Nevertheless, his research has outlined six characteristics of PjBL: driving questions, focusing on learning goals, active participation of students, student collaboration, use of architectural technology and creation of artifacts (Guo et al., 2020). In contrast, Farrow et al. (2022) emphasized PjBL as an approach that focuses learning through projects rather than exams and aims to improve students' intrinsic motivation, problem-solving and communication skills. In addition, Grossman et al. (2019) suggested four distinct yet interrelated characteristics of PjBL namely, emphasis on the subject, authentic tasks, collaborative learning, and continuous learning processes. Although the interpretations of PjBL vary, most studies emphasize the same set of criteria: projects driven by real-life situations; authentic issues raised; active student involvement; collaborative learning environments; ability to reflect, review and evaluate continuously; and producing real and authoritative products (Farrow et al., 2022). Condliffe et al. (2017) claimed that despite discrepancies in how PjBL is defined, these criteria serve as the fundamental basis for all PjBL's guiding principles. Thus, in the context of this study, PjBL has been defined as a student-centric inquiry-based teaching and learning strategy that emphasises authentic problem solving through the creation of a valid product.

## 2.2 Lecturers Readiness

Past studies on the readiness of lecturers to implement PjBL in the context of community college are limited. Most recent studies related to community college focused on e-learning (Siti Azura, 2021; Zulkurnain, 2021; Siti Khadijah & Norzaini, 2021), graduate employability (Mohd Zairulniza et al., 2020; Jie & Ruhizan, 2022; Khairul Bariyah & Nurul As'shikin, 2018), lifelong learning (Mohd Rashidi et al., 2022; Hazwani & Nor Aishah, 2018; Najdiah et al., 2019) and innovation and commercialization (Mohd Irwan and al., 2019; Hanin Falina, 2020; Muhammad Arid et al., 2020). However, studies related to 21st century learning approaches are limited and only focused on students such as studies conducted by Normurni et al. (2019), Wong & Kamisah (2018) and Rohaida & Marina (2020). In particular, for technical and vocational courses, PjBL is reported to be an effective teaching and learning technique to teach 21st century skills (Haffidzull et al., 2020). Nevertheless, most of the studies conducted focused only on the effectiveness of PjBL among students and were less focused on the experience and readiness of educators (Hasni et al., 2016). This is also similar in the context of community college.

In general, readiness is defined as the ability to do something learned seriously, correctly, and perfectly (Fadilla & Zamri 2019). This is in line with the study of Nur Fatahiyah and Siti Diyana (2020), which interprets readiness as the ability, discomfort, or condition of a person to be ready to carry out tasks. There are several factors that influence the readiness of educators to implement teaching and learning for example, Sofiana (2020) explains that readiness during the process is influenced by knowledge, skills, and attitudes. This is supported by Muhammad Aiman et al. (2017), who affirm that the educators' competence to implement a teaching and learning approach is influenced by their readiness in terms of knowledge, skills, attitudes, interests, and objectives of execution. Therefore, in the context of this study, readiness is interpreted as the ability of community college lecturers to implement the PjBL from the aspects of knowledge readiness, implementing skills, and attitude.

Faridah et al. (2016) reported knowledge as the ability to recall and acquire through experience, reading, and notification. Educators' knowledge of a concept affects the control of teaching in the classroom (Noraini, 2015). Hasni et al. (2016) explain that the knowledge of educators about the definition, characteristics, and process of PjBL is limited. This fact is supported by Said et al. (2019), who affirm that educators face difficulties in the implementation of PjBL due to problems of understanding and a lack of subject expertise. According to Muhammad Aiman et al. (2017), technical and vocational educators should have extensive knowledge and skills related to the actual work environment, and failure to master both aspects will lead to less skilled labour. This is in line with the study of Raja Norhafizah (2019), which reports that technical and vocational educators should be knowledgeable, highly skilled, and master the 21st century pedagogical approach that is consistent with teaching and learning in order to produce quality graduates.

Skills are interpreted as behaviours mastered by educators for the purpose of implementing classroom teaching and management strategies. Skilled educators have technical competence in terms of teaching, formative assessment, and classroom management (Malinao 2019). Ismail et al. (2017) discovered in their study that many technical and vocational educators lacked the practical pedagogical abilities required to carry out teaching and learning activities. This problem is due to the absence of a plan or framework for training and professional development in pedagogical skills, especially for technical and vocational educators. This issue arises from the lack of a strategy or framework for pedagogical skill training and professional development, particularly for technical and vocational educators. This condition is concerning because it results in a reduction in the calibre of instruction and learning outcomes since educators are inadequate at controlling teaching and learning. As a result, educators must possess the abilities to effectively apply instructional methodologies (Naciri

et al., 2020). Teaching skills is a comprehensive assessment of the quality of the educator that measures whether they successfully solve the assigned teaching tasks, achieve objectives, and use an appropriate teaching and learning approach (Xia & Li 2022). Pedagogy skills readiness is important because these skills play a positive role in achieving effective and innovative teaching (Xia & Li 2022).

Attitudes are interpreted as feelings, confidence and thoughts that affect the individual. According to Said et al. (2019), a factor impacting an educator's preparedness to employ innovative teaching practices is their attitude and level of confidence. In accordance with research by Mihic & Zavrski (2017), educators had good attitudes towards the PjBL strategy and thought it was more engaging and inspiring for students. However, by adopting a new viewpoint on the teaching and learning strategy, unfavourable attitudes among people can be changed (Muhammad Aiman et al., 2017). This differs with research by Said et al. (2019), which discovered that it was challenging for educators to put into practise a positive attitude while implementing PjBL

### 2.3 The Influence of Knowledge and Attitude on the Skills to Implement PjBL

Said et al. (2019) emphasised the importance of understanding, acceptance, and self-adaptation in the adoption of PjBL. Previous research has also demonstrated that there is a positive correlation between educator attitudes, classroom practises, the efficacy of teaching and learning methodologies, relationships with students, and the working environment. The attitude of educators towards tasks is significant because it influences teaching and learning activities such as planning, classroom teaching, and student interactions (Wang & Du 2016; Said et al., 2019). This is corroborated by a Malinao (2019) research, which discovered a correlation between skills and knowledge for applying instructional strategies. Furthermore, to ensure the efficacy of PjBL implementation, educators must have a high level of expertise as well as a positive attitude (Said et al., 2019). However, Tamin and Grant (2013) highlighted that even when educators have a favourable attitude towards change, implementing new teaching practices is challenging and time-consuming. Furthermore, a lack of confidence, pedagogical skills, understanding of educational techniques, administrative assistance, work stress, a lack of resources, and support from colleagues may all be attributable to the gap between attitude and performance. This insufficiency produces constraints that compel educators to alter conflicting teaching and learning activities from the actual mode of the implementation (Du & Chaaban 2019). The abilities of educators to put teaching and learning techniques into practice are often impacted by a wide range of circumstances. As a result, educators confront challenges in adjusting to new situations, interacting with students, and supporting their learning and growth. As consequently, knowing the factors influencing teacher preparedness is critical to ensuring efficient PjBL implementation. Furthermore, educators' resistance to adapt fosters a negative attitude towards change while depriving students' long-term advantages (Fullan 2007; Du et al., 2020).

### 2.4 Theory and Model

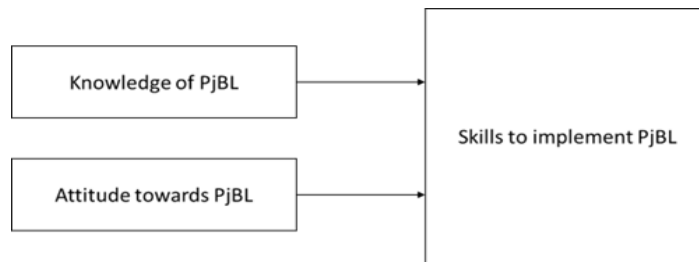
Fullan's Theory of Educational Change (2001) and Bryant's Model of Educational Process (1974) served as the foundation for this research. According to Fullan (2001), change is a process that takes place throughout time to transform an individual or a circumstance. The process of change is divided into three stages: the initial stage, the implementation stage, and the institutional stage (Nurfatahiyah & Siti Nur Diyana, 2020). This theory also discusses the elements that impact change, including the involvement of educators in change. The educator readiness is influenced by several factors, including clarity about change, ability to implement change, attitude, administrative support, community support, resources, the presence of change agents, and organisational members' acceptance of change (Fullan 2001; Nor Sha'irah 2015; Nurfatahiyah & Siti Nur Diyana, 2020). In this study, three primary elements were examined: the clarity of the change, which referred to PjBL knowledge, the ability to implement the change, which referred to PjBL skills, and the attitude factor, which linked to attitudes towards PjBL.

Then, in 1974, Bryant presented his own model of the educational process. This model identifies the three key elements that influence the efficacy of each new educational strategy. According to Bryant's Educational Model (1974), the success of various educational practises is determined by input factors, work action in teaching and learning, and attitudes. The input component in education is knowledge, the teaching work movement factor is the ability to carry out some practise, and the attitude factor is the educator's attitude towards the presented practise (Nurfatahiyah & Siti Nur Diyana, 2020). The Bryant Educational Process Model 1974 is frequently used in studies that examine aspects of readiness, particularly among educators. For example, the study conducted by Nurfatahiyah & Siti Nur Diyana (2020) examines the readiness of science and mathematics teachers' knowledge, attitudes, and experiences in implementing STEM education using this model. This study is divided into two parts: knowledge and attitude. Next, Khairul Syafiq and Mohd Nazri (2021) apply this approach to investigate teachers' preparedness in terms of knowledge in conducting STEM education.

The conceptual framework of the study is based on Fullan's Theory of Education Change (2001) and Bryant's Model of Education Process (1974). According to Fullan's Theory of Education Change (2001), the major issue to be researched is the factor that contributes to teachers' readiness, because teachers play an



essential role in educational reform. Teacher knowledge and skills are highlighted as characteristics that impact educational reform. According to Bryant's Model of the Educational Process (1974), three aspects impact the success of educational practises: input, action in instruction, and attitude. In the context of this study, the input is interpreted as knowledge of PjBL while the action in teaching is also defined as the skill to implement PjBL and attitude as attitude toward PjBL. Jamilah (2016) argues that knowledge and attitudes affect the level of readiness and skills to implement changes in the teaching and learning process. Fig.1 shows the conceptual framework of the study.



**Fig. 1** Conceptual framework of the study adapted from Fullan (2001); Bryant (1974) and Jamilah (2016)

### 3. Methodology

The research design, demographic and sample, instrument, validity and reliability, and data analysis of the research will all be covered in this part.

#### 3.1 Research Design

The quantitative approach to survey design is used to investigate community college lecturers' readiness and the influence of knowledge and attitudes on their skills to apply PjBL. The rationale for using a quantitative approach is that it involves the use of statistics, is numerical, and attempts to further clarify the link of the identified ideas (Ghazali & Sufean, 2021). The survey technique was chosen for this study because of its comprehensive character, which allows for the analysis of several sorts of questions at once. Furthermore, the capacity to gather data with large sample numbers, directly, and rapidly, as well as the ability to generalise research findings to the population, makes this technique appropriate for this study (Chua, 2021).

#### 3.2 Population and Sample

The population of the study is 2779 Higher Education Officers (PPPT) who are lecturers and include both male and female lecturers (KPT, 2021). According to KPT (2021), there were 1098 male and 1681 female lecturers at community college in the year population data was acquired.

The sample size and sampling methods are determined after the population is identified. This study uses a simple stratified random sampling. Simple stratified random sampling is a probability sampling method used to obtain random samples (Chua, 2021). This sampling method was rationally chosen because of its applicability and capacity to provide lesser sample errors when compared to systematic random sample methods and simple random samples. This sampling strategy employs distinct random selection for each group in the research population (Ghazali & Sufean, 2021). First, two groups, which include male and female lecturers, were defined in this study. Then, random sampling can be performed on each population group independently.

The sample size for this study was obtained using the sample size determination table developed by Krejcie and Morgan (1970), with a significance level of  $p < 0.05$ . According to Krejcie and Morgan (1970), the minimal sample size for the community college lecturer's population of 2779 persons was 338. The approach described by Abu Hassan (1998) in the study of NorShai'rah (2015) is used to determine sub samples for two groups, male and female. The minimal sub sample size was 134 males (39%) and 204 women (61%). The survey did, however, collect 400 responses, including 156 (39%) male and 244 (61%) female respondents.

#### 3.3 Location

The study involved 92 community colleges across Malaysia except for the Putrajaya, Kuala Lumpur, and Labuan Federal Territories because there were no Communist Colleges in the three locations (KPT, 2021).

#### 3.4 Instrument

Data for this study is gathered using questionnaires. The questionnaire utilised in this study was adapted from a study conducted by Jamilah (2016) and Abdul Rahman (2016). Questionnaires were rationally chosen as a study

instrument because of their capacity to collect data on respondents from a range of places, in big quantities, and for a limited period (Chua 2021; Ghazali & Sufean 2021). The questionnaire was divided into four sections: demographics, knowledge readiness, skill readiness, and attitude readiness. As a measuring scale, this poll employed a Likert scale of 5 scales (1: very disagreeable; 2: disagreed; 3: uncertain; 4: agree; 5: very agree) as a measurement scale (Likert, 1932).

### 3.5 Validity and Reliability

Instrument validity refers to the accuracy, usability, and procedure of determining if an instrument is appropriate for a study (Ghazali & Sufean, 2021). Three specialists who analyse the instrument from the language, design, and content perspectives carry out the validity procedure. The expert validation procedure for an instrument consists of four steps: identification of experts; appointment of experts; expert instrument evaluation; feedback from experts; improvement of expert feedback after undergoing this procedure. After undergoing this validation process, improved instruments were used in the pilot studies.

The Alpha Cronbach index was used to assess the reliability of this questionnaire instrument, and the method was chosen due to its suitability for determining the internal consistency of the questionnaire measured using the Likert scale, as well as its ability to calculate the reliability index for the data collected individually (Ghazali & Sufean 2021). The pilot study was done in community colleges in two states, Selangor, and Pahang, and had 35 respondents who shared the same characteristics as the sample. According to Mohd Majid (2000), a sample size of at least 30 responders is adequate for normal distribution. The data from the pilot study were analysed for the Alpha Cronbach index using the Statistical Package for Social Science (SPSS) software version 26.0. The total result of the Alpha Cronbach index is 0.971, indicating that all research variables are trustworthy and of high quality (Vierra & Pollock, 1992). Therefore, no questionnaire items are eliminated, and this questionnaire instrument is suitable for actual research.

### 3.6 Data Analysis

The data of this study were analysed using Statistical Package for the Social Science Version 26.0 descriptively and inferentially. In this study, the demographic profile data of the respondents was analysed descriptively to obtain frequency and percentage distributions. Descriptive analysis based on mean and standard deviation scores is also used to analyse the average mean of knowledge, attitudes, and skills in implementing PjBL. Interpretation of average mean to explain findings from this study is carried out by reference to Table 1 adapted from Nur Hawa Hanis & Ghazali (2018).

**Table 1** Interpretation of average mean score

Mean score	Interpretation
1.00 - 1.80	Very low
1.81 - 2.60	Low
2.61 - 3.40	Moderate
3.41 - 4.20	High
4.21 - 5.00	Very high

The study hypothesis is tested inferentially with multiple regression analysis. The purpose of this test is to identify the influence of the independent variable (predictor) on the dependent variables (criteria) (Suhaila et al., 2019). The study uses multiple regression analysis to predict the relationship between knowledge, attitude, and skills implementing PjBL.

## 4. Findings

This part will discuss the demographic profile and the findings based on research questions.

### 4.1 Demographic Profile

61.0% of respondents are women and 39.0% are men and this finding is consistent with the percentage of female lecturers that outperform men in the community college system. Additionally, only 16.5% of respondents had more than 16 years of teaching experience, compared to 43.0% of respondents who had 11 to 15 years of teaching experience. This result is comparable with lecturer statistics in the community college system. In terms of the location of teaching, 61.5% of respondents consisted of urban locations while 38.5% were from outside the city. Table 2 outlines the demographics of the survey respondents.

**Table 2** Demographic of survey respondents

Demography	Descriptive	Frequency	Percentage (%)
Sex	Male	156	39.0
	Female	244	61.0
	Total	400	100
Teaching experience	Less than 5 years	76	19.0
	6 to 10 years	86	21.5
	11 to 15 years	172	43.0
	16 years above	66	16.5
	Total	400	100
Locality	Urban	246	61.5
	Rural	154	38.5
	Total	400	100
PjBL frequency of implementation	Always	35	8.8
	When necessary	267	66.8
	Never	98	24.5
	Total	400	100

#### 4.2 Research Question 1: What is the Level of Readiness of Community College Lecturers to Implement PBPj?

Overall, community college lecturers were highly prepared for PjBL ( $M=3.43$ ,  $SD=0.77$ ). As a result, respondents are ready to use the PjBL approach as one of their teaching and learning strategies. The knowledge item receives the lowest average mean score ( $M =2.83$ ,  $SD = 0.84$ ), followed by the attitude item ( $M =4.00$ ,  $SD = 0.59$ ) and skill item ( $M =3.46$ ,  $SD = 0.89$ ). This demonstrates that even while respondents' knowledge readiness is at a modest level, their skill readiness and attitude towards applying PjBL are at a high level. Table 3 presents the overall state of readiness in terms of knowledge, skills, and attitudes.

**Table 3** Readiness in terms of knowledge, skills, and attitudes

Readiness	Mean	SD	Interpretation of the mean
Knowledge	2.83	0.84	Moderate
Skills	3.46	0.89	High
Attitude	4.00	0.59	High
Total	3.43	0.77	High

#### 4.3 Research Question 2: Do Knowledge and Attitudes have an Influence on the Teaching Skills of PjBL among Community College Lecturers?

Multiple regression analysis is carried out to determine to what extent knowledge and attitude (predictor variable) influence the skills of implementing PjBL (criterion variability) among community college lecturers. In the early stages, analysis is carried out to ensure that the data meets the requirements for a multiple regression test. The analysis found that the Tolerance value was 0.956, which is greater than 0.20, while the VIF value was 1.05, which is smaller than 5.0 for both predictor variables, knowledge, and attitude. This indicates that the study data did not experience any multicollinearity problems and qualified for a multiple regression test.

Overall, the correlation between the criterion variable and the predictor variable knowledge and attitude is strong ( $r=0.81, p<0.05$ ). The change of both predictor variables, knowledge and attitude contributed to 64.1% of the change in the criterion variable, the ability to implement PjBL. Table 4 sets out the findings of the multiple regression analysis.

**Table 4** Multiple regression analysis summary

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	SE of the estimate
1	0.800	0.641	0.639	0.540

Next, the findings of the ANOVA analysis found that both predictor variables are significant and affect the skills of implementing PjBL among community college lecturers [ $F(2, 397) = 354, p < 0.05$ ]. The results of the t-test shows that knowledge ( $t=24.79, \beta=0.76, p<0.05$ ) and attitude ( $t = 4.25, \beta = 0.13, p < 0.05$ ) are significant predictors of the skills to perform PjBL. Positive standard beta values indicate that the higher the knowledge and attitude, the higher are the skills of implementing PjBL among community college lecturers. In addition, the standard beta value of the knowledge predictor variable ( $\beta=0.76$ ) is greater than the attitude ( $\beta = 0.13$ ). This means that knowledge is a key factor that affects the skills of implementing PjBL among community college lecturers. Table 5 sets out test findings.

**Table 5** t-test summary

Predictor variables	$\beta$	$t$	$p$
Knowledge	0.76	24.79	0.01
Attitude	0.13	4.25	0.01

Therefore, the null hypothesis that stated no influence of knowledge and attitude on the skills of implementing PjBL was rejected. This means, there is an influence of knowledge and attitude factors on the skills of implementing PjBL among community college lecturers. Overall, the knowledge and attitude factors contributed 64.1% to the ability to perform PjBL with the knowledge factor having the greatest influence over the attitude factor.

## 5. Discussion

This section will discuss the findings in depth and constructively, using previous research as support.

### 5.1 Level of Readiness among Community College Lecturers to Implement PjBL

The study aims to identify the readiness and influence of knowledge factors as well as the attitude of community college lecturers towards PjBL. Furthermore, this is the first study to demonstrate the preparedness and effect of knowledge and attitudes towards the PjBL implementation skills in the setting of community college lecturers. The descriptive analysis results found that the readiness level among community college lecturers for implementing the PjBL approach was high ( $M=3.43, SD=0.77$ ). These means community college lecturers are prepared in terms of knowledge, attitude, and skills for implementing PjBL. This is consistent with prior research by Ain Nur Atika (2021), which found that instructors are well prepared to employ a variety of teaching and learning strategies to make sure students are competitive and knowledgeable. Ngo (2020) also supports this statement and argues that the readiness of teachers in terms of knowledge, skills, and attitudes is high for the implementation of teaching and learning. Even though the studies supporting these findings were carried out in different contexts, the findings of these studies are closely related and relevant to the results of the studies carried out in the context of the community college.

The study found that community college lecturers' level of knowledge for adopting the PjBL strategy is modest ( $M=2.83, SD=0.84$ ). This explains why community college lecturers' expertise and knowledge of the PjBL strategy are limited and should be improved. This result is consistent with the research of Hasni et al. (2016), which shows that there is a lack of teaching understanding and knowledge of the definition, characteristics, and implementation strategies of PjBL. This is further supported by research done by Said et al. (2019), which discovered that instructors experience challenges in properly implementing PjBL owing to a lack of understanding and knowledge. This finding, however, contradicts Ain Nur Atika's (2021) explanation that instructors have excellent knowledge to implement different teaching and learning approaches, which contributes to instructors' high confidence and understanding in the delivery of teaching and learning activities. In the context of community college, the level of knowledge of lecturers is moderate. This may be because community college lecturers are not required to hold a degree in education; rather, their recruitment is only based on credentials for in-demand fields of expertise (SPP 2022). In light of this lack of experience, community college lecturers are less familiar with the instructional and pedagogical aspects. This is congruent with Ngo



(2020), who describes how a lack of exposure causes instructors to have less understanding and knowledge, which subsequently affects their teaching and learning practises.

community college lecturers showed a positive attitude towards the implementation of PjBL as a 21st century teaching and learning strategy ( $M=4.00$ ,  $SD=0.59$ ). This is consistent with the results of a prior study by Mihic' & Zavrski (2017), which found that teachers are consistently motivated and optimistic about the use of PjBL. In the context of community college, this is interchangeable. community college lecturers are willing to try new things and are adaptable, particularly in terms of classroom delivery. This is a result of the wide range of duties assigned at community college, which calls for the lecturers to constantly be dynamic, confident, and open to change. Additionally, the enthusiasm and acceptance of PjBL among students boosts instructors' preparedness and acceptance of this strategy. This finding is further supported by Ngo (2020), who contends that instructors have a good attitude towards teaching. Similar to this, the study by Fadilla and Zamri (2019) shows that teachers are open to experimenting with new teaching and learning techniques, which in turn influences the efficiency of teaching delivery in order to produce favourable effects on learning outcomes and student learning. This, however, runs contrary to research by Said et al. (2019) that claims it is challenging for instructors to behave constructively while using PjBL. However, this mindset is impermanent and may be changed by adopting a different approach to the teaching and learning techniques (Muhammad Aiman et al., 2017).

Similarly, community college lecturers showed a high level of PjBL implementation skills ( $M=3.46$ ,  $SD=0.89$ ). This indicates that instructors at community colleges are adept at using the strategy while adhering to the processes and principles for successful application. This is because the teaching and learning methodology used at community college is hands-on, giving the lecturers the chance to explore and apply a range of creative thoughts into practise in the classroom. The effectiveness of learning among students is also influenced by the capacity to put the knowledge into practise (Ngo 2020). This is also compatible with Nor Amalina and Zanaton (2018), who explain that the instructor's skills to handle instruction influences teaching delivery. As a result, it is crucial that instructors have the necessary abilities to guarantee that students learn effectively. Ismail et al. (2017) disagreed with these findings, arguing that most technical and vocational institution instructors lacked the pedagogical skills needed to implement 21st century teaching strategies. This was also backed by the Ngo (2020), which stated that instructors who lack mastery of teaching skills will result in ineffective student learning, affecting the accomplishment of learning outcomes.

However, because the study was only conducted to identify readiness generally among community college lecturers without considering the influence of demographic factors on PjBL strategy implementation, the results are less illuminating regarding readiness based on demographics such as gender, teaching experience, and location. Zamri & Anita (2020) highlighted that teaching experience influences readiness for using a teaching strategy. The Ngo (2020) study also found differences in teacher teaching preparation by location, gender, and teaching experience. As a result, it is appropriate to pay attention to the demographic factors influencing community college lecturers' preparedness to use the PjBL.

## 5.2 The Influence of Knowledge and Attitude on the Skills to Implement PjBL

The results of the inferential analysis for multiple regression found the null hypothesis, there was no influence of knowledge and attitudes on the skills to perform the PjBL is rejected. This means the skills to implement the PjBL strategy among community college lecturers are influenced by their knowledge and attitudes towards it. Findings also explain the influence of knowledge and attitudes contributing 64.1% to the skills to implement PjBL. This outcome coincides with previous studies that show knowledge and attitudes affecting the effectiveness of the teaching and learning delivery (Wang & Du 2016; Said et al. 2019). This is also supported by Malinao (2019) that explains there is a relationship between knowledge and skills in implementing teaching and learning strategies. Similarly, Noorleha (2016) stated that there is a good relationship between the attitude and the skills to implement teaching strategies effectively. Martinez (2022) explains that there is a strong positive relationship between knowledge and attitude towards the implementation of PjBL.

This study supports Fullan's Theory of Educational Change (2001) which explains the change and readiness of educators to implement instructional strategies influenced by factors such as knowledge, attitudes, and skills (Fullan 2001; Nor Sha'irah 2015; Nurfatahiyah & Siti Nur Diyana 2020). This also coincides with Bryant's model of educational process (1974) which affirms the effectiveness of implementing some instructional strategies influenced by input factors (knowledge), work movements (executing skills) and attitudes. The results of this study are also consistent with the Jamilah (2016) study that reports the influence of knowledge and attitudes on the readiness and skills to implement changes in the teaching and learning process. Although evidence from the previous studies claimed knowledge and attitudes have contributions toward implementation skills, less is known on the depth of the contributions for each variable and external factors that influence the effectiveness of certain teaching and learning strategies. This is similar in the context of community college and PjBL implementation. Therefore, this gap needs to be addressed in further research. In addition to contributing to the understanding of community college lecturers' readiness, the findings of these studies can be used by the

stakeholders to provide a systematic training framework and structure for the professional development of the lecturers.

## 6. Conclusion

The study successfully narrowed the gap from the aspects of lack of research related to the PjBL strategy; preparedness studies based on the theory of educational change (Fullan 2001) and the model of the educational process (Bryant 1974); as well as the influence and contribution of some variable in the context of community college. Additionally, the results of this study were beneficial in providing a preliminary overview of the level of knowledge, attitude, and skills of community college lecturers when a particular instructional strategy was introduced. This can aid in the process of consistently and effectively enhancing teaching and learning while producing students who are knowledgeable, competent, and competitive. Similarly, the study's primary findings were noteworthy in terms of closing practical research gaps, as well as affirming the theories and models tested.

Additionally, the results demonstrate that community college lecturers are highly prepared to implement the PjBL strategy, and that knowledge and attitude factors have an impact on PjBL implementation skills. It reveals that factors related to knowledge and attitude are crucial in determining the extent to which the PjBL is implemented. Therefore, it is essential to develop lecturers' pedagogical strategy knowledge, attitudes, and abilities by giving them adequate and efficient in-service training. The role of the community college and its administration in guaranteeing support for the execution of activities and programmes to improve the efficacy of teaching and learning is critical in this regard.

The purpose of this study is to determine the level of readiness and the effect of knowledge and attitude variables on the skills of implementing PjBL among community college lecturers in general, without taking into consideration the demographics of the respondents. Future research should thus concentrate on variables like geography, teaching experience, and gender. Additionally, more in-depth research may examine the effects of other elements including self-efficiency, autonomy, motivation, and difficulties adopting PjBL in the setting of community colleges. Additional studies can be carried out regarding the relationships between gender, place, teaching background, and PjBL understanding. Similarly, qualitative research might be conducted to learn more about community college lecturers' preparedness and acceptability of PjBL implementation. Lastly, more research may be done to examine the factors that enhance the quality of instruction as well as the essential skills either quantitatively or qualitatively to improve the expertise and skills of community college lecturers in the context of PjBL.

In conclusion, this study identified the level of readiness and the effect of knowledge and attitude variables on the skills to execute PjBL among community college lecturers. The findings demonstrated that community college lecturers are generally highly prepared to execute PjBL and that knowledge and attitude factors have an impact on these skills. Therefore, to implement teaching and learning activities in accordance with current trends and challenges, the lecturers should be ready to accept changes and improvements. Additionally, the management of community colleges, the Department, and the Ministry of Higher Education need to play important roles in supporting reforms in the educational system. The authority should offer sufficient aid in terms of curriculum development, the supply of funds and infrastructure, as well as assistance with motivation. Problems encountered by lecturers during the implementation of PjBL should be addressed as soon as possible to improve the delivery of teaching and learning and achieve the national goal of producing highly trained and competitive technical and vocational graduates in order to achieve high-income developed countries.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design, data collection, analysis, and interpretation of results:** Suganti Ealangov; **draft manuscript preparation:** Suganti Ealangov, Khairul Azhar Jamaludin. All authors reviewed the results and approved the final version of the manuscript.*

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