

The Effect of Pre-Service EFL Teachers' Deeper Learning Awareness on the 21st-Century Skills Promotion

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ABSTRACT

The current study aims to investigate the effect of pre-service EFL teachers' awareness of promoting deeper learning on students' 21st-century skills encouragement. This quantitative research uses a cross-sectional survey design. The participants were 366 pre-service EFL teachers from five universities in the Special Region of Yogyakarta, Indonesia. The data were collected by distributing two questionnaires: the Deeper Learning Awareness, adapted from Jiang (2022) and Rodriguez and Fitzpatrick (2014), and the 21st-Century Skills questionnaires, adapted from Kelley et al. (2019). The pilot testing, expert judgement and SPSS analysis were used to assess the questionnaires' validity, reliability, and practicality. The data were analyzed using Regression Analysis. The result reported that pre-service EFL teachers in the Special Region of Yogyakarta are aware of promoting deeper learning to support students' 21st-century skills. Their deeper learning awareness also significantly predicted the promotion of 21st-century skills. The more pre-service EFL teachers are aware of promoting deeper learning, the more the 21st-century skills are implemented in the EFL learning.

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INTRODUCTION

In a current era where new knowledge and technologies are evolving exponentially, incorporating 21st-century skills in teaching English is very important to support students' individual and social success. The 21st-century skills which consists of critical thinking, communication, collaboration, and creativity (Pardede, 2020), prepares EFL students for implementing their English after graduating from school. It facilitates students to deliver their ideas effectively through their spoken and written communication skills (Wongdaeng & Hajihama,

2018). Then, students' collaboration abilities are developed (Asri, 2019) and can support their teamwork skills which is beneficial for their after-school life. For the critical thinking skill, it helps students to evaluate and solve problems related to English mastery and social life. Moreover, EFL students' creativity development after promoting 21st-century skills (Tang et al., 2022) assist students to create their own innovative products after the learning process. It indicates that 21st-century skills provide advantages for EFL students' four language and life skills enhancement.

One opportunity to support students' 21st-century skills achievement during the learning process is deeper learning implementation. The research by Hernández et al. (2019) reported that deeper learning reinforces the development of students' 21st-century skills and fulfills the gap among students with low, medium, and high scores. It also offers chances for students to be engaged with a meaningful lesson (Daniel et al., 2019) that is beneficial for them outside the classroom. They are facilitated to be capable of implementing the lesson learned in the classroom in a real-life situation. Furthermore, deeper learning is beneficial to meet the obligations of life, occupation, and citizenship in the 21st century (Darling-Hammond & Oakes, 2019). Its urgency is supported by the MBKM curriculum which expects that English learning provides opportunities for students to open up insights related to themselves, social relations, culture, and job opportunities that are available globally. Therefore, the promotion of deeper learning in EFL classrooms is in line with students' needs and 21st-century achievement.

Ideally, deeper learning in EFL classrooms is recognized by all teachers. However, little is known about the implementation of deeper learning. The substance of the deeper learning concept is exceptionally investigated (Jiang, 2022) and is only limited to defining "deep" without being connected to the language learning process. It must emerge with the teacher's awareness of applying deeper learning in the classroom to avoid unsatisfactory learning outcomes. Teachers without awareness only target the completeness of delivering materials through memorization without promoting deeper learning for students (Mustika et al., 2019). Regardless of teachers' awareness, Tyas et al. (2019) highlighted that teachers are still required to dig deeper into understanding on promoting deeper learning as well as 21st-century skills in EFL classrooms.

Several studies have been conducted in examining deeper learning implementation at different levels of education. At the high school level, Rickles et al. (2019) compared students' achievements from high schools promoting deep learning and regular high schools. The study reported greater outcomes achieved by students in the school that implemented deeper learning. Riordan et al. (2019) also completed a study that focused on exploring the design of professional learning to assist teachers in promoting students' deeper learning and equity. Jiang (2022) also carried out a survey on university students in China to perceive, examine, and

encourage deeper learning in the online EFL learning environment. These studies focused on the advantages, promotions, and strategies of deeper learning which can be implemented in EFL classrooms in Indonesia. The existing literature on deeper learning implementation in ELT is extensive and focuses particularly on students and in-service EFL teachers.

While these studies provide valuable insights into the benefits, strategies, and applications of deeper learning, most existing research has primarily focused on students and in-service teachers. Limited attention has been given to pre-service EFL teachers and how their awareness of deeper learning dimensions contributes to the promotion of 21st-century skills in the classroom. Addressing this gap, the present study aims to analyze the relationship between pre-service EFL teachers' awareness of deeper learning and their perceived ability to promote 21st-century skills. Accordingly, the study seeks to answer the following research question: To what extent does pre-service EFL teachers' awareness of deeper learning influence the promotion of 21st-century skills in EFL teaching?

Based on this objective, the following hypothesis is proposed:

H1: There is a significant relationship between pre-service EFL teachers' awareness in promoting deeper learning and the implementation of 21st-century skills in EFL classrooms.

RESEARCH METHOD

The current study used a survey of cross-sectional design (CSD) with a quantitative approach. CSD can investigate the current beliefs, attitudes, practices, or opinions, it can also survey the awareness of EFL students and teachers (Hismanoglu, 2013; Rahmani & Riyanti, 2022). The design is suitable to examine the awareness of pre-service EFL teachers in promoting deeper learning in the classroom.

The population of the current study was the pre-service EFL teachers at nine universities in the Yogyakarta Special Region. The eligible participants for the current research were students from the Bachelor Program in English Education who had already obtained the microteaching course. The participants were students from semesters six up to eight. The sample selection was carried out through a stratified purposive sampling technique to determine the sub-groups in the population represented in the sample (Cohen et al., 2018). It guarantees that the sample provide appropriate characteristics to answer the research questions. The current study followed several ethical procedures to assure that the research was conducted with a proper manner. The data were collected from the voluntary participants who were willing to participate in the current study by signing the consent form before fulfilling the questionnaire.

The data collection instruments in this study were two close-ended questionnaires. The first one was adapted from five awareness of teaching from teaching brain theory by Rodriguez & Fitzpatrick (2014) and Deeper Learning in Language Education Scale by Jiang (2022) to measure deeper learning awareness. Table 1 presents the blueprint of the questionnaire of pre-service EFL teachers' awareness of promoting deeper learning.

Table 1. Blueprint of Deeper Learning Awareness Questionnaire

Variable	Indicators	Item Numbers	Item Total
Pre-Service EFL Teachers' Deeper Learning Awareness	Deeper Learning Motivation (DLM)	1, 2, 3	3
	Deeper Learning Engagement (DLE)	4, 5, 6	3
	Deeper Learning Competence (DLC)	7, 8, 9	3
	Deeper Learning Strategies (DLS)	10, 11	2
	Deeper Learning Materials (DLMa)	12, 13, 14, 15	4
	Deeper Learning Media (DLMe)	16, 17	2
	Deeper Learning Assessments (DLA)	18, 19, 20	3
Total			20

The second instrument was adapted from 21st-Century Skills Survey Instrument by Kelley et al. (2019) to measure the 21st-century skills promotion. The measuring aspects included critical thinking, communication, collaboration, and creativity. Table 2 illustrates the blueprint of 21st-century skills instruments.

Table 2. Blueprint of 21st-Century Skills Questionnaire

Variable	Indicators	Item Numbers	Item Total
Pre-Service EFL Teachers' 21 st -Century Skills Awareness	Critical Thinking (CT)	21, 22, 23	3
	Communication (CM)	24, 25, 26	3
	Collaboration (CL)	27, 28, 29	3
	Creativity (CR)	30, 31, 32	3
Total			12

Pilot testing was conducted to assess the questionnaires' validity, reliability, and practicality. Content validity analysed through SPSS item-total correlation showed Items 1, 8, and 16 as invalid ($p > .05$) and were eliminated. Face validity was examined through expert review and pilot testing. Construct validity was confirmed using CFA, and reliability tested via Cronbach's Alpha ($\alpha = .928$ for deeper learning; $\alpha = .907$ for 21st-century skills), indicating both instruments were highly reliable and suitable for assessing pre-service EFL teachers' awareness. Then, they were distributed as digital and paper-based questionnaires. Finally, the linear

and multiple regression powered by SPSS ver. 22 were conducted to examine how deeper learning awareness predicts 21st-century skills promotion in EFL teaching.

RESULTS AND DISCUSSION

Results

The present study is designed to examine the relationship between pre-service EFL teachers' awareness of promoting deeper learning and their ability to facilitate students' 21st-century skills within the classroom context. This investigation focuses on how the seven dimensions of deeper learning, motivation, engagement, competence, strategy, material, media, and assessment, collectively contribute to the enhancement of key 21st-century competencies, namely critical thinking, creativity, collaboration, and communication. By exploring this relationship, the study aims to provide empirical evidence on the pedagogical importance of deeper learning awareness in teacher education programs. Accordingly, it is hypothesized that there are significant relationships between pre-service teachers' awareness of deeper learning promotion and the implementation of 21st-century skills in EFL classrooms.

Linear Regression

A linear regression was run to predict the implementation of 21st-century skills from pre-service EFL teachers' awareness of promoting deeper learning. The results reported the relationship between independent variables i.e., Deeper Learning and dependent variables i.e., 21st-Century Skills. The Model Summary of linear regression analysis are depicted in Table 3.

Table 3. Model Summary of Linear Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.473 ^a	.244	.222	2.668

a. Predictors: (Constant), Deeper Learning

Table 3 presents the model summary that demonstrates the relationship between pre-service EFL teachers' awareness of promoting deeper learning and the implementation of 21st-century skills in the classroom. The obtained R value of .473 indicates a moderate positive correlation between the two variables, suggesting that higher levels of awareness and practice of deeper learning are associated with greater implementation of 21st-century skills. In other words, as pre-service EFL teachers become more conscious and capable of applying deeper learning dimensions, such as motivation, engagement, competence, strategy, material, media, and assessment, they tend to foster students' critical thinking, collaboration, creativity, and communication more effectively.

However, the R^2 value of .224 (or 22.4%) reveals that only a portion of the variance in 21st-century skills promotion can be explained by the awareness of deeper learning implementation. This indicates that while deeper learning awareness plays a significant role, other factors, such as pedagogical training, teaching experience, technological literacy, or institutional support, may also influence teachers' ability to integrate 21st-century competencies into EFL instruction. Despite this limitation, the relationship remains statistically meaningful, underscoring the relevance of fostering deeper learning awareness among pre-service teachers. Furthermore, Table 4 provides the results of the variance analysis (ANOVA) test for the linear regression model, confirming the overall significance of the relationship between deeper learning awareness and the implementation of 21st-century skills.

Table 4. ANOVA of Linear Regression

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	747.413	1	747.413	104.985	.000 ^b
Residual	2591.396	364	7.119		
Total	3338.809	365			

- a. Dependent Variable: TFCS
- b. Predictors: (Constant), Deeper Learning

Table 4 illustrates the results of the ANOVA test, which was conducted to determine whether pre-service EFL teachers' awareness of implementing deeper learning has a statistically significant influence on the promotion of 21st-century skills in the classroom. The ANOVA test serves as a critical step in confirming whether the observed relationship between the independent variable (deeper learning awareness) and the dependent variable (21st-century skills promotion) is not due to random variation. The analysis yielded an F value of 104.985 with a significance level of less than .001 ($p = .000$). This result indicates a very strong and statistically significant effect, demonstrating that awareness of deeper learning practices among pre-service EFL teachers substantially contributes to their ability to promote 21st-century competencies such as critical thinking, collaboration, creativity, and communication.

The findings imply that as pre-service teachers become more aware of the deeper learning dimensions—motivation, engagement, competence, strategy, material, media, and assessment—they are better equipped to integrate modern learning principles that align with 21st-century education goals. These results reinforce the importance of embedding deeper learning concepts in teacher education programs to strengthen instructional quality and innovation. Further insights into the specific contributions of each deeper learning dimension toward 21st-century skills promotion are detailed in Table 5.

Table 5. Coefficients of Linear Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	22.050	1.870		11.790	.000
Deeper Learning	.282	.028	.473	10.246	.000

a. Dependent Variable: TFCS

Table 5 depicts the coefficients of linear regression analysis results. The t-value of 10.246, with a significance level of $p < .001$, confirms that this relationship is statistically significant. The results revealed that the awareness of promoting deeper learning has a significant and positive impact on 21st-century skills promotion in EFL learning ($B = .155$, $t = 2.623$, $p = .009$). Hence, H_1 was supported.

Multiple Regression

A multiple regression analysis was run to examine the model that best predicts the promotion of 21st-century skills in the EFL teaching. The awareness of deeper learning produces 125 models from seven dimensions including deeper learning motivation (DLM), engagement (DLE), competence (DLC), strategy (DLS), material (DLMa), media (DLMe), and assessment (DLA). These models are tested through multiple regression analysis with 21st-century skills as dependent variables. From 125 models, six models with the highest score are illustrated in Table 6.

Table 6. Summary of Multiple Regression Analysis Models for Dimensions Predicting 21st-Century Skills Implementation

No	Model	Predictor	R Square	t	Sig.
1.	Model 56	DLM+DLC+DLS+DL+Ma+DLMe	.225	12.472	.000
2.	Model 65	DLM+DLE+DLC+DLMa+DLMe+DLA	.225	11.618	.000
3.	Model 64	DLM+DLC+DLS+DLMa+DLMe+DLA	.227	11.824	.000
4.	Model 62	DLM+DLE+DLC+DLS+DLMa+DLA	.228	11.721	.000
5.	Model 60	DLM+DLE+DLC+DLS+DLMa+DLMe	.235	11.809	.000
6.	Model 66	DLM+DLE+DLC+DLS+DLMa+DLMe +DLA	.236	11.260	.000

Table 6 presents a summary of the multiple regression models tested to examine how well they predict the implementation of 21st-century skills in EFL classrooms. Each model incorporated different combinations of deeper learning dimensions, motivation, engagement, competence, strategy, material, media, and assessment, to identify which combination best explains the variance in teachers' ability to promote 21st-century skills. The statistical analysis revealed that all tested

models contributed significantly to the prediction, with $p < .05$, indicating that the included variables collectively have a meaningful effect on the dependent variable.

Among all models, Model 66 emerged as the best-fitting model, with an R^2 value of .236. This means that approximately 23.6% of the variance in the implementation of 21st-century skills can be explained by the combined effects of the seven dimensions of deeper learning awareness. In other words, pre-service EFL teachers' motivation, engagement, competence, strategy, material, media, and assessment practices collectively account for nearly one-fourth of their ability to promote 21st-century learning outcomes. The remaining 76.4% (100% - 23.6%) of the variance is likely influenced by other factors not examined in this study, such as institutional support, teaching experience, or access to educational technology. Furthermore, Tables 7, 8, and 9 provide detailed information regarding the R^2 values and regression coefficients of Model 66 in predicting the implementation of 21st-century skills across these dimensions.

Table 7. Model Summary of Multiple Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.486 ^a	.236	.221	2.669

a. Predictors: (Constant), DLA, DLM, DLC, DLMe, DLS, DLE, DLMa

A multiple regression analysis was conducted to examine the extent to which the dimensions of deeper learning awareness predict the promotion of 21st-century skills in the EFL classroom. The predictor variables included seven key dimensions of deeper learning: motivation, engagement, competence, strategy, material, media, and assessment. Collectively, these variables were analyzed to determine their contribution to how pre-service EFL teachers promote critical thinking, communication, collaboration, and creativity as the core components of 21st-century learning.

Table 8. ANOVA of Multiple Regression

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	788.061	7	112.580	15.801	.000 ^b
Residual	2550.747	358	7.125		
Total	3338.809	365			

a. Dependent Variable: TFCS

b. Predictors: (Constant), DLA, DLM, DLC, DLMe, DLS, DLE, DLMa

In table 8, the description of ANOVA test results is presented. It is utilized to examine whether the Model 66 has a significant influence on 21st-century skills promotion. The F test result shows a value of 15.801 with a significant level less than .001, $p = .000$, which means that the effect of pre-service EFL teachers' awareness of

promoting deeper learning on 21st-century skills promotion is significant. Further insight of Model 66 on 21st-century skills promotion is presented in Table 9.

Table 9. Coefficients of Linear Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	21.496	1.909		11.260	.000
DLM	.454	.127	.182	3.580	.000
DLE	.269	.127	.111	2.113	.035
DLC	.291	.120	.124	2.426	.016
DLS	.370	.159	.121	2.318	.021
DLMa	.212	.107	.110	1.973	.049
DLMc	.430	.168	.132	2.554	.011
DLA	.101	.121	.043	.838	.402

a. Dependent Variable: TFCS

The results of the analysis revealed that the model significantly predicted the promotion of 21st-century skills in EFL classrooms, $F(7, 358) = 15.801$, $p < .05$, with an R^2 value of .236. This means that approximately 23.6% of the variance in 21st-century skills promotion can be explained by the combined influence of the deeper learning dimensions. Among these predictors, some dimensions demonstrated stronger associations than others, suggesting that particular aspects of deeper learning awareness play a more influential role in shaping teachers' ability to integrate 21st-century skills into their instructional practices.

Overall, the findings support the proposed hypothesis, confirming that there is a statistically significant relationship between pre-service EFL teachers' awareness of deeper learning dimensions and their effectiveness in promoting 21st-century skills within the language classroom.

Discussion

The present study examined the relationship between pre-service EFL teachers' awareness of promoting deeper learning and their ability to facilitate 21st-century skills in English language teaching. Using both linear and multiple regression analyses, the findings revealed a significant and positive correlation between the two constructs. This suggests that pre-service teachers with higher levels of awareness of deeper learning are more likely to implement instructional practices that foster key 21st-century competencies, including critical thinking, creativity, collaboration, and communication. The results highlight the importance of developing deeper learning awareness within teacher education programs, as it

directly supports the integration of modern learning goals into classroom practice. Beyond confirming previous theoretical assumptions, the findings also strengthen the conceptual connection between cognitive engagement and pedagogical innovation, emphasizing that meaningful teaching requires not only subject knowledge but also the capacity to cultivate higher-order thinking and learner-centred skills.

Relationship Between Deeper Learning Awareness and 21st-Century Skills

The statistical results of this study strongly support the hypothesized relationship between pre-service EFL teachers' awareness of promoting deeper learning and their tendency to promote 21st-century skills in teaching. Even though there is a significant and positive relationship between the two constructs, the awareness of promoting deeper learning explains approximately 24.4% of the variance in 21st-century skill promotion. Other factors may also contribute to this relationship such as teaching experience, institutional culture, or pedagogical training. Despite this limitation, the ANOVA results confirmed the statistical significance of this model indicating that deeper learning awareness exerts a strong and meaningful influence on the promotion of 21st-century skills.

Further analysis from the coefficients confirmed the robustness of this relationship. The standardized coefficient provides additional evidence that pre-service teachers who are more conscious of deeper learning principles tend to design learning environments that engage students in higher-order thinking and collaborative tasks. These results substantiate Hypothesis 1 (H_1), demonstrating that deeper learning awareness significantly and positively predicts 21st-century skills promotion in EFL contexts.

The results also support the argument that awareness precedes practice. In teacher education literature, the level of teachers' awareness significantly affects their instructional choices and classroom culture (Darling-Hammond & Oakes, 2019). When teachers are aware of the necessity of deeper learning, they are more intentional in adopting pedagogical models that integrate reflection, inquiry, and collaboration. Consequently, awareness becomes a critical cognitive domain influencing behaviour, bridging theoretical understanding and practical implementation in teaching 21st-century skills.

Deeper learning represents a shift from surface-level knowledge acquisition toward active meaning-making, problem-solving, and knowledge transfer to authentic contexts. When pre-service EFL teachers internalize these principles, they are more capable of designing learning activities that develop students' abilities to analyse, evaluate, and create using English as a medium of thought. Therefore, the awareness of deeper learning does not only reflect pedagogical knowledge but also indicates a readiness to align teaching with 21st-century educational goals. This relationship demonstrates that deeper learning awareness acts as a foundational

mindset for teachers in preparing students for the complexities of global communication and lifelong learning.

This empirical evidence aligns closely with earlier studies on deeper learning conducted at different educational levels. Rickles et al. (2019) found that students in high schools implementing deeper learning approaches achieved higher academic outcomes and greater engagement in critical thinking and problem-solving. The current study reinforces this result by providing evidence from the teacher preparation perspective: just as deeper learning enhances students' performance at the school level, teachers' awareness of deeper learning principles enhances their ability to promote such outcomes through instruction. The key distinction lies in the focus, whereas Rickles et al. (2019) examined student outcomes, this study examines the cognitive antecedent in teachers that enables those outcomes to occur.

In a similar vein, Riordan et al. (2019) emphasized the design of professional learning that empowers in-service teachers to promote students' deeper learning and equity. Their findings underscore the critical role of teacher professional development in fostering reflective and student-centred practices. The current study extends this understanding to the pre-service stage, suggesting that awareness of deeper learning can be cultivated even before teachers enter professional practice. By identifying awareness as a measurable and influential construct, this study contributes to bridging the developmental continuum from teacher preparation to in-service practice, highlighting that deeper learning begins as a mindset long before it manifests as pedagogy.

At the higher education level, Jiang (2022) explored deeper learning among university students in China's online EFL environments, revealing that reflection, collaboration, and problem-solving significantly enhanced learning motivation and engagement. The present study's results echo this pattern, indicating that awareness of deeper learning not only supports these same skills but also predicts their systematic promotion within EFL instruction. Yet, where Jiang (2022) centred on learners' engagement, the current research focuses on the teachers' cognitive awareness as the driver behind such engagement. Thus, while Jiang demonstrated the outcomes of deeper learning from a learner's viewpoint, this study contributes the missing pedagogical dimension, showing that the awareness of teachers themselves constitutes a vital precondition for such outcomes.

Collectively, these comparisons reveal a coherent trajectory across educational research from the outcomes of deeper learning in students (Rickles et al., 2019), to the professional enactment of deeper learning by teachers (Riordan et al., 2019), to the pedagogical awareness that precedes practice. This continuum reinforces the claim that awareness of deeper learning principles is not a peripheral construct, but a central factor that drives the development and implementation of 21st-century education.

Furthermore, the moderate level of correlation found in this study implies that while awareness plays a significant role, it should be complemented by other

pedagogical supports such as institutional leadership, curricular innovation, and continuous professional development to achieve holistic promotion of 21st-century skills. This interpretation aligns with Riordan et al. (2019), who argued that sustained professional support systems are crucial for enabling teachers to translate awareness into consistent practice.

To extend the interpretation of the linear regression findings, a multiple regression analysis was performed to determine the model that best predicts the promotion of 21st-century skills in EFL teaching. This analysis incorporated seven key dimensions of deeper learning awareness: motivation (DLM), engagement (DLE), competence (DLC), strategy (DLS), material (DLMa), media (DLMe), and assessment (DLA). A total of 125 models were generated to examine various combinations of these predictors and their collective impact on teachers' ability to foster 21st-century competencies. From these, six models demonstrating the highest predictive accuracy and statistical significance were retained for further interpretation, as summarized in Table 6. These selected models provide valuable insights into which aspects of deeper learning awareness most effectively explain the variance in 21st-century skills promotion among pre-service EFL teachers.

All tested models were statistically significant and indicating that each combination of deeper learning dimensions contributed meaningfully to explaining the variance in the promotion of 21st-century skills. Notably, Model 66 emerged as the best-fitting model, explaining 23.6% of the variance in 21st-century skills implementation. This result suggests that, collectively, the seven dimensions of deeper learning awareness provide a moderate yet meaningful predictive power, while the remaining 76.4% of the variance can be attributed to other contextual, pedagogical, and individual factors not captured within the present study.

Further examination through ANOVA confirmed that the model was statistically significant. These results confirm that the awareness dimensions of deeper learning, spanning motivational, cognitive, and instructional domains, significantly predict pre-service EFL teachers' ability to promote 21st-century skills. This result strengthens the earlier linear regression conclusion that deeper learning awareness is not only correlated with, but also predictive of, effective 21st-century skill promotion in language classrooms.

In summary, the present results not only corroborate existing literature on the positive effects of deeper learning but also extend the scholarly conversation by identifying awareness as a critical, measurable predictor within the teacher education context. The statistical evidence reinforces that pre-service teachers' understanding of deeper learning has a direct and meaningful influence on how effectively they promote 21st-century skills. This contribution positions the current study as a bridge between research on student outcomes, teacher professional learning, and the foundational awareness cultivated during teacher preparation.

The Relative Contribution of Deeper Learning Dimensions

The results of the multiple regression analysis indicate that each dimension of deeper learning contributes uniquely to the promotion of 21st-century skills in pre-service EFL teachers. Among these dimensions, motivation and engagement emerged as foundational factors, as they inspire teachers to approach instruction with reflective purpose, enthusiasm, and a learner-centred orientation. When teachers are intrinsically motivated and actively engaged in their own learning processes, they are more likely to create classroom environments that foster students' curiosity, collaboration, and critical thinking. This finding is consistent with Rickles et al. (2019), who reported that students in schools emphasizing deeper learning demonstrated higher levels of engagement and critical thinking performance. Therefore, enhancing motivation and engagement within teacher education programs may serve as a catalyst for strengthening teachers' overall capacity to integrate deeper learning principles and effectively promote 21st-century competencies in English language teaching contexts.

Meanwhile, the competence and strategy dimensions signify teachers' metacognitive readiness to design and facilitate learning activities that nurture collaboration, creativity, and problem-solving. When pre-service teachers possess a strong sense of competence and are equipped with strategies grounded in deeper learning principles, they are better positioned to enact pedagogies that cultivate 21st-century competencies among their learners.

The material, media, and assessment dimensions carry significant influence as well. Materials and media that embody deeper learning principles can expose students to authentic, inquiry-based, and technologically mediated tasks that mirror real-world communication. Similarly, assessment practices grounded in deeper learning encourage reflection, feedback, and performance-based evaluation rather than rote memorization, thus reinforcing the very skills that 21st-century education seeks to develop.

The predictive strength observed in this study extends findings from previous research. For example, Riordan et al. (2019) underscored that sustained professional learning enhances teachers' capacity to design equitable and deeper learning experiences, suggesting that awareness develops into impact when reinforced through pedagogical support. Likewise, Jiang (2022) demonstrated that deeper learning strategies in online EFL contexts fostered students' engagement and reflective capacities, echoing the current result that multiple dimensions of awareness, particularly motivation and strategy, can predict improved learning outcomes. These connections indicate that deeper learning should not be perceived as a single construct but rather as a multi-dimensional framework that holistically supports 21st-century education.

Internationally, the relationship between deeper learning and the development of 21st-century skills has been widely acknowledged across diverse educational

systems. Numerous studies conducted in different contexts have demonstrated that deeper learning approaches foster essential competencies such as critical thinking, creativity, collaboration, and communication skills that are vital for students to thrive in an increasingly complex and interconnected world. For instance, research in the United States by Huberman et al. (2014) has shown that schools integrating deeper learning frameworks enable students to engage more meaningfully with content and apply knowledge to real-world problems. Similarly, studies in China conducted by Jiang (2022), Shen and Chang, (2023), and Zhou et al. (2025) have highlighted that deeper learning not only enhances cognitive engagement but also supports motivation and learner autonomy in EFL and online learning environments. In Germany, Banerjee and Zlatkin-Troitschanskaia (2021) reported that students exposed to deeper learning-oriented instruction demonstrated stronger analytical and problem-solving abilities compared to those in traditional classroom settings.

Despite these encouraging findings, relatively few studies have explored the teacher-related dimension of deeper learning—specifically, how teachers' awareness and understanding of deeper learning principles influence their ability to promote 21st-century skills among students. This gap is particularly evident in English as an EFL contexts, where linguistic, cultural, and pedagogical factors interact in complex ways. Since EFL teachers often serve as both language facilitators and skill developers, their awareness of deeper learning concepts may play a crucial role in shaping how effectively 21st-century competencies are embedded within language instruction. Thus, examining teacher awareness in this regard is essential for advancing both deeper learning theory and EFL pedagogical practice.

It also demonstrates that even before entering the workforce, teacher candidates' conceptual understanding of deeper learning correlates with their perceived ability to foster 21st-century skills. Compared to Western contexts, where curriculum reform and professional learning communities are well-established, EFL teacher education in Indonesia is still developing systemic frameworks for integrating deeper learning principles. Thus, the current results provide a valuable reference for designing culturally relevant teacher education models that balance local pedagogical traditions with global educational expectations.

CONCLUSION

There is a significant relationship between the awareness of promoting deeper learning and 21st-century skills implementation. The provision of 21st-century skills in the EFL classroom can be predicted by the awareness of promoting deeper learning. When they are aware of promoting deeper learning in the classroom, they can provide 21st-century skills for students. Therefore, deeper learning awareness of pre-service EFL teachers can support students' 21st-century skills. The results of this research also support the idea that the promotion of 21st-century skills can be

supported by promoting deeper learning in the classrooms. Since the pre-service EFL teachers are aware to promote deeper learning, they must also be guided to implement it properly. Deeper learning can also be optimized through the emancipated learning (MBKM) program proposed by the government. Teachers can provide deeper learning to make students experience the meaningful lesson.

While the study provides valuable insights, several limitations must be acknowledged. First, the use of self-reported questionnaires may introduce subjectivity and social desirability bias, as participants could overestimate their awareness or teaching readiness. Future research could employ mixed-method designs combining surveys with classroom observations or reflective journals to capture a more nuanced understanding of deeper learning in practice. Second, the study's sample was limited to pre-service EFL teachers in Yogyakarta Special Region, which may restrict the generalizability of the results in Indonesian context. Expanding future research to include in-service teachers or cross-region comparisons would strengthen the external validity of the results.

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