PROJECT MANAGEMENT PEDAGOGY: CULTIVATING CRITICAL THINKING SKILLS IN HIGHER EDUCATION

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Abstract. *The present study explores the integration of critical thinking skills concepts in agricultural project management instruction at the undergraduate level, using the traditional classroom theoretical approach and a blended learning model. The study, encompassing 118 undergraduate students, compares the effectiveness of these methods in enhancing students' understanding, measured through examination scores, group presentations, and students' overall perceptions of the use of the methods. Students achieved a mean examination score of 64.82% under the traditional approach and 72.66% for the blended learning approach. Statistical analysis, including a t-test, revealed significant differences favoring the blended approach. Additionally, performance assessments using six criteria during presentations yielded varied mean scores. ANOVA analysis showed a significant difference among the groups, and post hoc tests highlighted distinctions between specific groups' means, emphasizing the effectiveness of blended learning in enhancing students understanding. Students' perceptions, gathered through a 5-point Likert scale, underscored satisfaction with the blended approach due to its flexibility, catering to diverse learning styles, and fostering critical thinking skills. We recommend institutions strengthen project management instruction by adopting blended learning, emphasizing critical thinking, and prioritizing continuous assessment and student-centric approaches since they cultivate an engaging learning experience, preparing students for managing future complexities on projects.*

Keywords: *Agriculture; Critical Thinking; Blended Learning; Project Management; Engagement*

ПЕДАГОГІКА УПРАВЛІННЯ ПРОЄКТАМИ: ФОРМУВАННЯ НАВИЧОК КРИТИЧНОГО МИСЛЕННЯ У ВИЩІЙ ОСВІТІ

Анотація*. У цьому дослідженні розглядається інтеграція концепцій критичного мислення в навчання управлінню сільськогосподарськими проєктами на рівні бакалаврату з використанням традиційного теоретичного підходу та моделі змішаного навчання. У дослідженні, в якому взяли участь 118 студентів старших курсів, порівнюється ефективність цих методів, що вимірюється за допомогою екзаменаційних балів, групових презентацій та загального сприйняття*

студентами використання означених методів. Студенти досягли середнього балу на іспиті 64,82% за традиційного підходу та 72,66% за змішаного підходу. Статистичний аналіз за допомогою t-тесту виявив значні відмінності на користь змішаного підходу. Крім того, оцінка результатів за шістьма критеріями під час презентацій показала різні середні бали. Аналіз ANOVA виявив значну різницю між групами, а пост-хок тести показали відмінності між середніми балами конкретних груп, що підкреслює ефективність змішаного навчання. Оцінювання студентами за 5-бальною шкалою Лайкерта показало, що вони задоволені змішаним підходом через його гнучкість, врахування різних стилів навчання та розвиток навичок критичного мислення. Ми рекомендуємо навчальним закладам покращити викладання управління проєктами, впроваджуючи змішане навчання, наголошуючи на критичному мисленні, надаючи пріоритет безперервному оцінюванню та орієнтованому на студента підходу, оскільки вони створюють цікавий навчальний досвід, готуючи студентів до управління майбутніми складними проєктами.

***Ключові слова**: сільське господарство; критичне мислення; змішане навчання; управління проектами; залучення*

1. INTRODUCTION

Over the years, critical thinking skills have become increasingly prominent as essential requirements for employment, as highlighted by Katende (2023), Campo et al. (2023), and Radulović & Stančić (2017). The integration of critical thinking into educational processes is now crucial, and there is a growing emphasis on its significance. Academic institutions are questioning the presence of these skills in their processes, recognizing the importance of understanding the meaning, historical roots, and theoretical foundations of critical thinking in education. Institutions are actively seeking to comprehend how critical thinking can be effectively implemented in higher learning establishments.

The definition of critical thinking varies based on the theoretical framework applied. Alsaleh (2020) describes it philosophically as reflective thought, where individuals employ clear and logical analysis from the onset of a problem, considering relevant facts and drawing conclusions based on existing information and reasonable logic. Raj et al. (2022) view it as the mental processes, strategies, and representations used for problem-solving, decision-making, and learning new concepts. Educational theorists, exemplified by Kosasih et al. (2022), associate critical thinking with higher-order thinking skills, while Fisher (2011) views it as an academic competency similar to reading and writing – involving observation, evaluation, interpretation communications, and argumentation.

Moreover, Buhl-Wiggers et al. (2022) view the objective of education as imparting thinking and reasoning skills. Kwangmuang et al. (2021) assert that higher-order reasoning is deemed a crucial component of higher education. Though authors express their views differently, a consensus on the skills critical thinking entails includes learning, comprehending, and deductive and inductive reasoning, which are universally recognized as competencies within critical thinking.

What is the significance of critical thinking in teaching project management? Davies (2015) contends that critical thinking skills are essential in the context of 21st-century skills. In our current era, where the structure and methods of learning greatly shape our lives like never before, the traditional emphasis on accumulating technical knowledge and competencies has diminished in importance. Instead, there is a greater priority on critical intelligence, a willingness to embrace change, and the ability to swiftly adapt to new competencies (Cano, 1993).

In the rapidly expanding global economy, higher education institutions play a crucial role in fostering economic growth through the skills and productivity of their graduates, including essential project management skills (Hefley & Bottion, 2021). The competencies acquired by students, particularly in project management, contribute to organizational efficiency by facilitating the production of ideas, the invention of technologies, and the development of key competencies. Recognizing the importance of project management to the economy further underscores its role in enhancing productivity, thereby fueling overall economic growth (Palacio, 2006). The pivotal role of project management skills in the workforce aligns with the broader significance of project management in driving economic development (Oke et al., 2016).

Employers expect employees to be equipped with critical and analytical thinking skills after gaining some university education in project management. These acquired skills are perceived to improve their competencies and performance on the job. While Butler et al. (2017**)** advise placing more instruction and attention on critical thinking skills in education, Khodeir (2018) stressed the importance of adopting different approaches in the teaching of project management courses. The perceived problems in teaching project management include facilitators not developing more concise teaching and learning materials, a lack of practicality in their teaching methods, not using real-world project scenarios or case studies, a lack of students' group presentations on selected areas of interest in project management, and the lack of industrial exposure, among others (Akhmetshin et al., 2019; Ramazani & Jergeas, 2015). With the persistence of the aforementioned problems, even with a good curriculum in the field, project management facilitators still lack innovative ways of fine-tuning their project management lectures to improve the critical thinking skills of course participants.

This study aims to extend our comprehension of how institutions of higher learning perceive and conceptualize critical thinking in their educational processes. Specifically, (1) investigate how traditional classroom and blended learning approaches to teaching project management enhance students' understanding of proposed concepts, (2) explore how critical thinking concepts can be effectively integrated into the teaching of agricultural project management at the undergraduate level, (3) assess students' perception concerning the effectiveness of the blended learning approach adopted.

Overall, the study seeks to contribute to improving the project management competence of prospective students, aiding in their preparation for transitioning into larger roles in managing projects in the Ghanaian agricultural sector. This educational perspective on critical thinking, linked with project management instruction, serves as the foundational framework for this research endeavor.

2. LITERATURE REVIEW

2.1 Nature of Project Management

The growing global demand for project managers to accomplish tasks across several fields, such as agriculture, architecture, electrical, telecom, and civil engineering, is popular these days. This growing demand has necessitated the need for well-trained project management experts to perform assigned project tasks and responsibilities irrespective of the challenges they confront. Projects, by their nature, are temporary, implying they need seasoned professionals and a well-organized project management office for timely as well as successful execution. Moreover, the uncertainty and ambiguity surrounding projects further indicate that project managers must have the necessary skill set to overcome any management difficulty during project execution (Liu et al., 2022).

2.2 Theoretical Perspective of Critical Thinking in Project Management

In project management education, prioritizing the integration of critical thinking skills is essential for nurturing strategic planning and facilitating effective decision-making. The theoretical perspective on critical thinking in project management teaching encompasses various models and frameworks that aim to cultivate students' analytical abilities and enhance their capacity for thoughtful decision-making.

Kerzner (2022) highlights the necessity of a comprehensive educational approach that integrates critical thinking into project management curricula. Pinto (2020) further advocates for a holistic educational strategy, emphasizing the development of critical analysis and reflective judgment skills in project management students. Farooq et al. (2022) support an integrative approach, underlining the importance of embedding critical thinking within the pedagogical practices of project management education. Jääskä & Aaltonen (2022) advocated for the use of game-based learning methods in project management instruction, as their impact on skills and competence development indicates a positive effect on student communication skills, critical thinking, and adaptability. Khatib et al. (2022) evidenced that the introduction of simulations in project management instruction has revolutionized the learning experience, allowing participants to engage in realistic project scenarios, thereby enhancing their decision-making, problem-solving, critical thinking, and leadership skills in a controlled, risk-free environment. Nijhuis (2023) endorses the utilization of innovative tools and strategies in project management instruction, recognizing that critical thinking skills are paramount for addressing complex project challenges. Marnewick (2023) emphasizes the significance of incorporating critical thinking into educational practices, suggesting that it equips future project managers with the cognitive tools necessary for effective problem-solving and decision-making. Furthermore, the works of Nijhuis (2023), and Nukoonkan and Dhammapissamai (2023) underscore the need for a curriculum in project management education that fosters critical thinking, strategic planning, and adaptive learning.

These references offer a deep understanding of the theoretical foundations of critical thinking in project management education, serving as groundwork for educators and practitioners. They provide valuable insights to enrich the cognitive abilities of upcoming project managers, ensuring they are well-prepared to navigate the complexities of modern

project environments. By incorporating critical thinking into project management education, institutions can better prepare students to become adept at strategic planning, risk management, and innovative problem-solving, ultimately enhancing the overall effectiveness and success of their future projects.

2.3 Challenges of Teaching Project Management

Project management education encounters various obstacles, with several researchers contending that it falls short of addressing the industry's genuine requirements. Table 1 outlines the fundamental challenges gleaned from existing literature sources, along with critical evaluations of proposed approaches to surmount these hurdles.

Table 1: Challenges Facing PM Education

Author	Date	Challenge	Methods of Overcoming the Challenge
Delle-Vergini et al.	2023	Ineffective tools to be used and approaches to deliver content, including traditional theory-based class	Recommended including integrating practical activities with theory-based teaching
Carreiro et al.	2023	Inefficient learning practice. Lack of interaction between students and instructors	Recommended the engagement of students in content development
Nedzinskaitė & Minelgaitė	2024	Inefficient learning methods	Suggested using multiple learning methods
Armenia et al.	2024	Irrelevant and ineffective PM educational programs.	To offer rigorous and relevant PM educational programs.
Laval et al.	2021	Inefficient content regarding knowledge, skills and attitudes	Recommended focusing on skills development and organizational interaction
Pereira et al.	2024	Students' dissatisfaction, and demotivation about the course	Recommended assessing the courses from stakeholders' points of view, including postgraduates, experts, and others

Author's compilation (2024)

The course recently gained prominence in Ghanaian tertiary institutions, but its appeal to students is hindered by abstract presentations of concepts and a single-semester introduction with a maximum of three credit hours. The course lacks standardized content and learning outcomes across institutions, leading to variations in delivery methods. Since this course is new in most public universities, especially at the bachelor's degree level, the scarcity of well-trained lecturers with both classroom and industry experience is a challenge. Additionally, due to limited knowledge of the course content, lecturers often tailor content to their delivery styles.

2.4 Approaches to Teaching Project Management

A vast literature exists on different approaches to be adopted in teaching project management to any group of participants endeavoring to manage projects. These approaches aim to positively engage course participants in appreciating both the theoretical classroom aspects as well as the practical on-the-job dimensions of project management. Table 2 indicates PM teaching methods used by PM facilitators based on their perceived learning outcomes.

Table 2: Project Management Teaching Approach

Author	Approach	Analysis/ Benefits
Ingason & Eskerod (2024)	Simulations-based learning	Positively impacts students' awareness of sustainability and enhances their ability to navigate projects in a sustainable way.
Barbosa (2022)	Blended project-based learning	Integration of classroom teaching methods and technology-based methods.
Farooq et al. (2022)	Blended learning and gamification	A mixture of teaching methods that aim at satisfying students' needs and challenge them to experience and learn in the meantime.
Nedzinskaitė & Minelgaitė (2024) Khodeir, (2018)	Blended learning	Proved that the blended learning method is among the methods that enhance the process of creating effective project managers.
Tumpa et al. (2024)	Computer-based Games	Higher engagement and motivation of students; experiencing project complexity; enhancing confidence of application in real-world scenarios.
Jääskä & Aaltonen (2022) Jääskä, et al. (2023) Hellström et al. (2023)	Game-based learning method	Learners' PM understanding and skills improved, because the GBL solution demonstrated the importance of managing unexpected events, re-planning the project, and making evidence-based decisions.

Author's compilation (2024)

3. METHODS

3.1 Study Participants

The research involved 118 undergraduate students enrolled in the BSc Agricultural Science Education program at the University of Education, Winneba, Ghana. Among them are 58 third-year, first-semester students from the 2022 cohort and 60 third-year students from the 2023 cohort. Ethical clearance for using the university's name in the research was granted at the departmental level. The researcher, who is a lecturer at the mentioned university, has been instructing the course at the Department of Agricultural Science Education for the past three years. Table 3 presents the demographic characteristics of the selected participants.

Table 3: Demographic Characteristics of Students

Characteristic	Variable	University of Education 2022 Cohort (N=58)		University of Education 2023 Cohort (N=60)		Pooled	
		Frequency	Percentage	Frequency	Percentage	Freq.	%
Gender	Male	48	84	49	82	97	82
	Female	10	16	11	18	21	18
Education	Senior High	58	100	60	100	118	100
	Diploma	0	0	0	0	0	0
Employment	Unemployed	9	16	42	70	51	43
	Teacher	7	12	4	6	11	9
	Others	42	72	14	23	56	48
Age	20-24	11	19	38	63	49	42
	25-29	42	72	15	25	57	48
	30-34	5	9	7	12	12	10
Experience	Non	15	26	44	73	59	50
	1-5	32	55	11	19	43	37
	5-10	9	16	3	5	12	10
	10-15	2	3	2	3	4	3

Survey data (2024)

The teaching of the course “Agricultural Project Management and Appraisal” to the selected 118 BSc agricultural students is to equip them with the necessary skills, tools, and techniques to select and successfully manage viable agricultural projects. As undergraduates without prior project management experience, it becomes necessary to find appropriate methods of delivering the entire course for maximum understanding, high engagement, and application of learned skills to dealing with industrial challenges.

3.2 Blended Learning Approaches to Teaching PM

The two teaching methods that have been adopted and implemented in teaching PM to the selected participants are the traditional classroom theoretical approach (for the 2022 cohort) and the blended methods (for the 2023 cohort). Previous literature indicates the latter increases the readiness of students to face industrial challenges (Kilkelly, 2008). Blended learning is a teaching methodology that integrates traditional in-person training with virtual learning experiences. To provide a more flexible and individualized learning experience, this hybrid model aims to capitalize on the advantages of both traditional and digital learning approaches. The introduction of the blended learning approach at the University of Education-Winneba stemmed from the lecturer's previous reliance on the traditional classroom method for the 2022 cohort. The decision to adopt this approach was primarily driven by the unsatisfactory performance of students in class discussions, end-of-semester examinations, mid-semester assessments, and take-home assignments. Additionally, there was a lack of active engagement and interest among students in class activities, coupled with insufficient critical thinking skills for effective problem-solving, making it crucial to implement a more dynamic instructional method.

3.3 Data Gathering and Instrumentation Procedure

Since study participants were exposed to different teaching methods, measured variables varied among the two groups. The traditional classroom theoretical approach used

for 58 students (2022 cohort) is face-to-face lectures, textbook reading, powerpoint slides, assignments, and homework. The second group, 60 students (the 2023 cohort), which benefited from blended learning extensively, depended on online teaching aids such as flipped classrooms and synchronous online sessions. Moreover, during in-class activity sessions, study participants were put into 4 groups, with each group consisting of 15 members (4x15). The nominated group leaders and some members were people assigned to work on agricultural projects with a firm during the summer vacation break. The facilitator developed a 165-page course manual based on a plan-driven or predictive approach to project management.

The methodology for assessing critical thinking skills is embodied in the lecture's self-prepared plan-driven/predictive university farm project, used as a case study for the construction of a university farm warehouse to store equipment, supplies, and harvested crops. This project aids in developing and understanding all project management concepts across the five project process groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing) and ten knowledge areas (Integration, Scope, Time, Quality, Resources, Procurement, Risk, Cost, Stakeholder, and Communication). Group participants utilized project management software tools, process cards, word puzzles, and quiz cards, and conducted role-playing exercises on real project activities (hands-on projects).

From the case study, six selected areas of improvement were used to evaluate the presentations of students instructed through a blended learning approach with embedded critical thinking skills. The areas of improvement are: Project Planning and Execution, Communication and Presentation Skills, Team Collaboration and Leadership, Risk Management, Problem Solving and Decision Making, and Use of Project Management Tools and Techniques (see Appendix A1 for detailed criteria and indicators used to gauge students' performance, identified areas of improvement, and mark allocations). It is important for project management students to develop strong critical thinking skills to effectively plan, execute, and manage projects. Consistent with this, key areas of critical thinking skills embedded in the case study for class activities include: Analysis (situation analysis, data analysis, and risk analysis); Problem Solving (identifying issues, generating solutions, decision-making); Decision Making (prioritization, trade-off analysis, decision impact); Strategic Thinking (alignment with goals, long-term planning, resource optimization); Communication (stakeholder communication, documenting findings, presenting recommendations); Adaptability (flexibility, learning from experience, resilience); Team Collaboration (team dynamics, conflict resolution, utilizing team strengths); Ethical Reasoning (ethical decision-making, integrity, balancing stakeholder interests); and Time Management (time allocation, schedule optimization, time tracking). See Appendix A3 for how these skills match up with the project’s performance domains previously indicated in Appendix A1. Critical thinking skills and new project management skills acquired as well as enhanced were determined and scored during group presentations.

Finally, information on participants' overall satisfaction, engagement, and areas of improvement using the blended approach was elicited using a 5-point likert scale.

3.4 Analytical Procedure

To accurately measure the effectiveness of the two teaching methods on the selected participants, their end-of-semester examination scores were compared using two sample-t

tests for the independent groups. The examination questions covered three performance domains, namely cognitive, affective, and psychomotor. Levene's F-test for the equality of variance was also performed. Finally, a right-tailed test was used to indicate which group's mean was significantly higher. The hypothesis to be tested for the independent sample t-test is:

$$H_0 : \mu_{blend} = \mu_{trad}$$

$$H_1 : \mu_{blend} \neq \mu_{trad}$$

The null indicates no significant difference between students' exam scores when exposed to the two project management learning methods. The alternative hypotheses indicate otherwise. The hypothesis of the right-tailed test adopted is:

$$H_0 : \mu_{blend} = \mu_{trad}$$

$$H_1 : \mu_{blend} > \mu_{trad}$$

The null hypothesis indicates no difference between the two means, while the alternative indicates mean scores for students who participated in blended learning are the highest. The study further used two independent project management experts to assess and score the 4 groups' presentations. Appendix A1 indicates the criteria and indicators used to assess the students' performance, identify areas of improvement, and mark allocations during group presentations. A one-way ANOVA was used to compare the four groups' means. A post hoc test (Tukey test) is used to test the significance difference between group means. An intra-class correlation coefficient was used to determine the inter-rater reliability. The ANOVA test's null hypothesis is represented as:

$$H_0 : \mu_{group\ 1\ score} = \mu_{group\ 2\ score} = \mu_{group\ 3\ score} = \mu_{group\ 4\ score}$$

This is against the alternative hypothesis that group means differ significantly. Finally, an analysis of the student's perception concerning the use of the blended approach was evaluated using the 5-point Likert scale. The internal consistency of the selected scale was determined using Cronbach's alpha. The Likert items concentrated on effectiveness, engagement, ease of navigation and use of online platforms, practicality, improvement in critical thinking skills, and overall satisfaction with the blended approach adopted. These variables are used to assess various aspects of the student's perception of the blended learning approach, providing valuable insights into their experiences and opinions regarding the teaching of the project management course.

4. RESULTS

The mean examination scores, standard deviation, and standard error values for the two groups of students exposed to distinct teaching and learning methods are presented in Table 4. Participants in the traditional classroom approach achieved a mean score of 64.82%, while those in the blended approach attained a mean score of 72.66%. Levene's test (Table 5) was employed to assess the assumption of equality of variances, yielding a non-significant F value of 0.18 with a corresponding p-value of 0.67.

Table 4: Descriptive Statistics of Group Examination Scores

	Teaching Approach	N	Mean	Std. Dev.	Std. Error Mean
Examination Score	Traditional Classroom Approach	58	64.82	7.41	0.97
	Blended Learning Approach	60	72.66	7.15	0.92

Consequently, the study retains the null hypothesis, suggesting equality of variances between the two groups. In Table 5, the t-statistic is 5.84, significant at the 5% level, leading to the rejection of the null hypothesis regarding equal mean examination scores for the two groups. Consequently, it is concluded that the mean scores of the groups are different.

Table 5: t-Table for Data on Examination Scores Along with F Value

Teaching Approach	Mean Score	SD	Mean Diff.	SE of Mean Diff.	t Value	p Value	F Value	p Value
Traditional Classroom Approach	64.82	7.41	7.83	1.34	5.84	0.000	0.18	0.67
Blended Learning Approach	72.66	7.15						

Utilizing the right-tailed test to statistically ascertain the group with the highest mean, the computed t-value (5.84) surpasses the tabulated t-value (1.658). As a result, the null hypothesis (H_0) is rejected, leading to the conclusion that the scores of students undergoing the blended approach are significantly higher than those in the traditional classroom approach.

Table 6: ANOVA Table of Groups' Presentation Scores

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	58.45	3	19.48	14.34	0.000
Within Groups	27.16	20	1.35		
Total	85.62	23			

Mean scores with standard errors in brackets: Group 1 = 8.83 (0.30), Group 2 = 6.16 (0.79), Group 3 = 4.50 (0.34), and Group 4 = 7.0 (0.25).

The mean scores for all groups after the presentation are 8.83, 6.16, 4.50, and 7.0 respectively (Appendix A2). While this presentation contributes to the comprehensive exam scores outlined in Tables 4 and 5, the study aims to intuitively assess the performance of individual groups and ascertain the extent of critical thinking skills developed throughout the semester. The lecturer explicitly explained these skills to the groups and guided them on how best they could be tailored to meet the needs of each project (Appendix A3). From Table 6, ANOVA results indicated a significant F value of 14.34, rejecting the null hypothesis of no difference among the means of the four groups. To compare the means, a post hoc test in Table 7 shows a significant difference between the means of groups 1, 2, and 3 and

not group 4. Similarly, there was a significant difference between the means of Group 2 and 1 and not 3 and 4. Using the inter-rater reliability test, the intra-class correlation coefficient was 0.984, which is greater than 0.70; hence, we conclude that there was a high inter-rater reliability between the two raters.

Table 7: Post Hoc Comparison of Means Using Tukey HSD Test

(I) Group	(J) Group	Mean Diff. (I-J)	Std. Error	Sig.
Group 1	Group 2	2.66*	0.67	0.004
	Group 3	4.33*	0.67	0.000
	Group 4	1.83	0.67	0.058
Group 2	Group 1	-2.66*	0.67	0.004
	Group 3	1.66	0.67	0.095
	Group 4	-0.83	0.67	0.611
Group 3	Group 1	-4.33*	0.67	0.000
	Group 2	-1.66	0.67	0.095
	Group 4	-2.50*	0.67	0.007
Group 4	Group 1	-1.83	0.67	0.058
	Group 2	0.83	0.67	0.611
	Group 3	2.50*	0.67	0.007

* The mean difference is significant at the 0.05 level.

Finally, an analysis of the students' perception concerning the use of the blended approach was evaluated using a 5-point Likert scale. The calculated Cronbach's alpha of 0.71 indicates an acceptable level of internal consistency among the 6 items chosen. The results are indicated in Table 8.

Table 8: Students' Perception of the Overall Effect of Blended Learning Approach

Area of Evaluation*	N	Minimum	Maximum	Mean	Std. Deviation
Effectiveness of the Blended Learning Approach	60	3.00	5.00	3.983	0.650
Actively Engaged with the Course Content	60	3.00	5.00	4.283	0.613
Ease of Navigation and Use of Online Resources and Platforms	60	3.00	4.00	3.533	0.503
Integrated Practical Application on Real Project Scenarios	60	4.00	5.00	4.450	0.501
Have Immensely Improved my Critical Thinking Skills	60	3.00	5.00	3.816	0.747
Satisfied with the Blended Learning Approach	60	3.00	5.00	4.150	0.633

*1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5 =strongly agree

Based on Table 8, a mean value of 3.98 suggests that students concurred on the effectiveness of the blended learning approach in enhancing their comprehension of the course content. This effectiveness was attributed to the diverse range of approaches and concepts employed to explain project information. A group member shared his perspective on the effectiveness of the approach, as follows:

"The blended learning approach was a game-changer for me. The mix of face-to-face and online components struck the right balance. Engaging in video lectures and collaborative forums reinforced theoretical concepts effectively. The flexibility allowed me to manage my time efficiently, fitting into my schedule seamlessly."

With an average of 4.28, participants were in strong agreement that the approach facilitated their active engagement with the course content. This could be attributed to the proactive methods employed, including active participation in group discussions, asking questions, completing assignments with enthusiasm, and demonstrating an overall high level of involvement and interest in the learning process. A group shared the following insights:

"The use of dynamic elements in the teaching and learning process collectively elevated the group's active engagement with the course content."

Participants, with an average rating of 3.53, expressed consensus regarding the user-friendly navigation and utilization of online resources and platforms. Despite not all students having access to or ownership of personal computers, they were able to participate in the class using smartphones connected to reliable internet. A group's commendation for the straightforward use of online resources is presented verbatim below:

"The online resources were top-notch, fostering practical skill development with real-world applications. The user-friendly technology made the learning experience smooth. The instructors were effective communicators and responsive to our needs. Overall, it provided a holistic and dynamic learning environment. We appreciate the thought put into this approach, making project management concepts more accessible and applicable."

With an average score of 4.45, participants unanimously affirmed their strong agreement that the implemented blended learning approach effectively integrated practical applications within real project scenarios. A participant's perspective on this matter is provided below:

"Overall, the blended learning approach successfully connected theoretical knowledge to practical application, providing me with a valuable and immersive learning experience centered on real project scenarios."

Recording a mean score of 3.81, participants concurred that this course significantly enhanced their critical thinking abilities. A fellow group member shared positive feedback, expressing that the developed critical thinking skills would similarly benefit their performance in other courses requiring analytical thinking and practical applications. Among the diverse comments, a student's coherent response is highlighted below:

"Through blended learning, I've seen a significant boost in my critical thinking skills as a project management student. The integration of real-world scenarios and collaborative projects challenged me to analyze complex problems. Engaging in practical applications and interactive discussions improved my problem-solving abilities. The blend of theoretical and practical learning allowed me to connect concepts with real-world situations. Regular feedback, reflection, and technology use also played a key role. Overall, this approach has

empowered me to independently explore and assert that my critical thinking skills have immensely improved."

Finally, with a mean rating of 4.15, participants expressed unanimous satisfaction with the blended learning approach employed as the instructional medium for the course. While the lecturer received numerous comments from the four groups, the most appealing remark is highlighted below:

"As a group, our satisfaction with the blended learning approach stems from its adaptability to diverse learning styles. The combination of online resources, interactive discussions, and traditional methods not only caters to various preferences but also fosters the development of critical thinking skills, ensuring a comprehensive understanding of the subject. The flexibility in accessing materials allows for self-paced learning, and the variety of instructional approaches keeps us engaged. Overall, the blended approach enhances satisfaction by accommodating individual preferences, optimizing the learning experience, and promoting the development of critical thinking skills."

5. DISCUSSION

Using both traditional classroom theoretical approaches and a blended learning approach, this study examined the integration of critical thinking concepts into the teaching of project management at the university level. The study used 118 BSc. Agricultural students to analyze the effectiveness of these methods in increasing students' understanding of taught concepts through examination scores and group presentation results. The study further adopted six evaluation items to determine students' overall perceptions of the blended learning approach.

It was discovered that the examination scores of students instructed with the blended approach are significantly higher than those in the traditional classroom approach. This finding supports the work by Barbosa (2022), indicating that the blended approach is effective in that it creates a meaningful learning environment, enabling students to excel academically. Several factors could be responsible for the lower examination scores of students taught in the traditional classroom compared to those instructed through a blended learning approach with embedded critical thinking skills. Nijhuis (2023) proposed that the possible reasons may include differences in the interactive and practical nature of the blended learning environment, the enhanced engagement and collaboration facilitated by technology, and the ability of critical thinking skills to foster a deeper understanding and application of concepts. Furthermore, Nedzinskaitė & Minelgaitė (2024) indicated that the traditional classroom setting may lack certain elements that promote active learning, problem-solving, and real-world application, which could impact student performance on examinations.

The study used six selected areas of improvement, namely, project planning and execution, communication and presentation skills, team collaboration and leadership, risk management, problem-solving and decision-making, and the use of project management software for evaluating the presentation of students instructed through a blended learning approach with embedded critical thinking skills. All four groups demonstrated outstanding critical thinking skills, as indicated in Appendix 3, while working on the case study. According to Nijhuis (2023), project management class participants need to develop strong critical thinking skills to effectively plan, execute, and evaluate projects. Moreover, some important

benefits of class grouping include encouraging team building, team conflict management, team collaboration, team alignment towards a common goal, and, more importantly, determining how best each team applies critical skills in dealing with real-world project management issues. Similar to our study, these findings; Collingbourne & Seah (2015), Córdoba & Piki (2012), and Straub et al. (2017) reinforce the importance of fostering critical thinking skills within group formation in the teaching of project management concepts.

An analysis of the students' perceptions concerning the use of the blended learning approach as a medium of instruction, evaluated using the 5-point Likert scale, revealed that students were pleased with the approach. A major strength of this method is its adaptability to a variety of learning styles. It is seen as a comprehensive learning experience that appeals to a broad range of preferences, created through the integration of online resources, interactive group discussions, and traditional teaching and learning methods.

6. STUDY LIMITATIONS

This study has several limitations that should be acknowledged. First, the sample size was relatively small, which may limit the generalizability of the findings. Future studies with larger, more diverse samples are needed to confirm these results. Additionally, the participants were undergraduates without any project management experience, which may have influenced their engagement and performance. The classroom setting was not suitable for conducting project activities and role-playing exercises, and the teaching and learning materials were inadequate. Furthermore, the time allocated to the course was insufficient to cover all the concepts in project management, constraining the depth and breadth of content delivery. Technological barriers also played a significant role, as some students did not own smartphones or personal computers, making it difficult for them to join the virtual mode, and the lack of access to fast and reliable internet connectivity caused disruptions during the online teaching sessions. This issue affected the continuity and quality of the learning experience. In conclusion, while these limitations suggest caution in interpreting the results, they also provide valuable directions for future research to build upon our findings. Addressing these limitations in subsequent studies could enhance the understanding and implementation of project management pedagogy in higher education.

7. CONCLUSION

The educational perspective on critical thinking, linked with project management instruction, serves as the foundational framework for this study. Specifically, how critical thinking concepts can be effectively integrated into the teaching of project management at the undergraduate level was explored. We investigated the traditional classroom theoretical approach and the blended learning approach to teaching project management, examining how these approaches enhance students' understanding of proposed concepts. The traditional classroom theoretical approach used for the first class of 58 students is face-to-face lectures, textbook reading, PowerPoint slides, assignments, and homework. In the second class, 60 students instructed with blended learning used face-to-face lectures, online teaching, group formation for in-class activities, project management software tools, process

cards, word puzzles, quiz cards, and also conducted role-playing exercises on real project activities (hands-on projects).

In the traditional classroom approach, participants achieved a mean examination score of 64.82%, whereas those in the blended approach attained a higher mean score of 72.66%, indicating that students in the blended approach significantly outperformed those in the traditional classroom approach. During group presentations, six specific criteria were used to assess the performance of students instructed through a blended learning approach with embedded critical thinking skills. The mean scores for the four groups were 8.83, 6.16, 4.50, and 7.0 against the overall mean of 10 for each group indicating improvement in their critical thinking ability. The study determined students' perspectives on the use of the blended approach using a 5-point Likert scale with six items. Their contentment with the blended learning method arises from its flexibility to accommodate diverse learning styles. The integration of online resources, interactive discussions, and traditional methods not only caters to various preferences but also nurtures the development of their critical thinking skills, ensuring a comprehensive understanding of the subject. The flexibility in accessing materials supports self-paced learning, and the diverse instructional approaches maintain their engagement. Overall, the blended approach elevates students' satisfaction by catering to individual preferences, optimizing the learning experience, and fostering the development of critical thinking skills.

We strongly recommend institutions strengthen the effectiveness of project management instruction. This can be achieved by strategically leveraging blended learning methodologies, placing a heightened emphasis on the development of critical thinking skills, implementing continuous assessment and constructive feedback mechanisms, and fostering an environment that prioritizes flexibility and student-centric approaches. These measures are crucial for cultivating a dynamic and engaging learning experience and preparing students for the demands of project management in the real world.

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Appendix

Appendix A1: Areas of Improvement for Scoring Group Presentation

Performance Domain	Criteria	Indicators
1. Project Planning and Execution	How well did the group plan and execute the project according to the project management principles covered in the class?	Clear project objectives, well-structured work breakdown structure (WBS), adherence to the project schedule, and effective resource allocation.
2. Communication and Presentation Skills	How effectively did the group communicate project details during the presentation?	Clarity of speech, well-organized presentation slides, ability to convey complex information in understandable manner, and responsiveness to questions.
3. Team Collaboration and Leadership	How well did the group work together and demonstrate leadership skills?	Team cohesion, distribution of responsibilities, effective leadership, conflict resolution strategies, and evidence of each team member's contribution.
4. Risk Management	How did the group identify, assess, and address project risks?	Evidence of a risk management plan, proactive identification of potential risks, appropriate risk response strategies, and adaptability in the face of unforeseen challenges.
5. Problem Solving and Decision Making	How did the group handle unexpected issues and make decisions during the project?	Demonstrated problem-solving skills, timely decision-making, consideration of alternatives, and adaptability to changes in project scope or requirements.
6. Use of Project Management Tools and Techniques	To what extent did the group apply project management tools and techniques covered in the class?	Utilization of project management software, effective use of Gantt charts or other planning tools, and incorporation of relevant project management methodologies.

N.B Marks between1-10 awarded in a performance domain

Appendix A2: Descriptive Statistics on Groups PM Presentation Scores

Groups	Number of Questions	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Group 1	6	8.83	0.75	0.30	8.04	9.62	8.00	10.00
Group 2	6	6.16	1.94	0.79	4.12	8.20	3.00	8.00
Group 3	6	4.50	0.83	0.34	3.62	5.37	3.00	5.00
Group 4	6	7.00	0.63	0.25	6.33	7.66	6.00	8.00
Total	24	6.62	1.92	0.39	5.81	7.43	3.00	10.00

Appendix A3: Critical Thinking Skills in PM Group Presentation

Skill	Situation Analysis	Data Analysis	Risk Analysis
Analysis	Evaluate the current state of the school farm, considering the available space, environmental factors, and the needs of different agricultural programs.	Examine data related to the required warehouse size, materials, and estimated costs.	Identify potential risks, such as weather-related delays, budget overruns, or changes in agricultural program requirements.
	Identify Issues	Generate Solutions	Decision-Making
Problem-Solving	Recognize potential challenges, such as soil quality issues, regulatory approvals, or conflicting needs of different agricultural programs.	Propose solutions to address issues, such as conducting soil tests, obtaining necessary permits, or implementing flexible design features to accommodate various agricultural needs.	Decide on the most viable solutions based on cost-effectiveness, sustainability, and stakeholder requirements.
	Prioritization	Trade-off Analysis	Decision Impact
Decision Making	Determine the priority of construction phases, considering critical milestones, such as obtaining permits, completing foundation work, and finishing the building envelope.	Evaluate trade-offs between using sustainable materials and managing costs.	Consider the impact of decisions on the overall project timeline and budget.

	Alignment with Goals	Long-Term Planning	Resource Optimization
Strategic Thinking	Ensure the warehouse design aligns with the university's overall vision for sustainable and efficient farm management.	Consider future agricultural program expansions and design the warehouse to accommodate potential growth.	Optimize the use of space and resources in the warehouse to enhance efficiency in storing equipment and harvested crops.
	Stakeholder Communication	Documenting Findings	Presenting Recommendations
Communication	Develop a communication plan to update stakeholders, including faculty, students, and neighboring communities, on the project's progress and potential disruptions.	Create clear documentation outlining project specifications, approvals, and construction plans.	Communicate recommendations to the university administration and seek approval for project plans.
	Flexibility	Learning from Experience	Resilience
Adaptability	Adapt construction plans in response to unexpected weather events or regulatory changes.	Incorporate lessons learned from previous construction projects to enhance adaptability.	Overcome unexpected challenges, such as material shortages or construction delays, with resilience and proactive problem-solving.
	Team Dynamics	Conflict Resolution	Utilizing Team Strengths
Team Collaboration	Foster collaboration among architects, engineers, and construction workers to ensure a seamless project flow.	Address conflicts related to differing opinions on design elements or construction methods within the project team.	Leverage the expertise of each team member to optimize the design and construction processes.
	Ethical Decision-Making	Integrity	Balancing Stakeholder Interests
Ethical Reasoning	Consider the environmental impact of	Uphold ethical standards in contractor	Navigate potential conflicts of interest among stakeholders

	construction materials and choose options that align with the university's sustainability goals.	selection, ensuring fair and transparent bidding processes.	to ensure the project's ethical execution.
	Time Allocation	Schedule Optimization	Time Tracking
Time Management	Allocate time efficiently for different construction phases, such as site preparation, foundation work, and building construction.	Optimize the project schedule to ensure timely completion while accounting for potential delays.	Monitor and manage time spent on various tasks to ensure adherence to the project timeline.