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Assessing the Transformative Impact of Flipped Learning in Project Management Education: The Case of a Saudi University

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Abstract

The present study investigates the effects of incorporating a flipped learning course into project management education as an innovative methodology. The course was designed to foster critical thinking and reflective learning among students, in accordance with the pedagogical principles of the ASSURE instructional model. The inquiry examines the scholastic accomplishments of students enrolled in the project management course, evaluating their capacity to implement acquired competencies in practical situations. Furthermore, the research investigates the progression of self-learning and self-regulation abilities that arise from engagement in this innovative educational endeavor. The study encompassed the development and implementation of a flipped learning course in E-learning project management. Subsequently, reflective exercises, focus group dialogues, and semi-structured observations were conducted with a sample of 29 postgraduate students located in Riyadh, Saudi Arabia. The results emphasize favorable consequences, such as increased student engagement, improved comprehension of the material, greater learning flexibility, an enriched platform for the exchange of knowledge, active participation in both individual and collaborative projects, the development of reflective writing abilities, heightened student interaction, and the acquisition of critical competencies for project management and other domains. The transformative capacity of the flexible classroom approach in project management education is highlighted in this study.

Keywords: *Flipped learning, E-learning project management, ASSURE, Reflection, Educational technology*

1. Introduction

Inadequate project management skills often result in delays, budget overruns, and cancellations (Strygacz & Sthub, 2018). The global rise of E-learning is evident, and E-learning in Saudi Arabia has achieved internationally competitive achievements. It has received much international praise, most recently from UNESCO (MOE, 2023). The Saudi Ministry of Education encouraged the digital transformation of education in keeping with the goals of Saudi Arabia's Vision 2030, and its significance within the digital transformation system and innovative solutions (MOE, 2023). This shift toward technology adoption highlights the need for improved student skills. Educational designers require strong project management skills to create digital content efficiently (Lynch & Roecker, 2007). Despite teaching an E-learning project management course at Educational Technology Department in university, students exhibited weaknesses in project management despite their excellence in educational design. Traditional teaching methods hinder practical application and timely feedback, which is critical for project management. Recognizing the sensitivity of project management and the need for enhanced student involvement, new strategies and methods were sought to address these challenges.

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Traditional lecture-based project management courses in universities are considered ineffective (Zaneldin et al., 2019), so many teachers have shifted to the flipped learning approach (Latorre-Coscolluela et al., 2021). Flipped learning is a blended teaching approach wherein instructional elements or content are delivered outside the classroom using an audio-visual format (O'Flaherty & Phillips, 2015; Strygacz & Sthub, 2018). The flipped learning paradigm involves 'interactive group learning activities within the classroom, and direct computer-based individual education outside the classroom' (Bishop & Verleger, 2013, p.5). This implies that students absorb knowledge before class and increase comprehension (Lai & Hwang, 2016). Al-Abdullatif (2020) observed that flipped learning strongly influenced self-regulated learning with academic attainment.

Considering that students in the 21st century are exhibiting a diminishing level of acceptance towards traditional instructional methods with the rise in advanced technologies, teaching approaches, such as flipped learning, are getting adopted prominently to facilitate profound learning that characterizes the future generations of the knowledge society (Latorre-Coscolluela et al., 2021). The existing literature highlights the benefits of flipped learning in enhancing student engagement, improving learning outcomes, and fostering metacognition (Huang et al., 2022; O'Flaherty & Phillips, 2015; Shaffi et al., 2023). Furthermore, Abushammala (2019) found that using flipped teaching and active learning in a Project Management module improved students' performance, enhanced their learning experience, and deepened their engagement, concluding that this approach fosters effective and deep learning. However, there is a gap in the literature in the context of developing a flipped learning environment for an E-learning project management course despite the growth of E-learning projects especially for Saudi-based students and educational technology designers. Furthermore, there is a need to explore how integrating reflective and critical thinking components can enhance student acquisition of skills and development.

2. Literature Review

2.1 Flipped Learning

Flipped learning facilitates the acquisition of practical skills and the attainment of improved learning outcomes among students (Luo, O'Steen, & Brown, 2020). This argument is grounded on the principles of Constructivist learning theory, which also offers theoretical justification for the effectiveness of flipped learning compared to traditional lecture-based learning (Xu & Shi, 2018). One of constructivist theory's fundamental principles is that the learning process does not include a passive absorption of information but rather entails an active construction of one's understanding and knowledge (Tippins et al., 1993). According to constructivists, learning occurs when any information engages with a student's pre-existing information and experiences, resulting in the development of new knowledge (Murphy, 1997). During this iterative process, knowledge acquisition gradually progresses towards greater complexity, facilitated by assimilating new information into pre-existing philosophical structures. Additionally, knowledge acquisition often occurs via collaborative efforts, as individuals co-construct with others (Dong et al., 2021). Flipped learning has been known to enhance the learner's self-regulation, critical thinking capabilities, and self-efficacy perception (Chang et al., 2020; Öztürk & Çakıroğlu, 2021).

2.2 Role of Reflection and Metacognition

Another reason for the success of flipped learning in classrooms is due to the vital role that reflection plays (Bredow et al., 2021; Sletten, 2017; Zain et al., 2022). Reflection catalyzes

metacognition, facilitating students to assess their comprehension, monitor their learning processes, and identify misunderstandings (Choi et al., 2005; Gamby & Bauer, 2022). It facilitates integrating theoretical knowledge with practical implementation by aiding students in establishing connections between pre-class materials and real-world scenarios (Fung, 2020). This particular facet of metacognition is consistent with the viewpoints of researchers such as Huang et al. (2017), who characterize it as a cognitive process of a higher order that interprets encoded information and enables monitoring of this cognitive progression. According to Rahimi and Katal (2012), metacognition plays a crucial role in acquiring skills by enabling learners to foresee challenges and choose techniques that promote successful learning and monitoring. Participating in metacognition involves integrating metacognitive information, including self-awareness, comprehension of tasks, and the implementation of strategies, as well as using metacognitive tactics, such as reflective practices (Papleontiou-louca, 2003). The implementation of reflective practice within the classroom profoundly impacts the dynamics of in-class exchanges, facilitating the development of dynamic debates and interactions among students (Loranc-Paszylk et al., 2021) and self-regulation (Öztürk & Çakiroğlu, 2021).

Additionally, it is a great mechanism for educators to refine their pedagogical approaches (Beauchamp, 2015). In addition, the practice of reflection fosters the development of critical thinking abilities, enabling students to assume an active and engaged stance in their educational endeavors (Brockbank & McGill, 2007). This improves academic achievement and provides individuals with the necessary abilities for continuous learning as self-directed, responsible learners (Morris, 2019).

2.3 ASSURE Instructional Model

In addition, in developing a flipped learning course, learners' opinions and input must be considered for several reasons (Chen et al., 2014). First and foremost, this practice guarantees that the material follows the learners' requirements, enhancing engagement and relevance. This engagement offers significant perspectives on efficacious instructional materials and pedagogical approaches (Roach, 2014).

Additionally, student input facilitates ongoing development, boosting the capacity to adapt and cultivating a conducive learning environment (Thomas & Mengel, 2008). This demonstrates a dedication to ongoing improvement. Moreover, including students in the educational process empowers them as active participants in shaping their learning experiences, enhancing their levels of motivation and engagement. This approach guarantees incorporating inclusion, diversity, and sensitivity within the material while catering to various learning styles.

To achieve an engaging learning experience, the ASSURE model can be used when designing a flipped learning course. ASSURE model is an acronym representing the sequential steps of analyzing, stating standards and objectives, selecting strategies, utilizing technology, media, and material, requiring learner participation, and evaluating and revising (Heinich et al., 1999). The instructional design process is a methodical technique that seeks to provide learning experiences that are both effective and entertaining for students.

During the first step of the ASSURE methodology, an analysis of the learners' requirements is conducted (Smaldino et al., 2015). This includes the examination of learners pre-existing knowledge, individualized learning modalities, personal inclinations, and any distinctive obstacles they may encounter. The next step comprises stating the standards and objectives, such as clearly defining and communicating the learning outcomes. Following this, carefully selecting suitable tactics, resources, and technology to effectively address and fulfill those

demands (Smaldino et al., 2015). Students' viewpoints are paramount in ascertaining the resources and technology that impact them most. For instance, students may indicate a predisposition for video lectures, interactive simulations, or collaborative online platforms following their learning methods.

The course materials are developed using technology, media, and material during the next phase. Learner participation is required, and student feedback is collected, which is crucial in guaranteeing that the information is organized and delivered in a manner that is comprehensible, captivating, and supportive of the learning process (Smaldino et al., 2015). By soliciting input from students about elements such as tempo, engagement, and accessibility, it becomes possible to make necessary improvements that enhance the overall learning experience (Kim & Downey, 2016). The final phase is the evaluation and review phase, which includes continuous evaluation and monitoring of the efficacy of the course contents (Heinich et al., 1999). The collection of student input, whether via surveys, exams, reflections or conversations, serves the purpose of identifying areas needing improvement. Modifications are made based on this input to enhance the learning experience.

Thus, based on the above, the purpose of this study was to design a flipped learning environment for an E-learning project management course based on the ASSURE instructional design model by considering the integration of reflective thinking and critical thinking into the class materials to evaluate the impact of this design on students learning. To achieve this aim, the following research questions were explored as part of the study: How does the E-learning project management course contribute to students' acquisition of practical project management skills and their confidence in applying them in real-world scenarios? Furthermore, how does the flipped classroom approach enhance students' self-regulation and self-learning skills in E-learning project management?

3. Method and Procedures

3.1 Method

The stated research objectives guided the intentional choice to employ a qualitative research approach in this study. The main goal of this study was to examine the student experience while participating in a flipped course, focusing specifically on how this method of instruction promotes critical thinking and facilitates reflective learning. Therefore, this study adopted a descriptive and exploratory case study. A case study researcher explores “in depth a program, an event, an activity, a process, or one or more individuals” (Creswell, 2012, p. 15).

Qualitative research was considered the most suitable methodology for a number of reasons. To begin with, this approach enabled the investigation to be carried out in a naturalistic environment, wherein the study was carried out in the precise context of the phenomena under investigation as they occurred in the actual world. Establishing a naturalistic setting is crucial to capture the actual experiences of students, as it prevents the use of artificial or controlled environments that may fail to accurately represent the intricacies of the classroom.

Additionally, contextualization is facilitated by the qualitative method. This permits the investigators to explore the distinct and particular circumstances surrounding the flipped learning initiative. It is essential to contextualize in order to comprehend the complexities and subtleties that could influence how students perceive this instructional approach. Through an examination of the background environment, the study can discern elements that facilitate reflective learning and the growth of critical thinking abilities. Section 3.4 provides more details about the process and data collection methods.

3.2 Research Design

I designed a flipped E-learning project management course which was completed within 13 weeks. In the first week, students were given the course's syllabus, which contained its general description, aims, main references and electronic sources, the timeline of topics, and task requirements with its rubrics. In addition, I designed PowerPoint presentations for each lecture, and students can download presentations and syllabi from LMS (Blackboard). Students also provided areas for discussions in the LMS and were encouraged to post their ideas and questions. One of the tasks for this course was creating E-learning project management and planning and executing this plan, which needed students to work in small groups. For this purpose, I created virtual classrooms with Blackboard Collaborate Ultra for each small group to enable students to have synchronous meetings anytime out of the classes. Furthermore, I prepared a short, interactive video for lectures using the Edpuzzle platform, using an editing screen recording technique with embedded questions and notes. I also gave students the codes for each lecture posted in LMS announcements. I utilized interactive videos to increase student engagement and promote critical thinking. The embedded close-ended questions provided students instant feedback for their responses, while the open-ended questions required the students to answer (prevent skipping). I illustrated the answer in the next clip. Edpuzzle provided me with data analytics for monitoring students' performance and their progress. The schedule is presented in Table 1 and Figure 1.

Table 1. E-Learning Project Management Topics.

Weeks	Topic
Week 1	<ul style="list-style-type: none"> • Course Syllabus & Clarifying the Teaching Strategy • Introduction to E-learning Project Management
Week 2	<ul style="list-style-type: none"> • Enterprise Environmental Factors • Organizational Process Assets
Week 3	<ul style="list-style-type: none"> • E-learning Project Life Cycle (Waterfall, Spiral, Agile)
Week 4	<ul style="list-style-type: none"> • Introduction to Process Project Management Groups • Integration Management
Week 5	<ul style="list-style-type: none"> • Scope Management • Schedule Management
Week 6	<ul style="list-style-type: none"> • Cost Management • Procurement Management • Quality Management • Resource Management
Week 7	<ul style="list-style-type: none"> • Communications Management • Risk Management • Stakeholder Management
Week 8	<ul style="list-style-type: none"> • E-learning Project Execution & Monitoring and Controlling
Week 9	<ul style="list-style-type: none"> • Project Closing
Week 10	<ul style="list-style-type: none"> • Submitting the Project
Week 11	<ul style="list-style-type: none"> • Final Revision
Week 12	<ul style="list-style-type: none"> • Doing Final Exam
Week 13	<ul style="list-style-type: none"> • End of Semester • Students received their grades

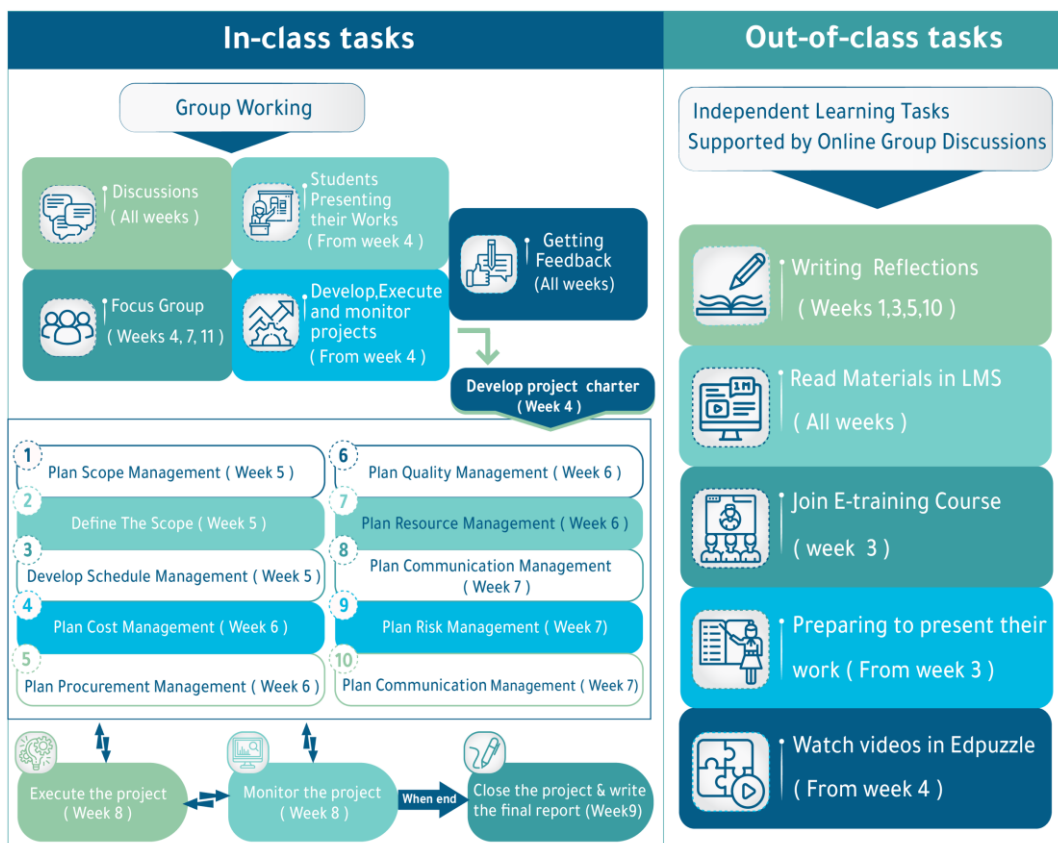


Figure 1. The Course Methods.

3.3 Participants

This research used purposive sampling, a non-random sampling technique, wherein the researcher intentionally picks individuals who possess certain qualities or attributes that are pertinent to the study purpose. The individuals involved in this study were postgraduate students in the Educational Technology department at King Saud University in Riyadh, KSA, who were in the last semester for a master's degree in 2023 and enrolled in an E-learning project management course for three hours per week from March to June 2023. This deliberate selection aimed to ensure that the chosen participants would provide relevant ideas and data pertaining to the administration of E-learning projects. This approach proves to be very advantageous when the objective is to collect data from a distinct and focused population that exhibits the essential characteristics required for the successful execution of the research. The number of students was 29; all participants were Saudi nationals over 24 years old, except one from Kuwait. The participants' backgrounds include Early Childhood Education, English Education, Special Education, Computer Science, Psychology, Science and Math Education, and Islamic Education.

Students enrolled in three groups consisting of 9 to 11 students, and their weekly lecture was provided based on their schedule on different days. In the first lecture and before providing the course title and general descriptions, I asked students to write their perceptions about E-learning project management, the topics they think the course will cover, and their previous experience managing projects.

Just two students have slight experience with project management, as one was interested in searching for project management training courses and wished to gain a PMP certificate. The other practiced project management skills as an operational manager in the Saudi Interior Ministry. In addition, most students did not experience flipped learning and showed enthusiasm for using this approach. Students were informed about the aim of this study and its process, and their consent was obtained from the beginning of this course.

3.4 Research Process

This study employed case study of a multifaceted approach to comprehensively assess the participants' learning experiences within the E-learning project management course. The first step involved participant reflections. Two distinct reflective exercises were administered to the participants. In the initial reflection, participants were tasked with delineating their anticipated course performance, predicated upon assessing the LMS's course title and general descriptions. The subsequent reflection sought to elicit insights into participants' methods of assimilating course content, executing tasks, and their subjective assessments of learning materials. Additionally, participants were prompted to expound upon encountered challenges and proffer recommendations for improvement.

In the second step, participants were invited to identify and elucidate impediments encountered while engaging with the flipped learning modality within the E-learning project management course. Furthermore, they were encouraged to outline the strategies to overcome these obstacles. Subsequently, participants were prompted to assess if any facets of the course could be refined to alleviate these challenges, utilizing their reflections facilitated through the Edpuzzle platform.

In the third step, the students were asked to conduct another reflection, which entailed participants providing insights into their experience with video-based learning via Edpuzzle within the context of the E-learning project management course. Particular emphasis was placed on the efficacy of video content and embedded questions in facilitating concentration and enabling flexible study routines. Additionally, participants were queried on their approaches to self-monitoring their learning progress.

In the fourth reflection, participants were prompted to evaluate their engagement in metacognitive activities, including self-reflection, self-assessment, and self-regulation. They were encouraged to explore how these activities contributed to their cognitive development and comprehension. Furthermore, participants were required to recount a complex task or issue encountered during the course, detailing their application of critical thinking skills in its resolution. Additionally, they were asked to outline the strategies implemented to surmount challenges and derive effective solutions. Optionally, participants were allowed to utilize infographics to represent their comprehensive understanding or sentiments toward the course visually.

In addition, three focus group sessions were conducted to garner participants' assessments of the learning materials, with specific attention to considerations of clarity in design and exposition. Additionally, participants were prompted to articulate the proficiencies they perceived to have acquired after engaging with the provided materials, as well as their levels of confidence in applying these newly acquired skills.

Semi-structured observations were also conducted in each lecture. A comprehensive evaluation was undertaken, encompassing assessments of participants' grasp of course content, their

execution of tasks during lectures, their affective states, interactive dynamics, and proficiency in engaging in scholarly discourse.

3.5 Data Analysis and Trustworthiness

This research used the thematic analysis approach, where the findings were organized and described in rich meaningful themes, following the six phases of thematic analysis outlined by Braun and Clarke (2006). The process included data familiarization, generating initial codes, searching for potential themes, reviewing and refining themes, and defining and naming themes in alignment with the research questions. A final research report was produced.

Various strategies proposed by Lincoln and Guba (1985) were implemented to ensure trustworthiness. Different data collection methods were used, and educational technology professors' input was sought to review the research design, data collection, interpretation, and analysis. Adjustments were made based on their feedback. Member-checking was employed by providing participants with summaries of their discussions to verify accuracy. Additionally, the research methodology, procedures, data analysis, and findings were detailed and supported by participants' direct quotations to enhance transferability.

4. Findings

4.1 Design and development of the E-learning Project Management Course

Adopting the ASSURE model, the study followed a systematic and learner-centered approach to develop the course on project management. The ASSURE model was a guiding framework for creating an engaging and effective learning experience. Figure 2 captures the steps that were involved in developing the course. The first phase of the ASSURE model, analysis, was undertaken meticulously. This phase involved comprehensively analyzing students' needs, previous experiences, and the learning context. This needs assessment laid the foundation for subsequent design decisions. The second phase, state standards and objectives, involved providing students with a course syllabus that contains a detailed plan of topics, timelines, and learning outcomes (Figure 3). Since the first week, the provision of the syllabus helped the students anticipate the educational content and enabled them to better prepare for learning and focus on the topics presented, especially since the educational materials were available at least a week before the weekly lecture date. In addition, all details of tasks and activities, their due dates, and rubrics are available in LMS.

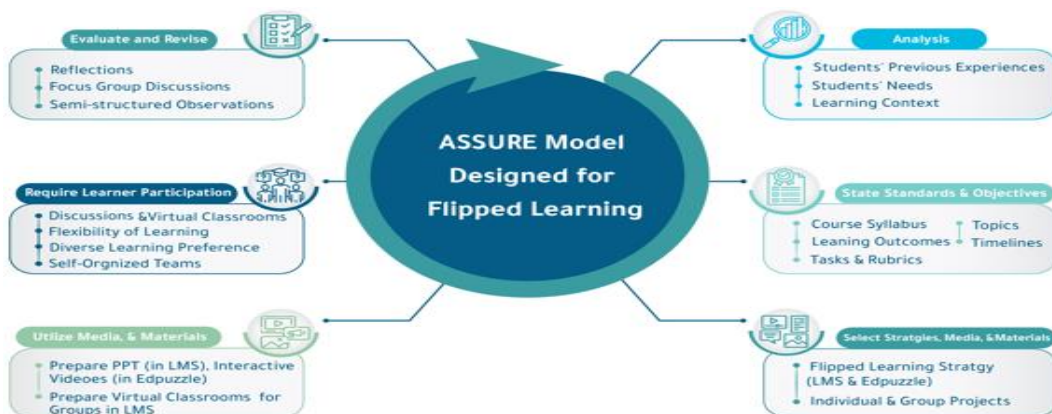


Figure 2. Phases of ASSURE Model Designed for Flipped Learning.

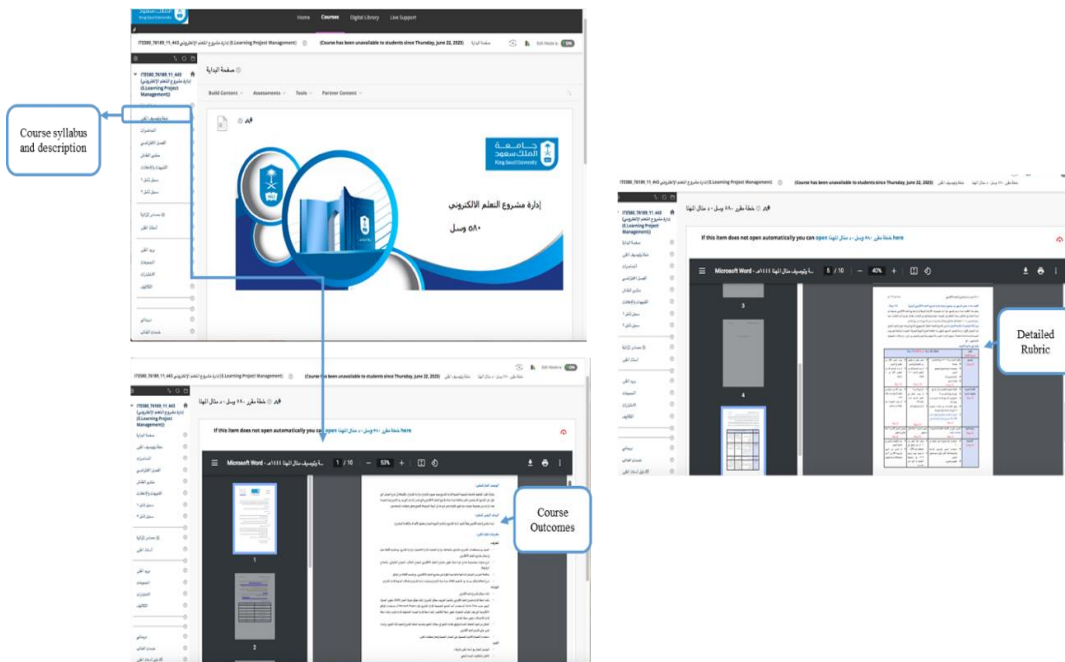


Figure 3. Course Syllabus and Descriptions in LMS.

The third phase involved the careful selection of strategies, media, and educational materials. Multimedia elements, such as interactive videos, questions, and notes, were strategically chosen to enhance the learning experience and were available in LMS and Edpuzzle platforms, applying a flipped learning strategy. Importantly, the selection process was guided by educational theories, specifically Mayer's Cognitive Theory of Multimedia Learning, ensuring that designed and chosen resources align with the principles of effective learning. This theory confirmed that humans have two channels for processing information, auditory and visual, and the ability to absorb and process information is limited at once. Mayer (2001) argued that learning is an active process in which the learner pays attention to the information received, selects and coordinates it into interconnected mental representations, and integrates it with previous knowledge. This theory was explained through detailed principles that generally highlighted the importance of good integration and synchronization between verbal information and images by presenting the most important information in a way that helps the learner build knowledge in a coherent form in order to have the learner's full attention and to achieve meaningful learning.

Furthermore, the course was structured logically and progressively, aligning with the third phase of the ASSURE model. Individual and group projects were also outlined. Group projects were thoughtfully designed to align with students' specialization in educational technologies. These projects were introduced gradually to ensure that students could develop an understanding of project management concepts effectively.

The fourth phase involved utilizing media and materials wherein interactive Edpuzzle videos (embedded with notes and interactive questions) and LMS presentations were developed and shared with the students. Utilization was exemplified in how educational materials effectively enhanced students' understanding of the course content. This effective utilization aimed to optimize student engagement and interaction by creating an engaging and effective learning environment.

The next phase of ASSURE model was the learner participation requirement, which was evident in the course design's strong emphasis on class discussions, flexibility of learning, virtual classrooms, and self-organized teams. Students were free to access materials anytime and anywhere, accommodating diverse learning preferences. Virtual classrooms and self-organized teams further reflected a commitment to providing a dynamic and adaptable learning environment.

Finally, the evaluation and revising phase was marked by ongoing assessment and feedback mechanisms, included reflections, focus group discussions, and semi-structured observations. Reflective writing played a crucial role in this phase, enabling students to self-assess their progress and provide feedback on their learning experiences. This continuous evaluation loop allowed for iterative improvements, ensuring the course remained effective and learner-centric.

In summary, each model phase, from analysis to evaluation, was meticulously implemented to create a course that prioritizes student engagement, flexibility, and effective resource utilization. The successful application of the ASSURE model highlights the significance of thoughtful instructional design in higher education settings. Overall, the course design passed into four rounds of modifications based on students' reflections and their opinions of the learning materials during lectures.

4.2 The success of the Flipped Classroom Design for the E-Learning Project Management Course

4.2.1 Improved Understanding

The learning process in each lecture followed a structured sequence. Students access course materials via the Learning Management System (LMS) by initially perusing the presentation slides and watching video clips in Edpuzzle that elucidate various sub-topics within each lecture. Subsequently, they engaged with the content by responding to associated questions. This preliminary exploration was followed by in-class discussions featuring students and the professor, where the most salient points were summarized. This dynamic discourse was followed by the practical application phase, during which student groups collaborated to execute tasks associated with the lecture's group project.

The students deeply appreciated this course's instructional materials and pedagogical approach. They expressed a desire to see similar design principles applied in other courses, attributing their enthusiasm to the enhanced learning experience and improved retention of information. Students also depicted their enthusiasm for learning while emphasizing their enjoyment of studying in a quiet environment and their happiness in acquiring and applying new knowledge.

4.2.2 Flexible Learning

The students' interpretation of flexibility within the context of this study encompassed several key aspects. Firstly, they viewed it as the availability of learning materials anytime and anywhere, accessible through various devices or mobile platforms. This flexibility allowed them to interact with instructional videos, questions, and notes at their convenience, allowing them to revisit content multiple times at their own pace. This adaptability was instrumental in promoting information absorption and facilitating enhanced learning.

Furthermore, this flexibility also lent cohesion to the lectures, as highlighted by Learner 6's observation.

"When some information was mentioned in the seventh lecture, and it was previously explained in the fourth lecture. I could easily return to it, listen to it again, and return to the seventh lecture for further understand."-Learner 6

Learner 1 added that when faced with unclear information, students proactively took notes and prepared questions to seek clarification from the professor at the start of the next lecture. Some students even rewatched videos to rectify incorrect responses, delve deeper into explanations, and re-evaluate their understanding. This demonstrated a strong commitment to comprehending the material, even when the answers could not be altered once submitted.

Additionally, flexibility extended to providing permanent virtual classrooms for each student group, allowing synchronous access at times convenient for individual group members (Figure 4). This feature was particularly beneficial for students facing health-related challenges, as exemplified by Learner 7 indicated,

"I was in the last month of pregnancy, and I was afraid that this would affect my academic level or even my participation with my colleagues in projects, but the method of teaching the course was enjoyable. Having virtual classes was very suitable for me as I used to communicate with my colleagues, sharing with them the project details, dividing weekly tasks flexibly, and thus all my fears were fading."

In line with the principle of flexibility and response to student preferences, group organization was based on a 'self-organized team' model, empowering students to determine and coordinate group members and responsibilities autonomously.

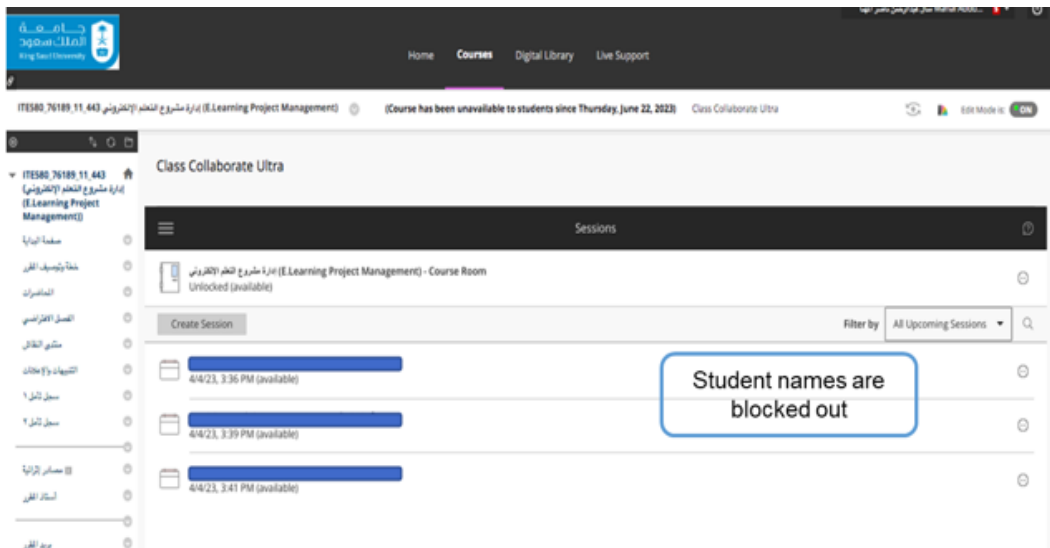


Figure 4. Groups in One of the Course Class.

In addition, student reflections on the course's flexibility were visually represented. Learner 1 illustrated two contrasting scenarios: one depicting a cheerful, tea-drinking student and another depicting a less enthusiastic student heading to a university lecture. The learner emphasized how the flipped classroom approach allowed students to choose an optimal day and time for preparation, fostering better concentration compared to traditional classroom settings, where external circumstances might impede full engagement.

"Student in picture 1 is cheerful and he prepared a cup of tea, while student in picture. 2 is not sad but not happy either... the idea is that student through flipped classroom has space to choose any day and time before

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the lecture to be optimally prepared for the lesson, while in traditional classroom student may attend but his mind is preoccupied with circumstances that distracts his mind”

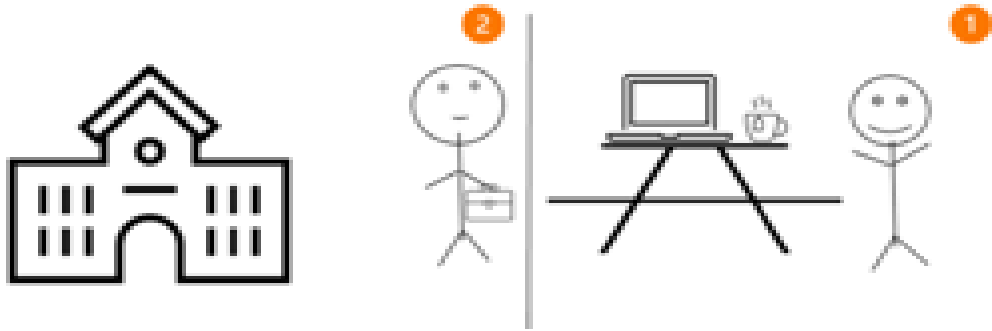


Figure 5. Learner 1 Reflection.

4.2.3 Greater Student Engagement and Enhanced Interface

All participating students expressed their satisfaction with the flipped classroom approach before and during the learning process. Learner 1 highlighted the professor's continuous guidance in implementing the approach, fostering active involvement and responsibility, and subsequently increasing motivation, interaction, and productivity. Learners 2 and 3 found the experience highly enjoyable, promoting interaction and idea exchange. Learner 4 noted that the approach effectively addressed information overload and attention lapses, enhancing comprehension and real-world applicability of concepts.

The course materials underwent multiple iterations to reach their final form, with each lecture offering diverse educational resources, including professor-prepared presentations with illustrations and concise explanations. Students highly valued professor-produced videos, considering them essential in the flipped learning experience.

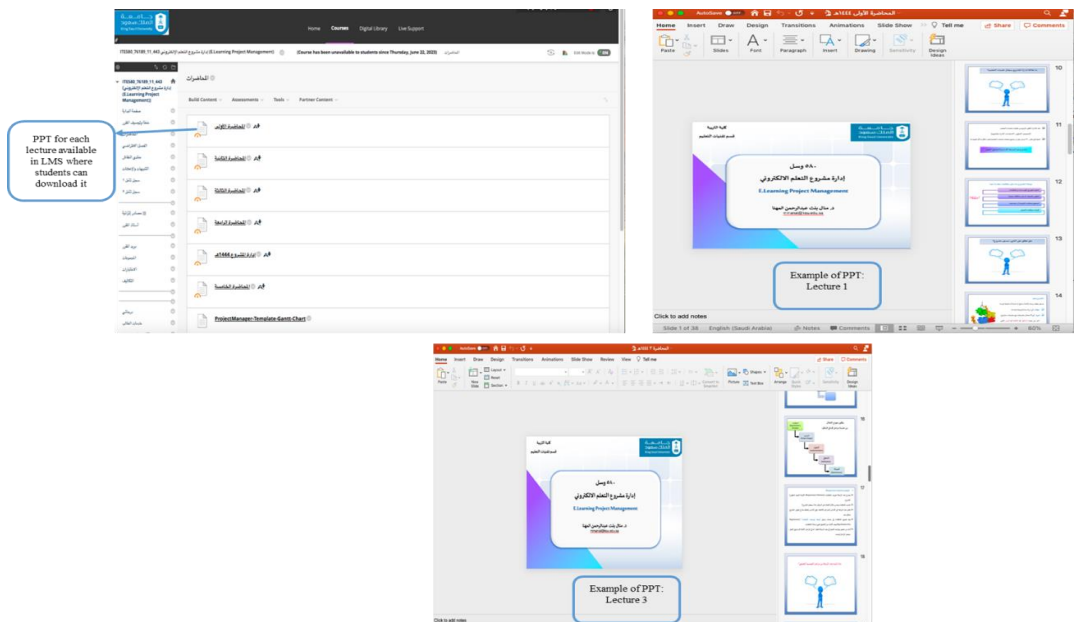


Figure 6. Example of PPT Material Available to Students.

Learner 22 emphasized that these videos significantly improved content clarity, appreciating the professor's deep understanding of the course material and students' needs. Videos were tailored for each lecture sub-topic, typically lasting no more than 15 minutes, with the quantity adjusted based on the sub-topic information volume. All materials, including presentations and videos, were designed in accordance with Mayer's Cognitive Theory of Multimedia Learning (Mayer, 2001). Attention to detail extended to audio elements within videos, with strategic emphasis on key points and well-timed pauses. This approach created a sense of comfort among students, who felt like they were in a lecture room with the professor while watching the videos.

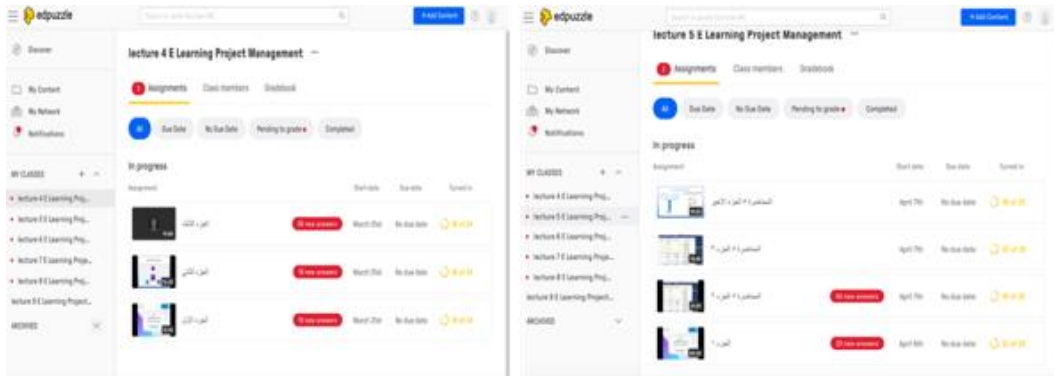


Figure 7. Example of Short Instructional Videos with Embedded Questions.

The videos featured a combination of closed-ended and essay questions, with the latter designed to stimulate curiosity, reflection, and critical thinking, while the former assessed memory retention, comprehension, and the ability to connect ideas.

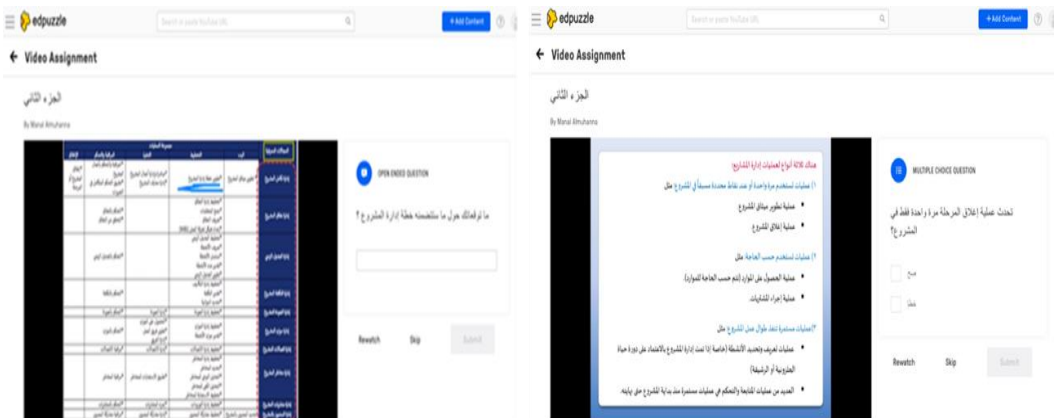


Figure 8. Example of Open-Ended Question and Close-Ended Question (Video Assignments).

Starting from the fifth lecture, videos were enriched with side notes to capture students' attention and focus on specific information. These notes prompted video pauses to facilitate reading comprehension. Students lauded this multifaceted approach, asserting that explanations through videos, questions, and notes offered a more engaging and visually interactive interface, elucidating concepts and information more effectively than relying solely on textual explanations in PowerPoint (PPT) presentations. Additionally, side notes were deemed instrumental in information organization and retention, providing a valuable resource for revisiting content when needed (Figure 9).

The screenshot shows the edpuzzle interface for a video assignment. At the top, there is a search bar and a '+ Add Content' button. Below that, the video title 'المحاضرة 5 الجزء الاخير' and the author 'By Maral Almuhamma' are visible. The main content area displays a video player with a side note overlay. The side note is titled 'المسار الحرج Critical Path Method-CPM' and contains the following text:

المسار الحرج Critical Path Method-CPM
 هو المسار الذي تقع عليه سلسلة من المهام (الأنشطة) الحرجة وهي التي يجب أن تتم في موعدها المحدد حتى لا يتأخر المشروع.
 ويظهر لنا في مايكروسوفت بروجكت من خلال اختيار قائمة format لم نختار زر هذه critical فيظهر المسار الحرج في مخطط جانت بالتون الأحمر (المهام التي تقع عليه لو تأخرت سينتج عنها تأخر المشروع ككل).

Below the text, there are two red warning icons with exclamation marks. The first one says 'يكون عدد الأنشطة الحرجة هو الأكبر بين المسارات الأخرى (أطول مسار)'. The second one says 'يحدد (يعتبر) المسار الحرج أقصر مدة ممكنة للمشروع'. To the right of the video player, there is a 'NOTE' box with a blue play button icon and the text 'المهام الحرجة هي التي إذا تأخرت فاتها ستؤثر على تاريخ تسليم المشروع'. Below the note box are three buttons: 'Rewatch', 'Skip', and 'Continue'.

Figure 9. Example of a Video Side Note.

Students' reflections guided the refinement of learning materials, focus group discussions, and in-lecture observations. This iterative process incorporated additional notes and questions within the videos and provided guidance and practical task templates. These modifications elicited heightened satisfaction among learners, who strongly desired to implement this design approach throughout the course. They attributed this enthusiasm to two distinct qualities of the latest design: flexibility and richness.

4.2.4 Authentic Group Projects

Students found great satisfaction in their participation in group projects within the course, acknowledging the significant value of these projects in connecting theoretical knowledge with the practical application of project management and meticulous planning. These insights positively influenced the projects' success and effectiveness. The group project involved creating an electronic portfolio that included the group's biographies and various projects completed during their master's program, along with articulating their vision and objectives within educational technologies. The project progressed in alignment with the weekly lecture topics, with students commencing tasks like crafting their project charter in the fourth week.

Subsequent lectures guided students in developing their project plans, covering essential aspects like scope, schedule, resources, costs, quality, communications, and risks. Students executed these plans, monitored performance diligently, and documented any alterations, ensuring approved changes were implemented. Ultimately, students concluded their projects and compiled final reports with valuable lessons learned.

The group project was intrinsically tied to students' specialization in educational technologies, necessitating the selection of a site or program to create an electronic portfolio. This portfolio adhered to the theories and standards acquired during their prior courses, notably the Educational Design and Production of Digital Media courses.

Participating in an authentic group project elevated the caliber of the work produced. Learner 10 eloquently justified this elevation by underscoring each group member's diverse intelligence and experiences, which facilitated the allocation of tasks in alignment with their unique skills. This principle resonated with Howard Gardner's Theory of Multiple Intelligences (Gardner, 2000). Moreover, the course's flexible design empowered students to select their group members and autonomously organize their roles and responsibilities. This autonomy motivated each member to deliver their best work, validating their decisions and the feasibility of their involvement in the broader course planning process.

4.2.5 Reflective Writing

Students found writing reflection papers to be a rewarding experience, as it prompted them to revisit the learnings of the preceding weeks. This exercise allowed them to contemplate their activities and learning throughout that timeframe. Writing reflections served as a motivational catalyst, instilling heightened attentiveness and focus on the weeks ahead while compelling them to articulate their perspectives in preparation for forthcoming lectures. Writing reflections allowed students to connect the course topics to their local realities, such as thinking about the success factors of some E-learning projects in Saudi Arabia.

4.2.6 Enhanced Interaction

Interaction plays a pivotal role in engaging students throughout the course and elevating the overall quality of learning. The course's design effectively bolstered student interaction from four distinct dimensions. Firstly, it heightened student interaction with course content by crafting interactive videos with questions that necessitated learner responses. These questions functioned as waypoints, offering learners immediate feedback and amplifying their sense of accomplishment and motivation.

Secondly, it cultivated interaction among students through collaborative group projects and tasks that mandated classroom discussions or engagement during virtual group meetings. Learner 9, for instance, commented “it is difficult to forget those issues that were discussed for a long time”. These interactions also had invaluable role in case of students' health-related absences from certain lectures, as their colleagues effectively kept her in the loop.

Thirdly, the course facilitated interaction between students and the professor by providing timely feedback on their responses to video questions and their classroom work, thus promoting improvement and fixing students' idea. Moreover, it fostered opportunities for in-depth inquiries and discussions within the classroom setting. Some of these discussions, particularly those touching on financial or future career gains, sparked students' curiosity and inspired them to engage in further research.

Lastly, the course provided a platform for communication and interaction among students and individuals from the broader external community who shared common interests. For instance, Learner 11 was inspired by the notion of creating an online portfolio showcasing her master's course projects, which held immense potential for educators. In other words, Learner 11 noted,

“The idea of creating an online portfolio of our projects in master's courses was very inspiring to me as a mathematics teacher for the primary stage, to be published and benefited by the teachers of mathematics, especially as I was interested in most of my projects in designing and implementing digital materials that belong to mathematics.”

Furthermore, Learner 4 underscored the value of linking individual achievement portfolios to LinkedIn accounts, enhancing the CVs of each participant. Learner 12 also found delight in learning through the flipped classroom approach and took pleasure in imparting newfound knowledge to her family members at home, especially as four of them are disabled and appreciate education.

Enhanced interaction within the course and beyond contributed significantly to a more profound understanding of project management processes. It fostered stronger collaboration and communication among team members and deeper engagement with external communities. As a result, many students advocated for the flipped classroom's continued use as an ideal learning mode.

4.2.7 Challenges Faced

Despite students' enthusiastic support for the flipped classroom model, they encountered several challenges during their learning journey, which can be categorized into three areas: materials and task challenges, technical challenges, and challenges related to embracing a learner-centered approach.

In terms of materials and task challenges, students transitioned from passive listeners to active viewers, which presented new difficulties. These included limitations in answering questions within videos, the inability to adjust video playback speed in Edpuzzle to suit individual preferences, and difficulties in selecting topics for individual presentations. Managing extensive course material within a short semester and coordinating group meetings, especially during Ramadan, also posed challenges.

Technical challenges further complicate the learning process for some students. Issues with video tracking, despite using university emails, and interface glitches during assessments for external training courses like Microsoft Project were encountered. Challenges related to subscription fees for certain programs, icon discrepancies in trial versions, and compatibility issues with the Arabic language in some applications arose. Connectivity issues in newly developed areas of Riyadh forced some students to rely on mobile networks or public spaces for tasks and video viewing. Additionally, the inability to download, save, and view videos offline and compatibility issues with Android devices during mobile viewing added to technical challenges.

The adoption of a learner-centered approach also presented unique challenges. Students struggled to identify suitable, distraction-free study environments outside the traditional classroom. Determining each student's most effective learning method was challenging, as individual preferences evolved based on personal experiences. Some students felt a diminished sense of significance in attending physical university lectures, particularly those with long work hours and evening classes.

4.3 Student Outcomes from the E-learning Project Management Course

As a result of the course and its design, students expressed increased confidence in practicing project management skills and found the project management process clear and well-sequenced. They also appreciated having access to resources and practical project applications, which contributed to their development effectively.

4.3.1 Indirect Skills

With its carefully crafted activities and tasks, the course design nurtured and refined students' self-directed learning and self-assessment abilities, fostering growth in three key dimensions. First, students learned to evaluate their work against rubrics, identify strengths and weaknesses, and meet deadlines, enhancing their self-assessment and accountability. As Learner 15 observed,

"The course empowered us to discern our strengths and weakness, prompting proactive efforts to improve."

Second, the course emphasized research and self-directed learning through digital resources, inspiring curiosity and teamwork among students. Learner 1 shared a transformative insight: "I learned not to label topics as 'difficult' prematurely; incorrect answers in video lessons sparked my curiosity to delve deeper into the subject matter."

Third, it cultivated critical thinking and analytical skills, which students applied to project work and metacognitive activities, benefiting their decision-making abilities. As highlighted by Learner 5, "*Collaborative analysis in group projects led us to make informed decisions.*" Additionally, the course fostered self-regulation, transforming passive learners into proactive, empowered individuals. Learner 9 shared her experience, "*I improved my time management by watching lecture videos before class, which boosted my recall and application of the material.*" In summary, the course's flexible and student-centered design promoted active learning, enhanced self-regulation, and facilitated the practical application of skills in real-life scenarios, which impacted participants' personal and professional lives.

4.3.2 Direct Skills

The significance of comprehending the enhancements in students' knowledge and competencies of E-learning project management following their participation in a course designed for this study cannot be overstated. At the outset of the course, an inquiry was made regarding students' self-assessment of their anticipated performance and any prior experience in E-learning project management. Furthermore, a substantial number of students believed they possessed rudimentary knowledge. It asserted that they had gained practical experience in management through their involvement in prior courses projects. Nevertheless, students were keenly interested in the course and enthusiastic about acquiring a Project Management Professional (PMP) certification. During the initial lecture, some students drew parallels between topics in the syllabus and courses they had previously taken, such as Instructional Design, where they claimed that the project management process bore similarities to instructional design stages. Other students contended that E-learning Project Management complemented their prior coursework and contributed to successfully integrating innovations in educational technology.

In the final focus group and reflection sessions, students articulated their desire to have taken this course in previous semesters, as they believed it would have enabled them to execute their projects with greater efficiency and quality, thanks to the techniques, tools, and knowledge management systems they had acquired. Learner 21 visually represented her thoughts, as noted in Figure 10.



Learner 21 noted, "*I made this draw when 'project management' came to my mind. There is a goal for each project, which is to come up with a product or service. The project begins with the project charter, then passes through a path with creative ideas during its execution managed by the project manager with the help of his team. There is also a specific budget for the project, in addition to periodic reports, while adhering to a specific time schedule.*"

Figure 10. Learner 21 Reflection.

Learner 19 said that E-learning project management is difficult for persons without professional experience. Understanding requires more than reading about the topics. After completing this course, Students learned how to handle concerns from previous work, including the necessity of setting project goals and scope from the start, managing team duties, and achieving deadlines.

Students said that this course increased their awareness of elements affecting E-learning project performance, such as:

- Choosing an appropriate project development life cycle and considering cost, size, and risks.
- Prioritizing a thorough project strategy.
- Using Work Breakdown Structures (WBS) to create subtasks, schedule them, assign them to team members, and allocate resources.
- Preparing and obtaining customer approval for project scope, quality, risk, and communication plans before execution.
- Regularly assessing project performance against milestones, recording and adapting to changes.
- Utilized current project planning technologies, including 'Schedule Compression', Gantt Charts, and Asana.
- Emphasizing the value of cooperation between project managers and team members, emphasizing the concept that effective project managers inspire confidence and help teams trust themselves.

Students said this training gave them more confidence in project management. They credited their confidence in the course's clear method and sequence and increased knowledge of work-related software and apps. As Learner 18 remarked,

“Nothing that makes me nervous about project management as I used to in the past unless the project field is new (not an E-learning field) and I have not tried working on it, because I might miss details related to quality or other things, and I would not be familiar with them.”

Thus, the provision of a clear course description, sequential explanation of processes, readily accessible resources, practical project applications, and guidance on the utilization of tools and techniques for precise project planning collectively generated enthusiasm among students for practicing their project management skills and bolstered their confidence in doing so.

5. Discussion

Significant gains in learning effectiveness have resulted from using the flipped learning approach in the E-learning project management course. A substantial portion of this achievement stems from giving students enough opportunity to use their newly gained knowledge and abilities in real-world contexts. The advantages were most noticeable in sessions that combined theory and practice. Because of this, students could understand the material better, retain it more practically, and adapt to their unique learning styles (Huang et al., 2022; O'Flaherty & Phillips, 2015; Strygacz & Sthub, 2018).

The concepts that advocate for active involvement in the learning process are consistent with the flipped learning method since it is based on constructivist learning theory (Bada & Olusegun, 2015). According to constructivist theory (Tippins et al., 1993; Xu & Shi, 2018), learning is not a passive act of absorbing information but rather an active process of developing understanding and knowledge. This is consistent with what I saw in the lesson, as students worked hard to learn new material and then used what they already knew to fill in the gaps and form their unique perspectives.

Additionally, reflection's critical function in developing metacognition is a major reason the flipped learning model has been so effective (Bredow et al., 2021; Sletten, 2017; Zain et al., 2022). Students could self-evaluate their knowledge, track their progress, and pinpoint any areas

of confusion by engaging in reflective thinking (Choi et al., 2005; Gamby & Bauer, 2022). As a result, students were better able to draw linkages between their prior learning and the contexts in which they will be put to use (Fung, 2020). Researchers like Huang et al. (2017) see metacognition as a higher-order cognitive process that decodes encoded information and facilitates cognitive monitoring, and their results are consistent with that approach. It has been shown that metacognition is crucial in acquiring skills by allowing students to plan for and implement the most effective study methods (Al-Abdullatif, 2020; Rahimi and Katal, 2012).

Incorporating metacognitive knowledge, which includes self-awareness, task understanding, and the application of strategies, and using metacognitive methods, such as reflective practices, is what it means to engage in metacognition (Papleontiou-louca, 2003). With the use of reflective practice, we were able to improve our teaching methods (Beauchamp, 2015; Loranc-Paszylk et al., 2021). This resulted in more engaging classroom exchanges and conversations between students, which is consistent with Kim et al. (2014) results, where they found flipped learning activities were valuable because they facilitated building collaborative networks with students in the class. Furthermore, reflection helped students develop critical thinking skills, allowing them to take ownership of their learning (Brockbank & McGill, 2007; Morris, 2019).

The findings demonstrate that the flipped learning model significantly improves student involvement, contentment, and achievement. Students had a more positive and fruitful learning experience when they actively participated from the outset, worked together to solve problems, and reflected on their progress. The method also helped students overcome cognitive difficulties and better comprehend the material covered in class. These findings validate the flipped classroom as an effective pedagogical tool for elevating education.

6. Conclusion

The increased self-assurance that students exhibit when applying project management skills clearly indicates the implications of the course design and modified learning methodology. This enhanced confidence was a result of the course's transparency and methodical process that required students' involvement in the course design. The accessibility of practical project applications, the design of learning materials and resources significantly influenced the development of students' skills. The previous expression of student interest in comparable courses suggests that such course has the capacity to positively influence future projects.

However, it is important to consider certain limitations, particularly because some students faced challenges while others had previous experience in project management, and some had none. This made it difficult to cater to students of all skill levels. It is advisable that forthcoming investigations explore approaches to customize course material to accommodate the varying proficiency levels of students and offer individualized assistance. In order to determine the enduring impact of these courses on students' careers, further research could examine the long-term implementation of acquired skills in professional contexts.

In this study, some limitations were acknowledged. The sample of 29 master's students is relatively small, which limits the ability of the findings' generalizability. Furthermore, the study context contained students at the Educational Technology department who are learning the course of E-learning project management. Therefore, it is imperative to investigate the potential effects of the flipped learning methodology with a larger sample size in various academic disciplines, considering its efficacy in augmenting student engagement, comprehension, and metacognitive abilities.

As the current case study mainly utilized qualitative data, future research can also examine the effects of flipped learning on the student's academic performance in an experimental study using mixed methods. Future research can also evaluate the inclusion of more innovative technologies, such as virtual and augmented reality, and how these technologies can enhance the E-learning project management experience. Future studies can also conduct a comprehensive comparative analysis with traditional classroom settings and compare academic performance, skills acquisition, and application in real-world settings. Overall, measuring the impact of technology on the learning outcomes is an emerging research field that requires significant focus.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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