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Research Article

AI-empowered Teaching Reform of Project Management in Telecommunication Engineering

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Abstract

As an important specialized extension course for undergraduate students who major in telecommunication engineering, the Project Management (PM) course is vital for the students to meet the requirements for engineering practice and project management skills in their future career. The course is rich in content, but with limited class time. Besides, it is both highly theoretical and practical. Lack of effective practice opportunities for students is the biggest challenge that is difficult to overcome in the traditional teaching background. Therefore, we integrate Artificial Intelligence (AI) into the teaching process of PM to overcome the challenge and promote teaching effects by providing students with virtual practice opportunities of project management. The integration of AI into PM courses offers personalized instructions, dynamic content recommendations, tailored project simulations, case-based learning, automated assessment and real-time feedback. AI facilitates the theoretical learning process and improves the learning efficiency of students. Furthermore, AI provides diverse virtual project environments tailored for students to practice their PM skills. Moreover, AI can take some virtual roles in a project and interact with students. With the aid of AI, more opportunities are available for students to develop their problem-solving skills in projects and to enhance their project management skills. Besides, AI can give some hints or provide suggestions when students are faced with some dilemmas in the virtual projects. There are usually several ways to solve a problem and each solution has its own advantages and disadvantages. Then, discussions among teachers and students are initiated to decide which solution is better. During the process, the horizons of students are broadened and their skills in PM, even their overall competencies, are gradually developed. Thus, by integrating AI into the teaching process of PM, teachers are able to offer more effective virtual practice opportunities to students, effectively conquering the biggest challenge of the course. In the end, it is emphasized that each of us is supposed to realize the limitations of AI and avoid over-reliance on it.

Keywords

Project Management, AI-empowered, Teaching Reform

1. Introduction

The Project Management (PM) course is one of the specialized extension courses for undergraduate students who major in telecommunication engineering. The main goal of this course is to enable students to understand and master the fundamental concepts, principles, and methods of PM, and to apply these skills in telecommunication engineering projects.

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Learning PM can equip students with the ability of making plans for their daily studies and life, as well as improve their competitiveness in the workplace after graduation. Mastering this course will significantly enhance students' employability and long-term career development. Project management skills are also essential for meeting the engineering practice and the project management requirements in professional standards. To meet their future career demands, undergraduate students majoring in telecommunication engineering need to acquire knowledge in project management.

The content of PM includes the ten knowledge areas of project management: integration management, scope management, schedule management, cost management, quality management, resource management, communication management, risk management, procurement management and stakeholder management. It also involves the five standardized process groups: initiating, planning, executing, monitoring and controlling, and closing process group [1, 2]. PM relates nearly every aspect of a project from inception to completion, with management targets including personnel, materials, finances, time, information, etc. The PM course is rich in content, but with limited class time. It is characterized by both highly theoretical and practical features. Lack of effective practice opportunities for students is the biggest challenge, which is difficult to overcome in the traditional teaching settings.

With the rapid development of information technology, Artificial Intelligence (AI) has been used in many fields [3]. In educational fields, AI is revolutionizing education by transforming teaching methods, personalizing learning pathways, and improving educational efficiency [4-7]. Its integration into classrooms worldwide has introduced new opportunities for educators and students. The Project Management Institute (PMI) also adds AI into their online courses [8]. They combine AI and project management to make the learning process more practical and effective.

In our teaching practice, we have embedded AI into our PM courses since 2024. The measure has increased student interaction in online courses by 15% compared to 2023. Students are more proactive, with significantly higher participation rates in class discussions. The integration of AI into PM courses is deeply welcome by students. In the autumn of 2025, the AI-Empowered platform will be adopted further in the teaching process of PM.

In the following parts of this article, we present the benefits of AI in teaching generally in Section 2. Then, our AI-empowered teaching practice in PM is introduced in Section 3. Moreover, the importance of human wisdom is emphasized in Section 4. Besides, the challenges and ethical considerations of AI are listed in Section 5. Finally, Section 6 concludes the article.

2. Benefits of AI in Teaching

When AI is fully utilized in teaching, at least the following benefits can be achieved: personalized learning, enhanced engagement and interactive learning [9-15], bridged educational gaps, reduced teachers' workload and improved work efficiency [16].

2.1. Personalized Learning and Adaptive Instruction

AI can provide students with a more personalized learning experience by taking a closer look at the strengths and weaknesses of students' learning, as well as their different learning habits. Now, many adaptive learning platforms have added AI technology, and these platforms can automatically adjust the difficulty of learning content, so that the learning content is more suitable for each student's actual situation. Studies have indicated that students using AI tutors achieve higher test pass rates [7].

2.2. Enhancing Interactive Learning

AI offers immersive and interactive learning experiences through virtual scenarios, playful designs, and AI-assisted simulations. Now with AI technology, teachers can use it to produce a variety of learning materials, which are rich in content, interesting in form and interactive. In this way, students will be more interested in class and more willing to participate. Students will learn more proactively, and the learning effects will be better. [12]. Moreover, AI chatbots can provide immediate feedback and keep students motivated and engaged.

2.3. Bridging Educational Gaps and Promoting Equity

By providing high-quality resources to underserved areas, AI enables more access to education. Many students in remote areas can now use AI, such as those learning software on mobile phones, which can answer questions at any time. There are also electronic textbooks made by AI, which can be used by each student, and these textbooks can adjust the content according to each student's situation. Additionally, AI-based translation tools break down language barriers, making education more accessible worldwide.

2.4. Reducing Teachers' Workload and Enhancing Their Work Efficiency

AI can automate some of the administrative tasks, such as grading, curriculum planning, and attendance tracking, so that teachers can focus more on student engagement and critical thinking development. Tools like AI-generated lesson plans and automated grading systems can greatly improve teachers' work efficiency and reduce their workload [16]. Teachers make use of AI for personalized student evaluations and make more time available for one-to-one mentoring.

AI assists educators in enhancing their teaching approaches. UNESCO has developed a framework on AI capabilities for teachers, which describes that AI can help teachers in many aspects, from lesson design to ethical AI use [17].

3. AI-Empowered Teaching in Project Management

The integration of AI into PM courses offers personalized learning pathways, dynamic content recommendations, tailored project simulations, case-based learning, automated assessment and real-time feedback. Thus, learning outcomes can be enhanced.

The measures we have taken in the teaching practice of PM are discussed below.

3.1. Personalized Learning Pathways and Dynamic Content Recommendations

Based on the students' engagement and performance in the learning tasks, supplementary resources, such as articles and videos, are pushed by AI accordingly. Such an effective dynamic way greatly promotes the students' learning motivation and largely improve their learning efficiency. One of the students said that the dynamic content recommendations in PM driven by AI guided him to learn the PM theoretical components with high efficiency.

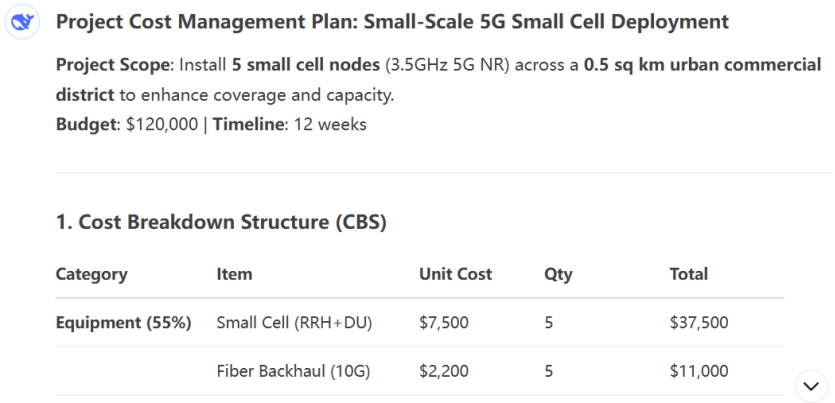
During the teaching processes, AI is adopted to analyze students' strengths and weaknesses in PM learning, and to offer suitable tailored virtual projects and case studies. For example, AI adjusts the complexity of project scenarios according to the actual progress and the learning profiles of students.

3.2. Tailored Project Simulations and Case-Based Learning

3.2.1. Generative AI for Scenario Creation

Teachers can now use AI to produce specialized project case studies, including risk logs, Gantt charts, and stakeholder analyses. That enables students to explore diverse industry backgrounds. The advantage of this is that students can encounter more problems with different scenarios, and in the process of solving the problems, their project management abilities are naturally exercised and improved.

For example, one student asked DeepSeek, "As an experienced project manager, please provide an example of Project Cost Management in a small-scale mobile telecommunication engineering. Scope: Install 5 small cell nodes to enhance coverage in an urban commercial district (0.5 square km area)." DeepSeek then offered the response, which is partly shown in Figure 1. Students are provided with a virtual project scenario about 5G mobile telecommunication network and the project cost management plan, which enables the students to think further about the plausibility of the AI-generated cost management plan.



Project Cost Management Plan: Small-Scale 5G Small Cell Deployment

Project Scope: Install **5 small cell nodes** (3.5GHz 5G NR) across a **0.5 sq km urban commercial district** to enhance coverage and capacity.
Budget: $120,000 | **Timeline**: 12 weeks

1. Cost Breakdown Structure (CBS)

Category	Item	Unit Cost	Qty	Total
Equipment (55%)	Small Cell (RRH+DU)	$7,500	5	$37,500
	Fiber Backhaul (10G)	$2,200	5	$11,000

Figure 1. *Example of DeepSeek generating project scenarios.*

3.2.2. Virtual Project Management Assistants

AI is deployed to simulate stakeholder interactions, risk assessment exercises, and agile sprint planning, helping students practice real-world decision-making. Moreover, the roles of AI in a project can be set or changed automatically. AI also gives some hints or provides suggestions when students are faced with some difficulties in the virtual projects.

For example, one student continually asked DeepSeek about the above-mentioned project in Figure 1, "As an experienced project manager, you are responsible to minimize the risks of the project. What are your strategies for controlling the risks?" DeepSeek then offer some suggestion on risk management, which is partly shown in Figure 2. Then, discussion on the AI-generated content is initiated among teachers and students. During the process, the corresponding theories on risk management are mentioned and adopted.

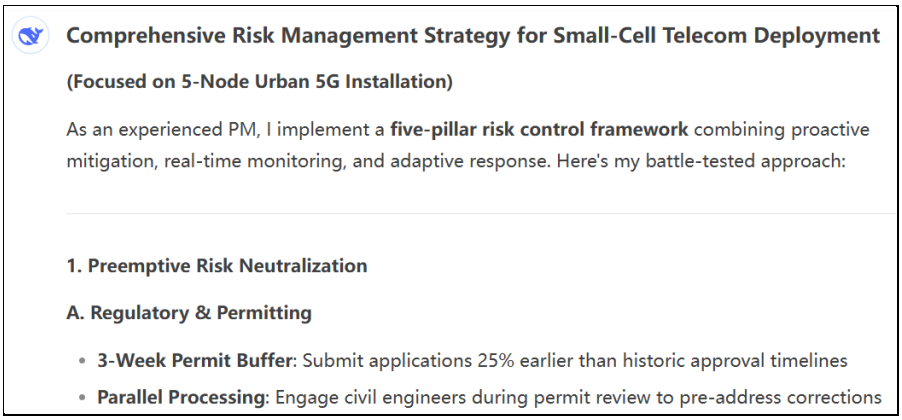


Figure 2. *Example of DeepSeek acting as a project manager.*

There are often multiple solutions to a problem and each solution has its own advantages and disadvantages. Therefore, teachers organize students to discuss together in classroom, so that everyone can compare all possible solutions to see which one is better. During the discussions, students share their ideas with each other, especially on some unfair or biased issues that may exist when AI makes decisions.

Usually, teachers combine in-person case discussions with AI-generated project simulations, ensuring a balance between human mentorship and technology-driven scalability.

3.3. Automated Assessment and Real-Time Feedback

3.3.1. AI-Powered Grading Tools

In the teaching of project management courses, AI technology can automatically help teachers check the tasks and project results submitted by students, such as reports written in normal times or the content of classroom presentations. Then, AI provides detailed feedback on students' critical PM skills such as scheduling, budgeting, and team coordination. The feedback is useful to teachers and students to better understand the learning situation. The grading tools empowered by AI can significantly improve the teachers' work efficiency and substantially lower their burden.

3.3.2. Bias Detection in Team Dynamics

In the teamwork of PM, AI analyzes the performance of each member, the peer-reviewed data and the way they usually work together, so as to identify inequities in group work. Through these analysis results given by the AI, the teacher can quickly find those who do not perform well, and then take some measures to help them better participate in the team activities, so that the cooperation of the whole group becomes fairer and more reasonable.

3.4. Faculty Development

Continuous professional development for teachers now incorporates AI-enhanced training. Teachers learn to design well-structured prompts, so that AI can help produce better lesson plans, classroom materials, and test topics. In addition, teachers are also trained on how to use AI to analyze class videos and the feedback given by students. The training also involves the awareness of the possible misinformation generated by AI and the limitations of AI.

There is no doubt that AI is an effective aid, not a substitute for teachers. It is important that teachers and students avoid over-reliance on AI. The intelligence of teachers and students remains irreplaceable.

4. The Importance of Human Intelligence

The wisdom of both teachers and students is vital for the teaching and learning effects of PM. To be more specific, the roles of teachers and students are listed in Table 1.

With the assistance of AI and the guidance of teachers, students absorb and grasp theoretical knowledge, technical skills, and engineering experiences in project management shared by teachers. During the in-class discussions, students propose ideas, debate perspectives, refine arguments, and brainstorm creative solutions to real-world problems. In the process, the ethical principles and societal responsibilities of students are cultivated.

By activating the intelligence of teachers and students, we establish a dynamic cycle to facilitate knowledge transfer and collaborative innovation. In the process, students are also guided by teachers to deeply think about moral issues, and gradually develop their critical thinking skills.

Table 1. Roles of teachers and students.

Teachers	Students
knowledge transfer and engineering experience transmission	proactive learning, knowledge acquisition and skill development
stimulation of discussion, thinking, creation, and innovation	active participation, brainstorming solutions, and collaborative innovation
thought guidance, values shaping and professional ethics cultivation	reflective analysis, critical thinking, and ethical development

By building a 'Teacher Intervention for Struggling Students' mechanism to identify the students who are struggling with PM learning, teachers can take early steps to help students avoid low academic performance.

In our teaching practice, we have been pursuing effective approaches to arouse the proactiveness of students and fully develop their potentialities, including the suitable utilization of AI tools.

5. Challenges and Ethical Considerations

The emergence of AI has brought us many new opportunities, but it also brings some risks that have not been encountered before. AI does have many benefits, which everyone can see, but it also has some hidden problems and possible harms. [18]. Despite its convenience and benefits, the wide application of AI in educational fields has raised concerns about data privacy, algorithmic bias, and over-reliance on technology. It is important for us to realize the risks of AI in the creation of fake content and misinformation [19, 20]. Ethical boundaries should be set for AI involvement limits and AI-generated content must be clearly labeled. UNESCO emphasizes the requirements for ethical AI frameworks to ensure responsible use of AI [17].

The integration of AI into PM courses offers us virtual scenarios, learning personalization, and efficiency improvements. Now the development of AI technology is particularly fast, and it has become a very important tool in teaching. AI will definitely change the direction of education in the foreseeable future. However, the successful application of AI largely depends on responsible guidance, ethical restrictions and proper utilization.

6. Conclusion

This paper introduces some measures for the teaching reform of PM in telecommunication engineering based on AI technology. AI can provide personalized learning pathways, adaptive content recommendations, automated assessments and instant feedback. Besides, with the assistance of AI, we can design virtual projects with various difficulty levels, which are specially prepared for students, so that students can get personalized training on the project management. Furthermore, we have been training our AI agent to create more suitable virtual project scenarios in telecommunication engineering for certain teaching requirements, in order to overcome the challenge of lacking practical opportunities in PM mentioned at the beginning of this paper. We plan to use the trained AI agent in the following semester.

AI is an effective facilitator, rather than a replacement for teachers. It is important for us to realize the limitations of AI and to avoid over-reliance on it.

Abbreviations

PM	Project Management
AI	Artificial Intelligence
PMI	Project Management Institute

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Author Contributions

Jinmei Liu: Conceptualization, Methodology, Writing – original draft, Writing – review & editing

Hua Yuan: Resources, Supervision, Methodology

Xue Lin: Methodology, Investigation

Nianqiang Li: Supervision, Investigation

Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest.

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