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Research on Teaching Evaluation Algorithm of Engineering Related Majors in the Context of Digitalization of Engineering Education

JES Journal of Electrical Systems

Abstract: - While the nation's industry building has progressed, so has the area that includes engineering leadership. But the nation's managerial engineering major is in an embryonic phase at the moment because of the difficulty of the beginning decades, or the instructional and operational setup of all courses is additionally in a nascent stage. Kids' faith in educators has declined with the rising absenteeism rate and the objectification of kids' once-dominant positions in the classroom. Individualism and variety are hallmarks of individuals' educational experiences. Despite calls for greater standards in the classroom, most institutions lacked the resources necessary to implement meaningful mechanisms for monitoring teachers' performance. The education of management and engineering majors must be reformed and innovated to better address these issues. Certification in technical courses is fundamentally about making sure that students are competent in their fields. It's a novel approach to determining the quality of course instruction for managerial engineering students, so naturally, there's a lot of academic interest in it. Certification in the teaching of engineering has been widely discussed by academics since it provides a novel way to evaluate the quality of instruction in managerial engineering courses. This research blends artificial intelligence with a credential in the field of engineering, and its foundation is an in-depth analysis of how engineering leadership classes are taught. Universities were surveyed and analyzed, and it was determined that a professional course in managerial engineering teaching students engineering guarantee against the backdrop of machine learning increased attendance among students by about 20%. The percentage of students who successfully complete course goals has grown by around 13%, while the average level of skill among graduates has risen by about 8%.So that current engineering managerial graduates are better able to satisfy the demands of contemporary society, it supported the growth of higher education and raised the overall quality of students as well as the quality of instruction and effectiveness of technical management programs.

Keywords: Teaching, Engineering Education, Algorithm, Artificial Intelligence, Technology, Managerial Skill.

1. Introduction:

Significant developments in the digitization of the engineering curriculum in the past decade have revolutionized both consumer and instructor practices in the field argue by (Buenaño-Fernandez et al., 2019), since the development of more complex technological tools, teacher assessment has emerged as a crucial factor in maintaining high standards in engineering instruction. Conventional techniques for evaluating classroom performance may not be enough to determine the impact of the internet on education. Because of the importance of digitization in the study of engineering, studies on the subject of imparting assessment methods to students in engineering-related fields are essential. The purpose of this study is to investigate the existing landscape of teacher assessment in engineering degree programs, highlight the shortcomings of prevalent approaches, and suggest a novel assessment engine that takes into account the specific features of computerized instructional approaches (Qadir & Al-Fuqaha, 2020). The suggested method is meant to enhance the education of engineers by providing a more precise and all-encompassing assessment of instructor performance. The broad contractual form of the field of engineering, also known for its combined approach to architecture, buying, and building, has emerged as the standard practice in China as the nation's capitalist system has matured. The engineering firm is given responsibility for the general contracting for layout, purchasing, and execution following the decision-making period of the job, which begins with the planning phase and continues through the bidding procedure. It has been challenging to adapt the model to the requirements of the building services sector's recent rapid expansion (Miranda et al., 2021), the adoption of entire procedures for the administration of construction assignments has grown in importance, necessitating an expanded and efficient approach. However, as managerial engineering programs were slow to gain traction in higher education, the instruction structure for these programs is still being tested and refined. There has been a recent uptick in the number of academics interested in studying the

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intersection of AI and teaching. Some academics also see accreditation in technical training as a crucial step toward improving both higher education and classroom instruction. Therefore, we are given an explanation to think that the application of engineering instruction authorization within the context of robotics regarding the explanation of technical leadership classes in higher instruction institutions is beneficial to the advancement of science and technology management instruction and the growth of science and technology managerial skills training. At last, it would fill the shortage in the engineering leadership sector for multidisciplinary professionals with strong technical, managerial, financial, and judicial acumen.

Diverse academics have conducted studies with mechanism to assess the effectiveness of business management lectures in preparation for the institution's recertification of machine learning (Singhal et al., 2021). He concentrated his research on changing how computational imagery analysis is taught to engineers. He demonstrated that every one of the approved basic principles from the field of engineering might be adapted to the reformation of the processing of images in schooling, considerably enhancing the quality of instruction. This research focused primarily on the idea and practice of technical education accreditation for mechanical engineering majors at regional universities. However, the introduction to the history, demands, and process of science and technology schooling competence plan accreditation demonstrated the importance and need of science and technology education accreditation for colleges overall. Specifically focused on the recognition of specialized degrees in ecological engineering across the world. Guidelines for academic curriculum, accreditation processes, and the connection of certificate and engineering credentials were rigorously combed through and assessed. Focused mostly on engineering degree holders' strategies for ongoing development in the field of automation. They looked at where the field is now and where it's headed, and their findings suggest that getting your engineering degree will help you promote functional engineering and an internationalized approach to building control systems. It outlined potential avenues for the growth of the robotics industry. The scope of these academics' work is narrow. Professional certification and its significance in the study of engineering are the subjects of their investigation. The area of study is usually more narrowly focused on analyzing the significance of professional certificates in the field of engineering education, while the examination of teaching practice is seldom engaged and addressed. As a result, a number of academics have begun focusing their studies on the latest developments in the field of artificial intelligence. A significant step forward in the development of multidimensional, comprehensible AI languages centered on humans was made by the study and practical work regarding how the context of AI affects opinions on AI explanation.

Although study discovers that expenditure of Virtual Reality and Artificial Intelligence (AI) voguish several informative grounds, an innovative range of exploration deceits in relating AI procedures intended for estimating education efficiency indoors business curriculums experiencing digitalization. Customary endorsement emphases proceeding program values, nevertheless the numeral uprising demands an original method (L. Wang et al., 2020). This study recommends the progress of a process that can be able to evaluate the convenience of digitalized education measures today production learning. Similar procedure possibly will evaluate several characteristics, hypothetically foremost towards a better-quality education excellence and eventually, an extra active knowledge involvement designed to developed learners

2. Literature Review:

According to (Gürdür Broo et al., 2022), learning assessment is essential in the teaching of engineering, according to the findings of previous studies, since it helps instructors improve their methods and guarantees learners learn effectively. Student’s assessments, assessments by peers, assessments of themselves, and outside assessments are only some of the ways that are being used to assess instructors' efficacy in the classroom. Older ways of evaluating teachers have their drawbacks, such as subjectivity, generality, and overemphasis on the role of the teacher. As new teaching techniques and technology are introduced under the framework of democratization in technical education, these constraints become more evident, and assessment standards must be updated appropriately (Yin et al., 2020). Therefore, academics have been looking into new teaching assessment algorithms that may take into consideration the specific features of digitalized pedagogical approaches like MOOCs, simulations, and flipped classrooms. These new mathematical formulae are designed to improve upon previous methods of assessing a teacher's effectiveness by considering not just their students' grades but also their level of participation and enthusiasm during class. It is important to offer relevant ideas and information before exploring how intelligent

technology might be included into the engineering education accreditation process, namely for classroom instruction in engineering administration courses (Hernandez-de-Menendez et al., 2020).

2.1 Introduction to Engineers Administration:

The term "construction engineer leadership" is used to describe the management of engineering in the USA. It is often associated with the School of Engineering and offers a Bachelor of Science in Engineering Management while also covering the full scope of engineering project management from inception to completion. Business educational institutions, administration divisions, and technology universities form the backbone of China's undergraduate management of engineering institutions (Kumar et al., 2021). Due to the lack of a consistent vocational focus at overseas institutions, there is more diversity in the distinctive features each institution emphasizes. More than half of the time spent in engineering management programs at international universities is devoted to studying engineering technology; students also spend a significant amount of time in laboratory and fieldwork settings (Coşkun et al., 2019). The Chinese Ministry of Education mandates that students majoring in management in engineering learn foundational skills in business administration, economics, and law. A top compounding talent that can oversee all aspects of building global engineering projects (Lu et al., 2020). The engineering manager major focuses on four profession fields' management, technology, finance, and law from the standpoint of creating curricula and talent development strategies. Most of educational opportunities are comprised of basic workshops, the vast majority of which are either accessible or subject-specific of the educational structure (Chen et al., 2021), this combines theoretical study with hands-on experience inside and outside of the classroom and culminates in a capstone project or thesis. However, many Chinese universities' management of engineering programs simply doesn't succeed in establishing their advantages or has no evident distinguishing benefits. Creating a platform for students to explore and learn is challenging, and many talent development initiatives focus on traditional classroom instruction (Lin et al., 2019). In addition to improving pupils' grasp of relevant occupational information, it also helps them more effectively apply their acquired knowledge, which in turn improves their capacity for scientific inquiry and creativity. Dissertations written by management and engineering majors are conducted quantitatively and qualitatively, with suggestions for resolving actual issues. This is because both quantitative and qualitative approaches have their uses and because quantitative evaluation methods involve establishing a theoretical framework based on statistical data, making them more scientific in nature (Cardoso et al., 2019). Overall, students believe that the capstone project helps them better comprehend and use what they acquired in class, which in turn improves their capacity for problem-solving and collaborative abilities. Course material may be modified in tandem with the new graduate structure. By combining the structure of the already-existing programs with the lessons learned from the nationally recognized success of "Project Cost Planning and Control," a comprehensive approach for managing project costs has been developed. Under the foundation of structuring, clustering, and other domains, the educational design overhaul plan's publication has significant normative relevance. Additionally, it might help students develop practical abilities.

2.2 Validation of Engineers Instruction:

Among those working in the field of engineering and other technical fields, there is a unique certification called the Engineering Education Accreditation (or Engineering Education Professional Accreditation, or simply Pro Accreditation). This relates to the standards set for regular school approval. Professional accreditation in engineering, as opposed to school certification more generally, is focused on ensuring that graduates of accredited engineering degrees are competent in their chosen fields (Chiarello et al., 2021). Degree programs in engineering at the university level often get official accreditation from professional bodies or engineering training organizations. It is crucial in establishing the credibility of university-level engineering degrees. The Technology Certification Council's mission is to evaluate engineering programs and provide certification to those that meet rigorous standards for producing competent engineers. Higher learning institutions that make requests for accreditation go through a process for professional accrediting that is carried out by expert accrediting organizations, like architecture organizations for engineering majors (Hernández-de-Menéndez et al., 2019), although it is an indicator of the extent to which instructors in engineering achieve the basic requirements for excellence, accreditation is more accurately a qualification assessment than a merit assessment. The fundamental reason why there are such things as professional certifications for architecture professors is so that quality requirements can be met. It is also important to ensure the quality of Chinese engineering instructors who want to

pursue careers in the international engineering education sector. It enhances the quality of service provided by China's educators in engineering by facilitating the ongoing development of the country's technical education systems. These standards provide more structure for learning about engineering in reality. The effectiveness of employee education is guaranteed by an exacting process of assessment. A thorough assessment system in respect of instruction goals, curriculum structure, and graduation criteria has been implemented within the context of accreditation in the field of engineering. A rather comprehensive quality assessment system has been devised, particularly for the entire instructional link to engineering school. The college's evaluation is comprised of internal as well as external tests (Garousi et al., 2019), the smooth progression towards certification is ensured by the excellent verification procedure. China's certification system for education in engineering includes a thorough certifying procedure and well-defined rules, both of which play an essential role in elevating the standard of instruction at the country's higher technical institutions.

2.3 Computer-Generated Cognition:

AI may have some smart characteristics, but it is not genuine intelligence and has no physical form of its own. In order to mimic human skills like perception, learning, and logic, AI is often programmed into computers (Semerikov et al., 2020), some academics argue that AI depends on computers to carry out tasks that normally require human cognition. Some experts have argued that AI's greatest potential lies not only in its ability to mimic human intellect but also in its potential to outshine it, therefore assisting humans in mentally demanding activities. Some academics define artificial intelligence as the study of how computers can mimic human intellect. According to these experts, AI is all about teaching machines to think like humans so that they can assist humans by taking on some of their mental workload. These comments make it very evident that most people see AI as a manifestation of human intellect and the result of human technology. It can replace humans in certain intellectual tasks, but it can never equal them. The term "artificial intelligence" (AI) used throughout this research refers to all AI-powered technologies. Reasoning, knowledge representation, planning, learning, natural language processing, perception, movement, and object control are all examples of classic AI challenges. In this respect, normal intelligence is a long-term objective. Statistics, CI, and even good old-fashioned symbolic intelligence are all viable options. Topics including finances, research, chance, neural network technology, web search efficiency, and probability theory are only a few of the methods used by artificial intelligence researchers. Computers, information technology, mathematics, psychology, linguistics, philosophy, and many other disciplines all have a role in artificial intelligence. Figure 1 depicts the detailed structure of artificial intelligence. Algorithms play a central role in most forms of artificial intelligence. Algorithms are explicit procedures that can be carried out by a group of mechanical computers. In theory, Here we include several "learners" that can pick up new information: Bayesian connections, Bayesian choices, and nearest relatives mathematical formulas that best represent reality. This allows students to consider all viable hypotheses and test them against the evidence. Because of this "combinatorial explosion," or exponential growth in solution time, it is impossible to consider every potential scenario (Lee & Malyn-Smith, 2020). Much of the study of AI focuses on learning to spot and disregard scenarios that aren't likely to provide positive results. Based on these findings, the research would provide a new way of doing cluster analysis that makes use of artificial intelligence.

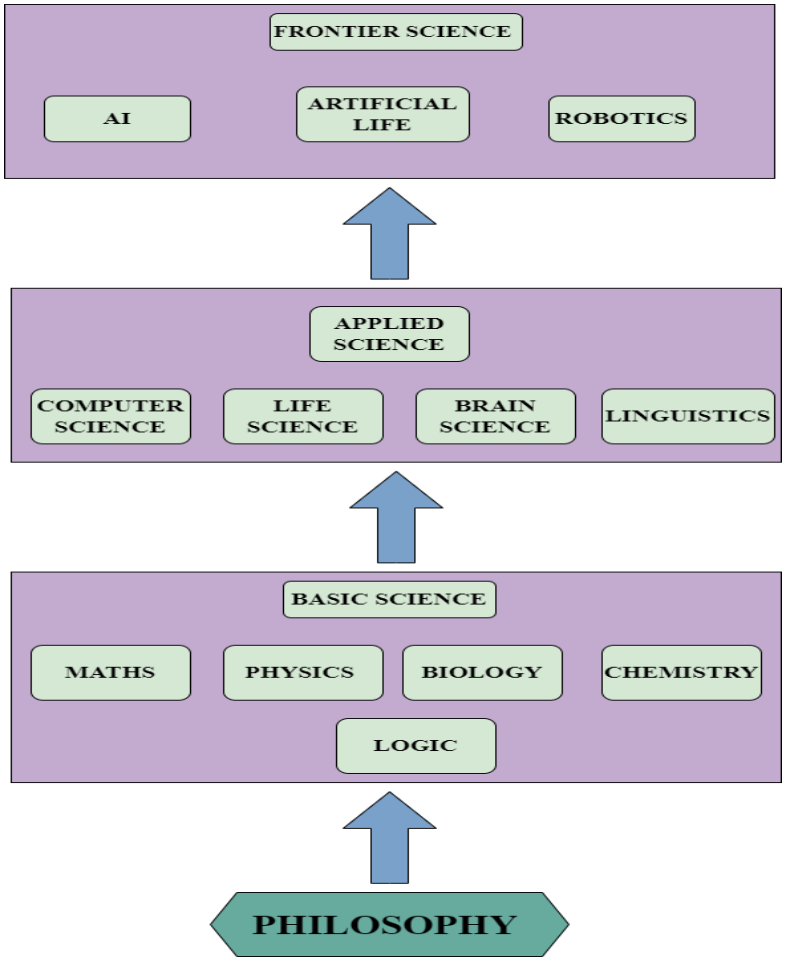

Figure 1: Intelligent Machines: A Conceptual Framework, Adopted from (D. Wang et al., 2022).

3. Methodology:

This mixed-methods study on teaching evaluation algorithms to engineering students in the context of digitalization uses quantitative and qualitative data gathering and analysis. A survey and semi-structured interviews with a sample of teachers will collect quantitative data from students and instructors. Descriptive and inferential statistics and theme analysis will assess quantitative and qualitative data. Triangulating the data will reveal the present status of teaching assessment in engineering education and the possibilities of new algorithms in the context of digitalization. This research investigates how a technical degree in management might be put to use in the context of the rapidly developing field of artificial intelligence (AI). We devised a study to experimentally examine the impact of engineering school certifications on the delivery of management in engineering courses within the setting of robotics. For a more complete this research uses statistics to execute a survey of managerial engineering majors in the classes of 2018–2020 in order to get a better understanding of the state of engineering management training.

3.1 Items & Surveying Material:

The schools of School A and School B, two nearby institutions, were chosen because their faculty members are ranked similarly. Courses at Institution A are taught in the conventional manner prescribed by national standards for technical education and certification. School B, on the other hand, uses AI to perform course instruction using a teaching approach certified in engineering instruction. Pupils from both educational institutions participated in our study. There are three subsections relating to the questionnaire's content. The first component is the distribution of ages, sexes, and grades among the subjects. The main body of any inquiry is the second section. The final section compares the effectiveness of the two systems in education by looking at how well recent college

graduates are doing on the job. The substance of the survey is broken down into four main categories: attendance at classes, teacher honor, instructor happiness, and satisfaction among students. With the goal of getting insight into managerial engineering pupil participation patterns, motivations for missing class, and opinions on studying, a poll was administered. The purpose of the pupil's opinion survey of educators is to get insight into how well educators communicate with their pupils and to what extent they are able to pique their curiosity about education. The intent of a teacher satisfaction questionnaire is to collect information on students' and instructors' views regarding the level of instruction in school, as well as the factors that contribute to their level of happiness or discontent. In order for this research to accurately represent the current state of the field of engineering management education, it is necessary to include both "gaining" knowledge and imparting knowledge in this study as mentioned in the depict figure below.

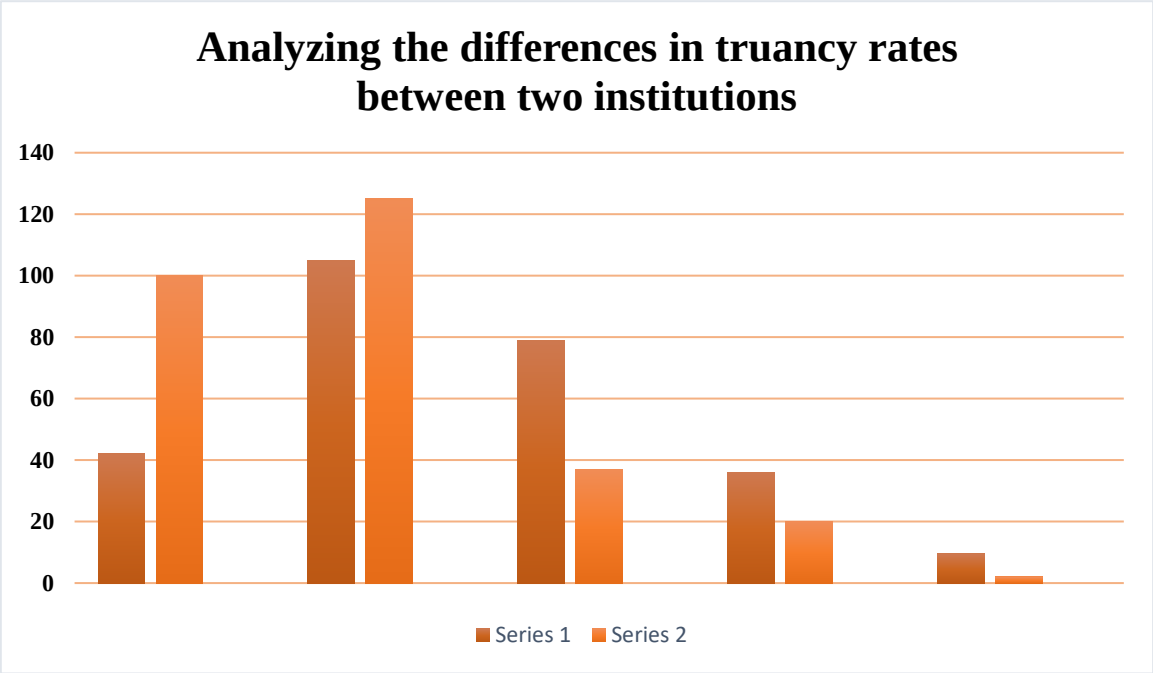

Figure 2: The rate about absenteeism at School A compared to that at School B.

3.2 Statistics and Information Mining:

The purpose of the study is to collect statistical information on how successful computerized instructional methods are from the perspectives of both students and teachers. A thorough literature analysis of current teaching evaluation methods and the unique qualities of digitized instructional methods in the field of engineering instruction will inform the creation of the survey items. Volunteers will be solicited by means of convenience sampling, whereas the survey itself will be conducted online. All survey responses will be kept confidentially in an encrypted database. Trainers who have used computerized methods of instruction in the teaching of engineering will be interviewed in structured format. Students will be given the option of completing the interviews remotely or in person. The purpose of the interview questions is to collect qualitative data from the professors on their thoughts and feelings on what makes a good teacher, as well as their ideas for how to better evaluate professors' performance. All of the interviews will be taped and typed out word for word. New instructional evaluation methods in the context of digitalization will be explored, as will the existing status of educational evaluation in engineering education, using triangulated data from a survey and in-depth interviews. In order to find correlations and differences, we'll compare and combine the findings from our quantitative and qualitative investigations (as shown in figure 3 below). Combining information from several sources increases confidence in the results.

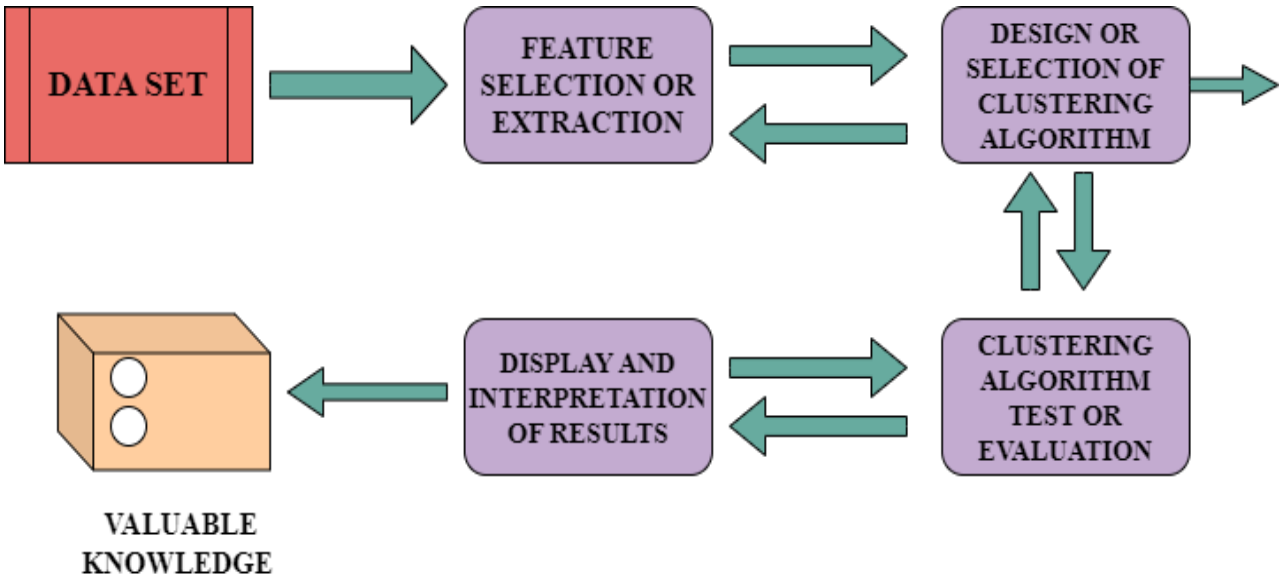

Figure 3: Analytical roadmap for clustering, Adopted from (D. Wang et al., 2022).

4. Results and Discussions:

Understanding the present condition of education regarding assessment techniques and the possible application of fresh algorithms for boosting the efficacy of educating assessments in the field of engineering is demonstrated by this study's findings on educating assessment methods to feed engineering-related majors within the setting of digitization within engineering learning. Findings are provided in two parts: the first offers the numerical results of the questionnaires, whereas the second provides the qualitative outcomes of the interviews. Although the quantitative indicators provide a high-level overview of the educational experiences with and views on digitized methods of instruction as well as the efficacy of instruction, the qualitative outcomes provide a more in-depth understanding of the instructors' views and encounters with instruction evaluation. The findings are informative for enhancing the education of engineers through assessment courses, as they highlight the difficulties and potential of assessing instruction against the backdrop of digitalization.

After doing some careful math and analyzing the survey results, it became clear that there were major distinctions between study participants of different ages in terms of student class attendance, teacher identification, and pleasure in the classroom. The fact that the participants' ages ranged widely when the survey was completed has allowed for this. Figure 3 displays a comparison between the two schools' students' rates of course absences. This reveals that school A, which uses traditional teaching techniques, has a serious absenteeism issue among its student body. Class skipping seems to be on the rise, despite the fact that the great majority of students only miss a few courses here and there. One interpretation of this finding is that it points to flaws in the typical approach to teaching engineering management students. About 36% of the pupils surveyed were fully immersed in the school B experience, where instruction took place against a background of AI. There were 101 students who attended every single lesson. A smaller percentage of students at School B are chronically late to more than half of their classes. The results show that School B has a much higher enrollment rate in the engineering management major than School A. In view of the fact that the attendance rate at the standards from elementary school are significantly less than those set at Schools decided to look into the possible causes of this disparity. We have also looked into why kids at School B seldom skip lessons. Table 1 demonstrates that School A students most often skip classes because they think they won't learn anything or don't like the lecturers. 34.90% of students are in these groups. This shows that most School A students dislike the content or the major's delivery. This reflects, at least in part, the difficulties that currently exist in the realm of course teaching as well as the learning attitude of traditional engineering management students. Table 2 displays the most common explanations for why students at School B show up to all of their courses every day. They may think the information is useful, like the instructor's delivery style, or find the material novel. These three groups makeup of the entire student body, indicating that students at school B are happier with the engineering management major of the engineering education certification program

being taught with an enhanced artificial intelligence background. With this new method of instruction, student attendance has increased by around 20%. Student attendance has also increased dramatically. Class pedagogy is well-known and well-liked. Students may acquire new information, engage in their curriculum, satisfy their classmates' needs, and become complete management of engineering majors.

Table 1: Sample of Identities:

School	Identity	No.	%	Total
A	No of male	175	63.63	275
	No of female	96	34.90	
B	No of male	183	65.12	281
	No of female	90	32.02	

Table 2: Sample Grade %

School	Grade	Freshmen	Sophomore	Junior	Senior	Total
A	No of Sample	65	79	60	71	275
	%	22.44	21.14	25.48	26.70	96.06
B	No of Sample	71	74	61	73	215
	%	23.54	26.21	24.41	26.75	100

4.1 Vocational Programs as an Assessment for Pupils:

This study evaluates the course teaching aims of third-year engineering management students at both universities. Course achievement tests evaluate this. This research examines student learning at the two institutions. This study evaluates each survey participant's professional courses. The course scores are then used to evaluate students who completed professional courses at the two schools using the two techniques. Figure 4 shows the situation. Figure 4 shows that school A students had lower professional course grades, average scores, and in-class experiment involvement than school B students. This suggests that school A students have grasped their engineering management curriculum considerably less than school B students. Only 67 students in School A have attained the highest course objectives. School B has 80 students. School B masters course content better than school A. 13% better. (This shows that the artificial intelligence-themed engineering management course necessary for engineering education certification helps students understand the semester's material.

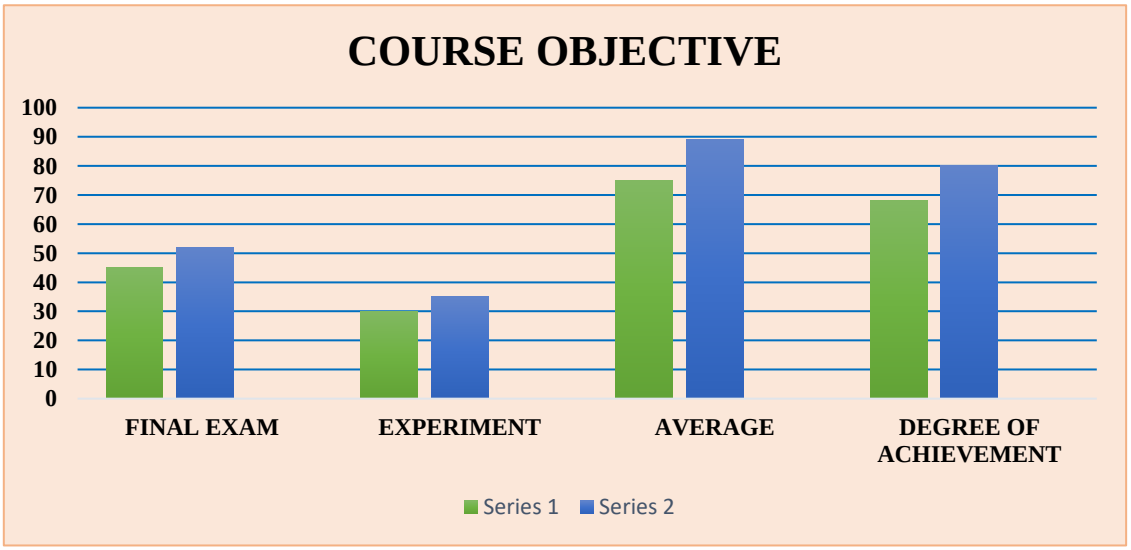

Figure 4: Coursework in both institutions' specialized programs are compared.

4.2 Postgraduate Volunteers in the School as Assessed by the Unit:

We decided to conduct one last poll to assess where recent college grads are in terms of internship possibilities. This assessment is in addition to analyses of student enrollment and the quality of instruction. The exact situation used for the evaluation is shown in Figure 5. Then comparing the graduates of the two schools, the discrepancy in general level of performance is still rather large, as seen by their scores on a number of standardized exams. A majority of School A's graduating seniors get an evaluation from the employing unit in the 4-to-5 range; a majority of School B's graduating seniors receive an evaluation from the employing unit in the 5-to-4 range. This shows that compared to students at School A, students at School B have a better overall ability level and are of higher quality. Both schools have similarly qualified pupils, however this comparison is limited to the students' ability to speak and understand a foreign language. Professional knowledge and skills, academic motivation, innovative potential, and cooperative proficiency are all areas where School B students significantly outperform School a students by a margin of about 0.5. Courses in engineering management taught using a framework of artificial intelligence and based on engineering education certification have been proved to improve students' abilities.

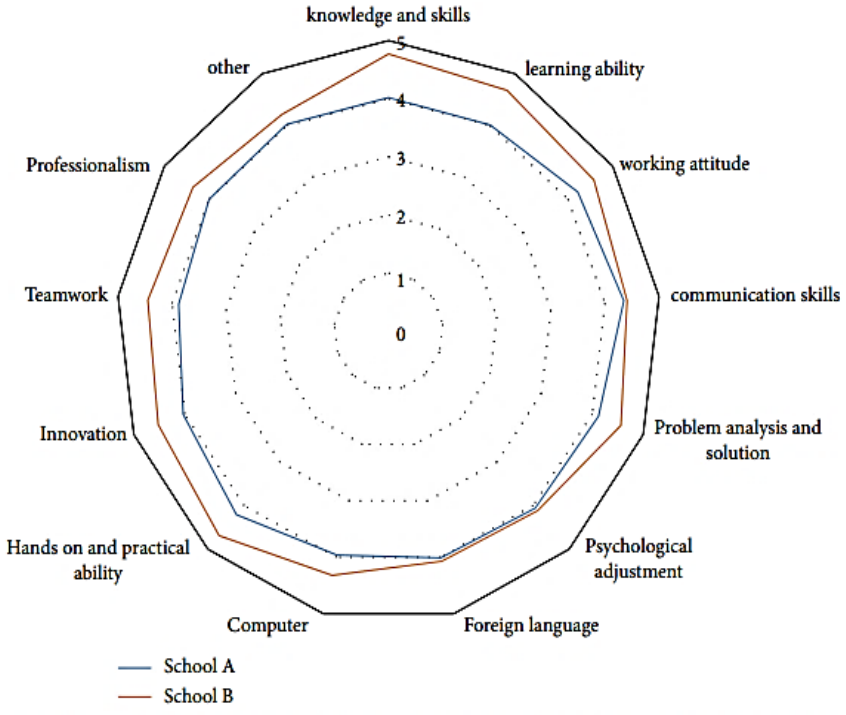

Figure 5: Practicum assessment for students of the two colleges, Adopted from (D. Wang et al., 2022).

This suggests that young adults will be better prepared to meet the demands of modern society once they reach the employment. From what has been said above, it is evident that School B, which is based on the principles of artificial intelligence, will create students with superior talents in every respect compared to School A, which is based on traditional engineering management courses. Figure 6 depicts the relevant details. Figure 6 shows that since students at School B have a more optimistic outlook on education, their attendance rates have increased by nearly 20% compared to those at School A. Also, compared to students at School A, those at School B have a greater command of the material to be taught; in fact, the percentage of School B students who have met the course's teaching criteria has increased by almost 13 points. The graduates of School B exhibited an improvement in general aptitude that was around 8 points greater than that of the alumni of School A. (This proves that engineering management students taught by instructors qualified in engineering education with a background in artificial intelligence perform better on average than those taught the traditional way. In addition to bolstering higher education and better meeting the needs of the modern engineering management industry for compound talents, it can also help enhance the quality and efficiency of instruction in the field of engineering management.

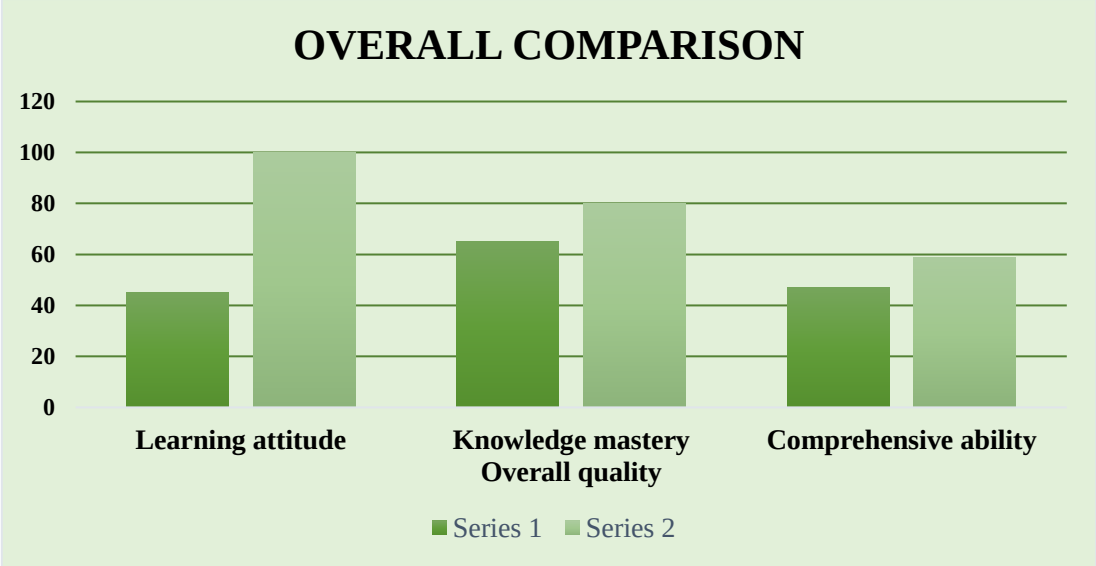

Figure 6: Overall Learning Comparison.

5. Conclusion:

Concurrently, the rise of China's market economy has pushed for higher levels of engineering management skills and encouraged the development of engineering management in China. The development of engineering management in China may be due to this. The many methods that may be utilized to teach engineering management professional courses are the topic of this research. These courses are required for earning accreditation in engineering education. The setting for the engineering management professional courses under consideration is provided by the artificial intelligence (AI) that acts as the study's basis.

First, the literature review that inspired this work is presented. Following that, a quick overview of the relevant academic research on the topic is provided. The study concludes with a brief explanation of its major ideas and methodologies. Through experimental investigation and analysis, the study concludes that engineering teaching certification courses in engineering management taught against the backdrop of artificial intelligence are more beneficial and in line with current development needs. This finding is based on an examination of certification programs in engineering education and their treatment of engineering management professional courses. This realization is based on research into engineering management professional courses performed for engineering teaching certification purposes. The results shown here are based on an examination required for engineering education certification. It has the potential to encourage the improvement of the teaching quality and effectiveness of engineering management courses, and it has the ability to bring graduates of existing engineering management programs more in line with the requirements that the field of engineering management currently has for compound abilities. In addition, it may attract engineering management course instructors and students who have the education and experience to improve the standard of engineering management education.

However, there are significant problems with the way this research was carried out. There hasn't been nearly as much investigation into this at the granular level as there should have been. This may lead to more studies that examine the creation and delivery of curriculum in greater depth. The discipline of engineering administration is also predicted to expand in the next few years. Many causes are contributing to this shift. This tendency is expected to continue. In general, the way forward is one that strives for this progress, which may be achieved via the establishment of a strong institutional structure. Potential future focuses of curriculum reform include curriculum reform. The field of continuing education will evolve in this way. In order to reform continuing education, it will be necessary to reform the school's curriculum.

Acknowledgments

Yunnan Province Undergraduate Education and Teaching Reform Project, Research and Practice on Overall Optimization of the Curriculum System for Chemical Engineering and Technology Majors (JG2023083) ;

Yunnan Province 2022 Higher Education "121 Project" Special Project, National First Class Course "Furniture Design and Manufacturing" (52200801).

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