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Develop a Quality Control System to Build Integrated Engineering Characteristics in the Civil Engineering Students

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Abstract: Objective: many of researches mentioned that the graduated from civil engineering faculty has an in-complete engineering characteristic; despite the faculty curriculum is designed as competency-based approach, this study aim to explore this gap and give suggested solutions, as the required competencies is already is fixed as a goals of the curriculum to be achieved, but there are lack of implementation due to un-achieved goals. Method: qualitative method using literature review to extract the gap and to be able to solve it. Results: after collecting the data, it will be grouped into different similar contexts to build the understanding, and then produce the result as a procedure consistent with logic steps. Novelty: bridging the gap between the competency-based curriculum and the incomplete engineering characteristic through the implementation and evaluation of a solution.

Keywords: civil engineering characteristics, compatency-based curriculum, job description-based learning outcomes of the civil engineering students, compatency-based teaching

INTRODUCTION

Quality of education real measurement is to find the goals of the curriculum achieved in the graduation, we can also call the achieved of the curriculum goals in the graduation is due a good quality control system, but we can ask; if the curriculum is designed by the highest global standard to be sure that the achieved goal is expressed the quality of education or not, we can consider the shift from knowledge-based curriculum to competency-based curriculum is the latest quality shift, but if the curriculum designed in competency-based but the the curriculum goal did not achieved, this mean the quality of education lost by weak quality control implementation, some of significance proved that the graduated from civil engineering faculty has an in-complete engineering characteristic; in spite of the faculty curriculum is designed as competency-based approach, this study aim to explore this gap and give suggested solutions, as the required competencies is already is fixed as a goals of the curriculum to be achieved, but there are lack of implementation due to un-achieved goals.

Quality of education: **"**Quality in education has been recognized as an issue that can guide the effort to improve the teaching and learning process (Nicolaou, Nicolaidou, & Constantinou, 2005). Analytically, quality in education is associated with the improvement of the learning process. This improvement results from the implementation of appropriate teaching

practices and methods, from the design of a curriculum that meets students' needs to the improvement of services provided by schools (Dritsa, 2016). According to Kaluge and Tjahjono (2004), the quality of education is not only related to the curriculum and educational technology"(Papanthymou**,** Darra, 2022), **Quality control in education:** " Quality control entails assessment of nature and extent of quality deficit in each sub-system and devising ways to improve quality so that it is recognized in international job market. In this perspective, it can be viewed as synonymous to quality assessment.

Quality education is a herculean task, particularly when knowledge doubling time is in single digits, and mobility of students, faculty, and programme offerings are on the rise.If the youth in a country is trained suitably,"(Gaeg, Kaushik, 2020) **, quality control system:** " In this context, quality has become today a very popular notion in human culture towards products as an important goal since the needs of consumers have been integrated into the decision loop. Quality is currently considered as the main and strategic function of the company to raise new challenges for the global competitive position. Quality has also become a necessary element to ensure that a company's products meet the needs of its customers, regardless of their field of activity or size. Therefore, this observation requires permanent improvement of all their processes to guarantee the expected performance, reliability, and to achieve customer satisfaction, in order to ensure their sustainability and their technological monitoring "(Khadiri, Brahim, Brahim, Sekkat, Souhail, 2023)**, Quality control system in engineering faculty:** "customer identification in a higher education institution seems to present more difficulties than are encountered in business/organizations. For example, in one model interpretation, parents and students could be perceived as external customers to the quality system, while in another, they might be perceived as internal customers. At the same time, parents act as suppliers also, since they supply the system with "products" – their children- who are influenced respectively by the family environment. With the term Internal Customers, in a TQM program in an educational institution, we refer to the parents, students, faculty, administration, and staff of the institution.

On the other hand, with the termExternal Customers we refer to society, businesses, future employers, families and other institutions that the student might continue his/her studies"**(**Staiou, 2006), "As a result, most of the engineering educational institute, employers, and professional organizations are keen in the quality of education received by engineering graduates who aspire to be a part of global engineering practices at home country or abroad under the effect of globalisation. This gives birth to quality assurance and professional accreditation, which are important for countries that rely on human resources export and import. However, although quality assurance is a big concern for every institution, the ultimate quality of engineering graduates varies significantly from country to country. This variation hinders the engineers from working in a team in the global market"(Ali, Ya'akub, Singh, 2021)**. Quality control systems in the civil engineering faculty: "** Our civil engineers should also acquire management skills and abilities.

The civil engineers should be prepared for team management along with good engineering knowledge. They are expected to operationalize their business ideas through plans.The Faculty of Civil Engineering - University of Montenegro has acknowledged the above-mentioned and consequently established a study program named "Civil Engineering and Management", taking an example of many similar schools across Europe and the USA. It is intended for staff familiar with the construction technology, legal framework, economic disciplines, and business psychology, in other words, the staff of the new age. In general terms, the needs of an employer contribute to the adjustment of the creative, innovative ideas to the actual measured potential results.Requirements set in our projects are always multidisciplinary - to build a hydro power plant?Yes, but the question is under which conditions?In essence, we assume high responsibility for creation of the construction legacy of our lives and creation of a future for the next generations"(Nevenka, Perazic, Jočić, Knezevic,2014)**.**

Engineering characteristics: "technical skills like strong analytical and mathematical abilities, as well as "soft" skills such as problem-solving, creativity, communication, and teamwork. Successful engineers are also curious, persistent, and committed to continuous learning to adapt to new technologies and solve complex problems. " Engineers are required to have strong technical skills and strong intrapersonal, social, intercultural, and sustainability competencies. Several projects (e.g., Global People, Measuring and Comparing Achievements of Learning Outcomes in Higher Education in Europe (CALOHEE), Time to Assess Learning Outcomes in E-Learning (TALOE), Program for International Student Assessment (PISA)) have investigated the intercultural or global competencies that are more useful to engineers in this perspective."(Marcos, Breuker, ORCID, Rivero, RCID, Kjellgren, Dorel, Toffolon, Uribe, Eccli, 2020)

Required Engineering characteristics in engineering students: There are many qualities that make students a good engineers, the most important ones are creativity, critical thinking, problem-solving ability, and communication skills. Engineers need to be able to look for problems from different angles to find creative solutions. " Future engineering students, both in the US and other countries, need to know how to communicate effectively, think globally, be environmentally conscious, and appreciate the impact of social/cultural dynamics on a team environment in order to remain competitive in this kind of economic climate. A vital part of this process is for engineering educators to give their students opportunities to work on international projects"(Sankar, 2021)

The researcher's role:

Use the relevant studies to explore the research gap, reasons for to research gap, and build logical suggestions for solutions

Theoretical perspective

This research uses some concepts from Tylor's theory, project-based learning, to elaborate on the scientific steps inside the educational process

METHOD

This research follows a qualitative method, using literature review to understand the phenomenon, prove the existence of the phenomenon, build the ability to solve the phenomenon problems, and suggest the exit solution.

Ethical considerations

The author of this article will honestly reference all knowledge to the correct reference as much as the author can.

RESULTS AND DISCUSSION

This study aims to develop a quality control system to build integrated engineering characteristics in civil engineering students, which is designed in competency-based learning and defined by job description-based learning outcomes.

Data analysis

In the introduction section, this research will try to collect what can be considered as raw information for the research gap, then in the discussion section, the research will combine the raw information collected in the introduction and find the result by analysing the compound phrases.

Limitations

This research is studying the global civil engineering study in higher education in latest ten years

Discussion

Job description: ” The word job description may be familiar to most people, especially those who work in a formal organization. A formal organization, whether large or small, usually has several divisions. Each division is related to certain business processes within a company. In addition, each division within a business entity or community has different duties and responsibilities. With these differences, the duties and responsibilities of each division are not enough just to be described verbally. It needs to be documented in a written document that explicitly summarizes the duties and responsibilities of each division. By doing this, it is easier for the employee to work. In general, that document is called a job description document.A job description is a written description of a particular job that is expected to be done, how it should be done, and the reasons for the work procedures required. ”(Switasarra, Astanti, 2021), ” the job description also explains the procedures for carrying out these tasks in order to achieve organizational goals effectively and efficiently. A job description is a written statement that contains what must be done by workers, how to do it, and under what conditions the work is done.

The description states the duties and responsibilities of a job. It states "what is done, why is it done, and where is it done, and briefly how to do it". The problem of performance is certainly inseparable from the process, results, and usability. In this case, work performance or achievement is the result of work in quality and quantity achieved by an apparatus in carrying out their duties in accordance with the responsibilities given to them. Jobs.”(Dingel, Maffet, 2020),” With the job description, work literacy and employee alienation arising from repeated tasks can be reduced. With the rotation of work, working methods, training, problem solving, and goal setting will greatly help employees in carrying out their duties and delivering good performance”(Ilany, Lumbanraja, Zarlis, 2020), ” A key instrument for ensuring a good match between a firm's needs and the prospective worker's skills is the job description. The job description can serve various functions. In some cases, a job description serves as a tool to the firm to classify jobs and assign basic compensation to them (Mitra et al, 2010). In many cases, the job description is edited and repurposed as a job advertisement to be used in the recruitment process. For the purposes of this study, we are interested in the latter. We use the terms job description and job advertisement”(Goulart, Menés, Armayon, 2022). **Job description for civil engineer**: ”We have experience in constructing job advertisements and serving on search committees within academic settings and have studied a variety of pathways through the undergraduate and graduate education system within engineering. Personally, we have observed and experienced that there are misalignments between what skills engineering programs teach their students and what industry employers seek based on our prior research, raising questions about the extent to which educational experiences optimally position engineering graduates at all levels for their desired sector of the job market (e.g., which programming languages are taught in courses compared with which languages are used in industry).

Observing this misalignment pushed us to conduct this study of job advertisements we thought there could be a useful opportunity to contribute to the conversation by applying relatively new developments in data extraction and natural language processing models within this space.”(leming, Klopfer, Katz, Knight, 2022),” complex projects, innovative technical and technological solutions would be requested in order to complete the project. Currently, in the construction industry, there is a trend of developing international construction projects that also need adequate professional skills of team members. Since international projects consist of project teams that are geographically distributed due to the different origins of the owner, designers, and contractor companies, their members should be ready for such ventures. Civil engineers, construction managers and architects need to be prepared to work in a multinational team, to develop cross-cultural collaboration and communication skills, multinational team management skills, to overcome difficulties caused by different knowledge and skill levels of

team members, to become familiar with construction materials, standards, and construction methods in foreign countries and diverse access to information and technologies and difference in time zones"(Andrić, Pujović, 2025), " Researchers at the Centre forEngineering Education at University College London (UCL) were enlisted to produce the study, and a focus on civil engineering was mutually agreed upon for exploratory work.Short-, medium-, and long-term objectives were identified. Short-term objectives are to: (1)identify and understand definitions and goals developed by leading organizations in the realm of global responsibility and engineering; (2) generate understanding of civil engineers'day-to-day experiences, identifying how they learn and integrate knowledge of global responsibility; (3) produce findings that help benchmark how far the civil engineering profession has travelled and how far it might have left to go to achieve stated goals; and (4) identify implications for research, engineering practice, and engineering education.

A medium-term objective is to help increase the rate of change and enhance overall success in civil engineering projects. A long-term objective is to help increase global sustainability across multiple sub-fields of engineering."(Chance, Direito, Lawlor, Maynard, Tyler, Mitchell, 2019)." Job Description Analysis Phase I of the study was a review of full-time, entry-level job postings for all engineering majors at the aforementioned university. In this phase, we analyzed job postings and specific job descriptions to identify companies meeting the criteria for inclusion in Phase II of the study. Using this methodical approach, we were able to select participants using purposeful selection. The goals of purposeful selection in this study were to identify typical companies that hired within disciplines that represented extreme cases – construction engineering"(Hartmann, Jahren, 2016)**, Relation between engineer job description and engineering characteristics,"** Given that the field of engineering is a practical profession, traditional methods of teaching no longer meet the learning needs of students at higher levels of education. Hence, to adequately prepare students for engineering practices, it is imperative that institutions adopt innovative methods of teaching, learning, and assessment.

Particularly, more importance should be placed on empowering students to make connections between theoretical concepts learnt in the classroom and applications in practice "(Seifan, Dada, Berenjian, 2020), "understanding the balance between the student skill supply, which is grounded within the education context, and the employee skill demand side, which is grounded within the industry context, is important for understanding the present labor market needs and potential avenues for curriculum reform"(ARTICLE, 2024), **"** the civil engineering profession should contemplate a shift in focus program structure that meets the construction industry's needs. Institutions must assess their current program structure to determine the type of civil engineer required to meet industry demand.Similarly, issues such as the mismatch between the academe's abilities and industry's needs, unit duplication and overlaps, and communication barriers should be regarded as drivers for improving the current civil engineering program structures.

In keeping with this, excellent preparation for a career in civil engineering should include a mix of classroom learning and hands-on experience.The demand for time, which identifies the desire for employment, should be considered in the civil engineering curriculum. The rapid advancement of technology has an impact on the demand for civil engineers. As the civil engineering profession becomes more reliant on innovation, modification, and incursion brought on by rapid technological development, it has been noticed that young civil engineers are having difficulty keeping up with current civil engineering trends and practices."(Nebrida, 2022)**.**" A competent civil engineer, good in technical knowledge, is the most important characteristic. Followed by knowledge of decision making, teamwork knowledge, planning and scheduling knowledge, and leadership skills. With these knowledge characteristics, the risk of problems at site construction, such as delay, over budget, and low-quality work, can be reduced. (Zwan, Sayuti, Ramli, 2019)**.** " These real-world challenges are easier to achieve when the industry is more involved in engineering education. Since companies play a crucial role in

shaping the image of the engineering profession, this might also improve the career management skills of engineeringstudents.“(Langie, Craps, 2020)**, Gap between engineer job description and engineering characteristics**: ” Only a qualified and competent workforce can carry the civil engineering of today to the future, turning it into a more innovative and competitive sector. The main condition to achieve this competent workforce is to define the expected evolution of skills requirements. To make this possible, we first need to describe the factors affecting the skills requirements of the sector and carefully draw a general portrait of skills needs.“(Akyazi, Alvarez, Alberdi, Zubillaga, Goti, Bayon,2020),” For education and training purposes, competencies can be regarded as a cluster of trainable skills, knowledge, and attitudes (van Klink and Boon, 2003).

For selection procedures, competencies are usually defined as the individual’s capabilities for future jobs, which may be trainable in part (van Klink and Boon, 2003). For performance assessment, the focus is on the output competencies deliver (van Klink and Boon, 2003), Ballesteros Sánchez et al. (2017) have shown that there is a broad consensus about two different types of project management competences: (1) knowledge and technical competences, called hard skills, and (2) interpersonal skills and behavioral competences, called soft skills. Hard skills, e.g., technical skills and field experience, are tangible and measurable, whereas soft skills, e.g., leadership and management skills (Rezk et al., 2018), are intangible and immeasurable (Ogunsanmi, 2016). Project managers’ soft skills are more critical predictors of their performance (Ahadzie et al., 2008b). Based on the literature, project management competencies are generic. The characteristics of a successful project manager are consistent, regardless of industry sector, corporate culture, or other factors (Gould and Freeman, 2004).

The technical skills that a construction project manager requires are specific to the construction industry, whereas general management competencies can be easily transferred between various disciplines of project management.“(Pariafsai, Pariafsa, 2021), ” According to the Accreditation Board for Engineering and Technology (ABET) criterion 3 (student outcome 5), in preparation for the engineering workforce, students must have “an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives, ” Interpersonal skills related to teamwork, communication, and conflict resolution are recognized as essential skills for engineers.“(Schibelius, Ryan, Sajadi, 2023), ” especially civil engineers, with the built environment contributing nearly 40% of global carbon emissions, Broader society, engineering students, and industry want higher levels of sustainability knowledge in engineering education, To achieve this end, universities are claiming that sustainability is increasingly being incorporated into higher education, encouraging engineers to tackle complex environmental issues. However, the actual integration of sustainability into engineering curricula is often slow, insufficient, and incomplete“(Warren, Rosenberg, Rayburg, Rodwell, 2025)**. Learning outcomes**: ” learning outcomes are transformations in students encompassing cognitive, emotional, and psychomotor dimensions resulting from the learning process. Furthermore, Caspersen and Smeby explain the concept of learning outcomes, stating that they represent a student's level of mastery of academic content, as measured by scores obtained from assessments in specific disciplines.

Learning outcomes are a crucial factor in determining success or failure in learning. Many students demonstrate substandard learning outcomes, falling below the minimum criteria. Learning outcomes, both favorable and unfavorable, are influenced by various elements, including motivation and interest in the learning process.“(Hasbi, 2025)), ” Therefore, some objectives can be derived from the mission statement and translated into learning outcomes.“(Alyasin, Nasser, El Hajj, Harb, 2023), ” The assessment of learning outcomes is essential for assessing students’ actual accomplishments, which is crucial for assessing the effectiveness of teaching.“(Hidayat, Ruhiyat, Nirani,2023), ” The SLO report is a good tool to identify the progress and status of the teaching and learning process in the educational institution. It is proof of the achievement of the students and teachers. This requires a comprehensive review of this report, which is in the CQI report. It should be given a lot of

attention to the quantitative data from its raw data such as the creation of the teaching and learning activities, specifically on the assessment tools"(Jr, Capidos, Cala, Legaspi, 2025", **Relation between learning outcomes and engineering characteristics**: The term competencies have become a constant notion; both in academia and in business, the notion of competencies concerns three dimensions, which include competency as resources-related to the concept of qualification (corresponding to the English concept of qualification or human capital accumulated) over the life of the individual as a result of training and accumulated experience.

The competencies are knowledge, skills applied (activated) in a professional place (in the act of work, during the accomplishment of the tasks) and the result of social judgment."(Gupta, Dubey, Weersma, Vats, Rajesh, Oleksand, Ratan, 2023)," Rubrics can be used as a checklist to verify whether students demonstrate the pre-defined competencies and at which level. When rubrics are objectively created and validated to measure students' behaviours, they are great measurement methods that improve inter-marker consistency and reduce marker bias effects"(Cruz, Smits, Groen, 2018)." Industry and universities are putting great emphasis on improving the employability of future engineers to guarantee competitiveness in the fast-changing knowledge-based economy.

In addition to technical competencies, engineering curricula have expanded curricular and pedagogical arrangements to include transversal competencies to prepare graduates for employment."(Cruz, Smits, 2019),cition76"student-centred learning and outcome-based learning were implemented in higher education institutions as part of the major curriculum, Outcome-based learning focuses on facilitating the achievement of desired learning outcomes through the design of learning and assessment activities."Outcome-based learning focuses on facilitating the achievement of desired learning outcomes through the design of learning and assessment activities. (Luk, Chan, 2021)**, Gap between learning outcomes and engineering characteristics:**" learning outcomes and assessments are conducted by many universities to determine whether the developed programs cover the materials needed or are stated in the learning goals.

This includes whether students are learning the materials, the level of their competency, and/or proficiency "(González, Melgoza, Cabeza, Okoye,2024), " To produce graduates who are professional and reliable to work in the construction industry, it is necessary to support the curriculum and competencies according to the standards and requirements needed in the industry."(Daryono, Luthfi, Tuah, 2022)**, Curriculum and competencies"** Professionals in the field of Curriculum and Instruction (CI) play a crucial role in defining competencies; provide a structured approach to defining and linking competencies and learning outcomes across different educational levels. They serve as a guide for educational processes, ensuring consistency in competency development and learning outcomes throughout a learner's educational journey."(Kart, Şimşek,2024), "Competency-based school curriculum development is a key mechanism for successful implementation, A school curriculum is a document prepared by a group of people at the school level that serves as a plan or a guideline for organizing the overall experience for learners, The curriculum is typically implemented in three steps: planning, preparation, and implementation.

Curriculum administration and services, learning management, and support and promotion of curriculum use were the three main tasks in the context of competency-based curriculum implementation (Jarernrak, 2022). However, the implementation of competency-based school curriculum discovered practical challenging issues in administrators' and teachers' knowledge and understanding of the curriculum, freedom of curriculum management, and clarity on learner assessment methods and tools."(Thummaphan, Sripa, Prakobthong, 2022), " Competence-based curriculum development is a pedagogical approach that prioritizes the acquisition of specific competencies or skills over the mere accumulation of knowledge. It emphasizes the application of knowledge and skills in real-world contexts and is designed to align more closely with the needs of learners and the demands of the contemporary job market.

Competence-based education (CBE) is grounded in several educational theories that emphasize active learning, learner-centered approaches, and the development of specific skills and competencies. Constructivism and social constructivism highlight the importance of learners' prior knowledge and experiences“(Catacutan, Kilag, Diano, Tiongzon, Malbas, Abendan, 2023). ” Many studies have examined the implementation of competency-based curricula, but there is still a gap in understanding how the curriculum can be effectively adapted to face changing global challenges. Most previous studies have focused more on the implementation of competency-based curricula at the national level.“(Harianto, 2024)**. Relation between civil engineering curriculum and engineering competencies:** ” As a core course in undergraduate engineering programs, civil engineering construction courses are responsible for cultivating students' construction technical skills, engineering analysis abilities, and comprehensive problem-solving competencies.

Project-Based Learning (PBL), grounded in constructivist learning theory, emphasizes students' active construction of knowledge systems within authentic tasks and contexts. This teaching model, driven by problems and task-oriented objectives, integrates cognitive activities with practical operations throughout the learning process. Introduction of Project-Based Learning (PBL) into civil engineering construction courses demonstrates a high degree of adaptability. The course content encompasses the full construction process, multi-stage tasks, and diverse skill requirements, providing abundant materials and authentic contexts for project-driven learning. By breaking down construction tasks into several operable project units, students can apply theoretical knowledge, develop construction skills, and enhance management abilities during task execution.“(Lan, 2025). ” We can summarise that there exists some skill gap in the Civil engineering sector and our University curriculum needs to be updated with these skills; 1. Drawing Skills and related software, 2. Communication Skills with oral and presentation skills, 3. Structural Analysis with related software, 4. Project Management software and Managerial Skills, 5. Estimation and Costing, 6. Knowledge of codes, 7. Ethics, 8. Value engineering, 9. Negotiation, 10. Modern survey methods such as LIDAR.”(GAURAV, 2020)**, Gap between civil engineering curriculum and engineering competencies**, ” The enhanced civil engineering curriculum of the College of Engineering, Samar State University implemented in 2005 was developed based on learning areas concept of practiced education, wherein the learning situations have to be related to work activities in a particular area of expertise(occupation). This is also supplemented by the design-directed curriculum.“(Gomb, 2014), ” Recent studies indicate that while traditional engineering curricula emphasize theoretical concepts, many students graduate without adequate hands-on experience or understanding of the real world, allowing students to apply theoretical knowledge to practical situations.

By collaborating on interdisciplinary projects, students can gain valuable experience in problem-solving, teamwork, and communication, ultimately preparing them for the collaborative nature of the civil engineering profession.“(Erinjogunola, Olayiwola, Ajirotutu, Nwokediegwu, 2025). **Reasons create the difference between the learning outcomes and engineering characteristics:** ” Competency-based curriculum (CBC) has been identified as an effective approach in educating and training students to become a competent and ready workforce (Muharrom et al., 2023). This curriculum is designed to emphasise the development of specific skills required in the world of work, in contrast to traditional education systems that focus more on mastering academic content. One of the biggest challenges is the change in mindset or paradigm from curriculum-centred education to student competency-centred education (Aslan, 2017). This change requires significant adjustments in the way teachers teach, evaluate learning, and manage the classroom. Teachers must be trained to design and implement lessons that support the development of student competencies, including the use of student-centred active learning methodologies, which are often much different from traditional teaching methods“(Mursalin, Pramesworo, Arbie, 2024),

Teaching failing to achieve curriculum goals: “curriculum mis-alignment occurs when the elements of instructional design learning outcomes, teaching strategies, and assessment methods—are not systematically aligned”(Bull, 2025) ,”Implementing new curricula and educational innovations often fails to achieve expected goals , Common issues include teachers' lack of understanding of curriculum goals, inadequate training, There are also gaps between policymakers' intended curriculum and the actual curriculum implementedby teachers, leading to partial or complete abandonment of curricula”(Buday, Galigao, 2025), “To the defined learning outcomes, during the planning process, it is up to the teacher to align the teaching methods with the expected outcomes as well as the ways to check their achievement”(ČEPIĆ, PAPAK, 2021)**,** “any teachers experience difficulties in carrying out theevaluation process correct or accurate, Various recent studies have highlightedthe challenges and common mistakes that oftenoccur in the evaluation of learning outcomes,Teachers tend to rely ontraditional evaluation methods that are less uited to 21st century learning needs,such as competency-based assessment andcritical thinking skills”(Rindawan, Mujriah, 2024), **teaching methods for competency-based curriculum:**(“the influence of the Competency-Based Approach on teachers' performance;Teachers already in the field will undoubtedly require more professional development programmes to improve their knowledge and skills in implementing the Competency-Based Approach(CBA),Today, there are different interpretations of the concept of "competence approach, but they are all aimed at providing the learner with the skills to independently solve a set of tasks, including tasks of a personal and professional nature."(Etengeneng, 2025),”The CBA promotes the collaborative work of teachers. This joint work allows for a better appropriation of skills determined by the curriculum, a comparison of practices, and an improvement in evaluation.

Consultation is formative and promotes the sharing of knowledge, thus enriching pedagogical practice.”(Zerouali, Amsdar, ElOmari, 2024). “Mind mapping promotes Mind mapping promotes CBE principles by enforcing critical thinking, active learning, and individualized instruction. It helps strengthen understanding and memory and solve problems by using a pupil's graphical organization and connection of concepts(CBE) principles by enforcing critical thinking, active learning, and individualized instruction. It helps strengthen understanding and memory and solve problems by using a pupil's graphical organization and connection of concepts.”(Tyagi, 2025). **Quality control system by Competence-Based Assessment:** “Competence-Based Assessment as the assessment of evidence to determine a person’s current abilities against a given set of competency standards. This implies that in a course of learning, students are assessed based on clearly pre-determined criteria that detail which competencies are to be acquired during learning.

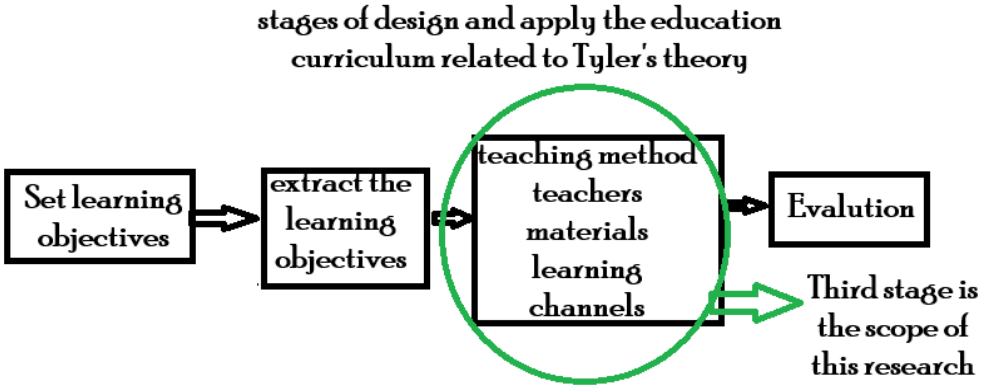
During assessment, teachers do not only rely on a single technique but use a variety of techniques. Besides, assessment is the practice of identifying, testing and deciding on the acquired knowledge and skills through understanding and proven abilities by students.”(Hagenimana, Ntawiha, Tabaro, Buhigiro, 2023), “competencies-based assessment forces the use of a diversity of instruments and the incorporation of different educational agents, it is means a change of the evaluative practice to be able to integrate the competences in the learning processes and performance as a way of establishing links of the knowledge contexts in which they can be transferred to improve decision-making. The basic idea is that the competence-based assessment can and must make explicit these relations of the design with the results obtained to contribute to continuous improvement of learning.”(Muñoz, Araya, 2017),” Competence-Based Assessment (CBA) is based mainly on performance and authentic assessment. It has been defined as involving observation and assessment of students’ behavior while making things.

Students are asked to demonstrate that they are capable of transferring knowledge, executing some skills in a certain complex situation in order to solve problems, and making decisions, or creating new alternatives within a given context.This performance is generally

observed in a semi-structured context or in real-life situations where collaborative work is required. Some advantages of applying performance and authentic assessment are: (a) giving more meaning to complex learning targets; (b) assessing students'ability to make decisions and solve problems; (c) integrating knowledge, skills, and attitudes into assessment and feedback; (d) giving the learning processes an important role rather than only focusing on solutions and products; and (e) being consistent with philosophical and pedagogical CBE basics."(Gallardo, 2020)," Traditional assessments are easy to design, administer, score and analyse compared to CBA but may not be able to provide complete information about the stage of the student.

Traditional assessments are snapshot observations of learning, are generally not linked to instructions or outcomes, and promote test-taking behaviour. They are fragmented and mainly focus on knowledge, sometimes skills. CBA, on the other hand, provides more comprehensive information about not only the current stage of the student but also about his progression and ascendency.They are longitudinal, often with low stakes, and help to reduce examination anxiety.CBA is based on direct observation and therefore helps in the generation of authentic feedback, which helps the students to learn better. This process of assessment for learning is crucial for the acquisition of competencies."(Supe, Seshadri, Kumar, Chalam, Singh, Singh, Vijayaraghavan, Maulik, Rajalakshmi, 2019)**, developing a quality control system for implementing the competence-based curriculum.**" Competency-based frameworks (CBF) are recognized as effective tools for identifying, developing, and managing work performance efficiently.

They serve various purposes, including: facilitating the recruitment and selection of new employees through assessments and selection procedures"(Benayoune, 2024)," School policy and operational structure are essential to ensure that all school activities are consistently focused on competency-based education"(Ponomariovienė, Staškuvienė, Torterat, 2025).

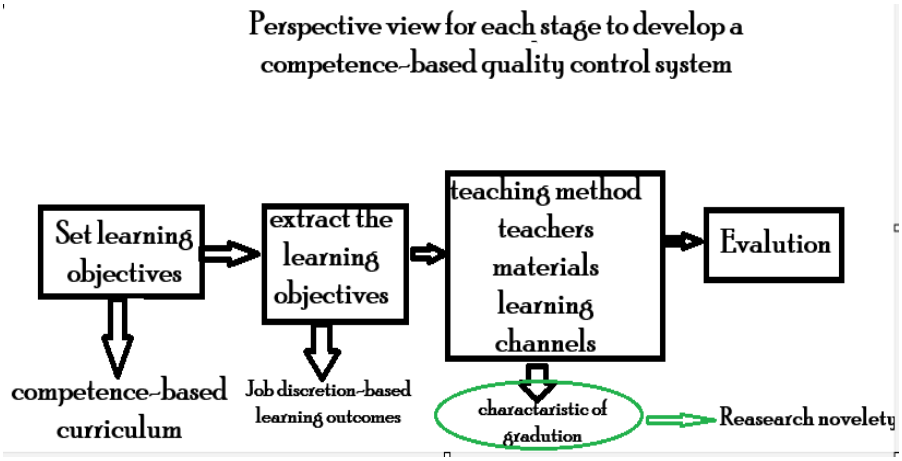


The education process:

The education process can be divided into two stages: **1.** Planning for the learning objective and planning for the learning outcomes, the learning objective put the maid market demand in one phrase like" create a civil engineer hold the technical skills and the soft skills makes him fit with market demand", while the learning outcomes translate the civil engineering jobs job description to educational goals like " the graduate must to be hold the knowledge of construction design with all sub knowledge serve this skills with the appropriate software skills and the integrated soft skills allow him work in the international standards", **2.** Planning will apply; this stage belongs to the design teaching method; choose and train the teachers, design the material, and choose the learning channels; in this stage also regarding running the education process.

The scope of the research:

Stage 2 is the focused area of this research, as after reading many relevant researches, it is clear that stage one was positively affected by many of the development and transitions, like the transition from knowledge-based curriculum to competency-based curriculum, but stage two didn't face the same treatment, as there is no teaching method designed as a competency-based teaching method



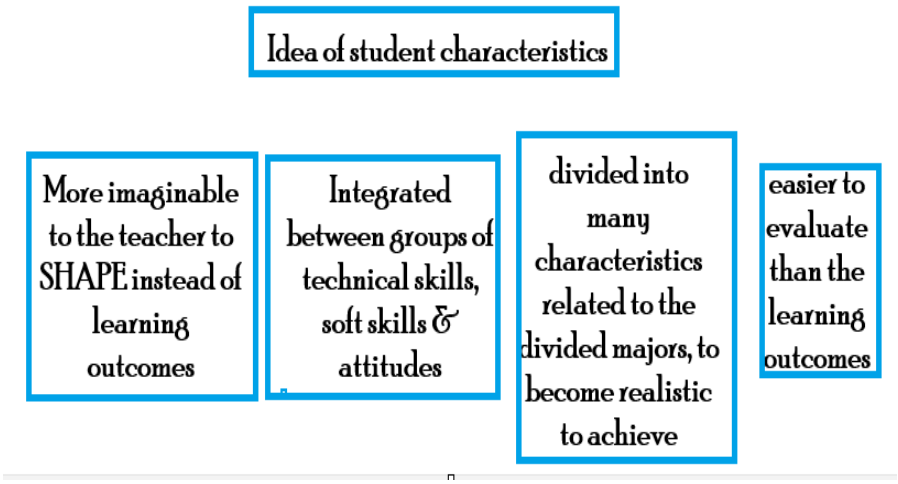
Novelty of this research is to develop a compatibility-based teaching method:

The key to developing a competency-based teaching method is to explore why stage number 1 is updated successfully, so the relation between setting the learning objective and the competency-based curriculum made the positive change in setting the objectives, also the relation between the learning outcomes and the job description made the positive change.

Then we need a measurable factor linking the teaching method to the competence-based teaching method, but we cannot use the market demand or the job description because they are so general, while the teaching is so detailed process

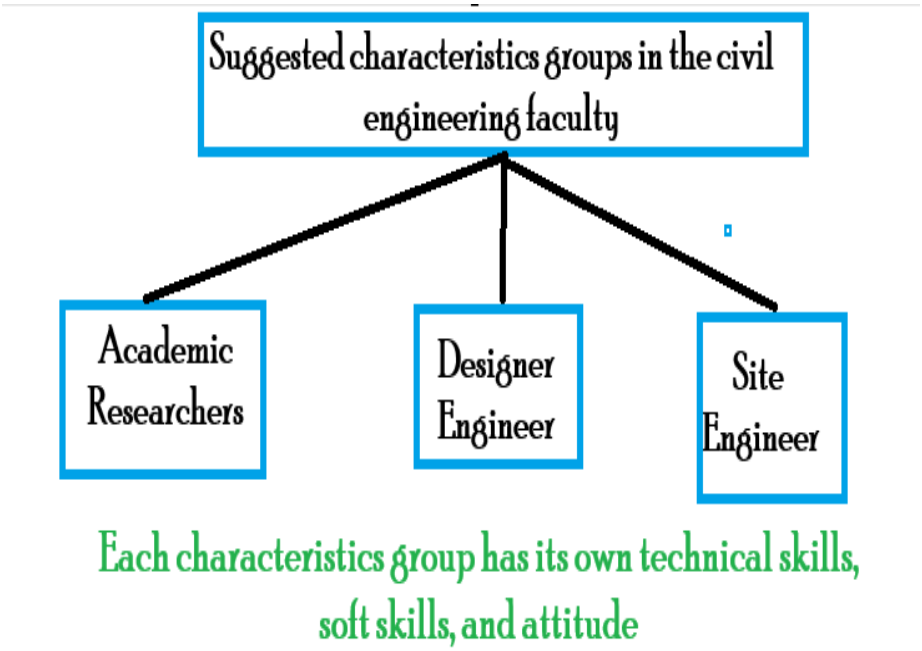
So we can break down the market demand and the job description to create new factors that have multi groups; this factor is a bridge between the market terminology and education terminology. Divide the factor to group make the teaching method more flexible to shape more than one group

This factor can be a civil engineering characteristic, then we can say as the learning objective is linked with the market competencies, and the learning outcomes are linked with the job description, also the teaching method will link with the civil engineering characteristic.



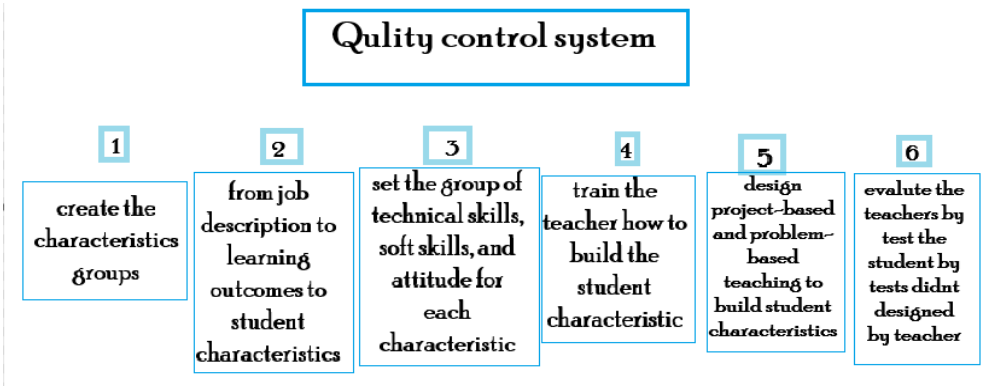
Idea of student characteristics:

1. More imaginable for the teacher to shape instead the learning outcomes instead; learning outcomes cannot make one image for the expected engineer, but the engineer characteristics make the teacher can make an image for the expected engineer
2. Integrated from groups of technical skills, soft skills, and attitudes; each one characteristic is shaped from many technical skills, soft skills, and attitudes. This makes the teaching method integrated with the whole program to achieve the goal
3. To achievable purposes; Divided into many characteristics related to the sub majors; if the civil engineer faculty presents many kinds of professions, we can't use the learning objective to achieve the goal, as we can assemble the multi professions into several characteristic groups, and make it count to achieve
4. For quality control, this is a more easy way to evaluate the learning outcomes achievement; the characteristics accomplished in each student can be measured frequently to evaluate the education process and teaching performance



Suggested characteristic groups in civil engineering faculty:

1. Academic research; this characteristic is for those who will complete an academic career, shaping their characteristic needs with different soft skills and different depth in some technical skills.
2. Designer engineering; this group needs special skills in some software, and more depth in some technical skills.
3. Site engineering; this characteristic needs more concentration in management skills, like cooperation, teamwork, project management, and so on.



Develop a quality control system to build integrated engineering characteristics in civil engineering:

1. Create a civil engineering characteristics group
2. Form the attributes of each group of the characteristic from the competency-based learning objective and job description-based learning outcomes
3. Set the appropriate technical skills, soft skills, and attitude for each characteristic
4. Train the teachers on how to build the characteristic in the student
5. Design a full teaching method using integrated project-based learning to build the student characteristics
6. Design an instrument tool for ongoing progress to measure the accomplishment ratio of the characteristic in each student, to correct and update the process

CONCLUSION

The scope of the research: there is no teaching method designed as a competency-based teaching method. Novelty of this research to developing a competency-based teaching method; the relation between setting the learning objective and the competency-based curriculum made a positive change in setting the objectives, also the relation between the learning outcomes and the job description also made a positive change.

Idea of student characteristics:

1. More imaginary to the teacher to shape instead the learning outcomes instead;
2. Integrated from groups of technical skills, soft skills, and attitudes;
3. To achievable purposes; Divided into many characteristics related to the sub majors;
4. For quality control, this is a more easy way to evaluate the learning outcomes achievement;

Suggested characteristics groups in civil engineering faculty:

1. Academic research;
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Develop a quality control system to build integrated engineering characteristics in civil engineering:

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