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The Needs of Curriculum Evaluation of Appreciation of Ethics and Civilization Course: From an Engineering-Based Perspective

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Abstract

The Appreciation of Ethics and Civilization course was introduced as a compulsory subject for all public and private universities in the 2019/2020 intake. This course is highly relevant for universities in Malaysia, with its sub-topics organized around themes that address global issues such as patriotism, ethics, and civilization. Additionally, it highlights the importance of tolerance in promoting harmonious relationships among Malaysia's diverse ethnic groups. The course is recognized for cultivating patriotism and encouraging ethical behaviour in daily life, specifically targeting university students in Malaysia. This course is particularly suitable for engineering students, as the field is often associated with lower ethical awareness compared to other disciplines. The paper will discuss several aspects and relationships that highlight the need for curriculum evaluation of Appreciation of Ethics and Civilization Course in Engineering field.

Keywords: Appreciation of Ethics and Civilization Course, Engineering Students, Needs, Curriculum Evaluation

Introduction

In general, education covers various aspects including cognitive, psychomotor and affective. Cognitive aspects are among the main aspects of an academic program. However, the affective aspect is always neglected because this is an aspect that covers an individual's desire to perform. In the affective aspect, ethics is one of the components that is considered very important. This will affect a person's behaviour to perform in his or her life, especially in the profession of work. Every profession has its own ethics. As declaration, ethics and social responsibility are often viewed as key areas of concern for many educators, students and graduates especially in the professional field of engineering (Jesiek et al., 2022). The importance of ethics practiced in higher institutions can be seen for fostering trust and community support, promoting fairness and equity, fostering professionalism, nurturing ethical leadership, fostering a secure and ethical educational environment and fostering social cohesion (Sakiman & Yasin, 2023). However, the presence of ethics education "Appreciation of Ethics and Civilization" course did not foster the desired outcome of good ethics students especially in the field of engineering. This claim can be seen from the previous study by (Rodzalan and Saat's 2016). The results indicate that engineering students possess a lower ethical standard than their social science and science friends. This is further supported by research revealing that about 9.6% of students acknowledged repeatedly engaging in unethical and moral behaviour while studying their educational institution (Abdul Muqsith Ahmad et al., 2017). In this review, the review will discuss briefly about the concept and the curriculum evaluation of the Appreciation of Ethics and Civilization course.

The Concept of Curriculum Evaluation in Higher Education

Evaluating and improving teaching and learning is crucial for meeting the goals of higher education programs (Stojadinovic et al., 2021). Curriculum evaluation is the process of assessing the value or effectiveness of specific aspects or the entire curriculum (Sharma et al., 2019). This evaluation can cover various elements such as curriculum design, the learning environment, the instructional process, and the resources and materials used in the educational delivery. It is equally important to evaluate the adequacy and accessibility of resources like teaching aids, laboratories, library books, and instruments. Curriculum evaluation aims to assess the value and effectiveness of educational activities, such as projects or tasks undertaken with students (Sharma et al., 2019).

By evaluating the curriculum, institutions can ensure that outdated educational goals, materials, and instructional methods are not only maintained but also updated in line with advancements in social, cultural, and scientific fields. It offers insights into the planned objectives, the ongoing process, and the final outcomes. At the same time, it helps identify challenges faced in achieving the desired results and provides guidance on overcoming these obstacles. In essence, curriculum evaluation plays a critical role in monitoring and reporting on educational quality.

This process is vital for any educational institution, making curriculum evaluation one of the most important and challenging tasks within the education system. As noted by Lynch, the two main objectives of program evaluation are to assess the program's effectiveness in absolute terms and to compare its quality with that of similar programs. Program evaluation is valuable not only for insiders but also for external stakeholders. By evaluating a curriculum before and after its implementation, its strengths, weaknesses, and overall effectiveness can be highlighted (Ornstein and Hunkins, 2009). Therefore, systematic and ongoing evaluation is crucial for continuous improvement, which ultimately underscores the importance of curriculum evaluation (Sharma et al., 2019). There are few of curriculum evaluation models can be used for the purpose of evaluation, especially in ethics and civilization education program.

Firstly, the Educational Connoisseurship and Criticism Model developed by Elliot Eisner in 1976 is based on an expertise-oriented approach to program evaluation. It emphasizes the role of professional expertise when evaluating institutions, programs, products, or activities, applicable across various fields depending on the evaluator's knowledge. This model, specifically for education, includes two key concepts: Educational Connoisseurship and Educational Criticism. Educational Connoisseurship is the "art of appreciation and evaluation." It involves identifying and emphasizing the qualities that define an educational process, such as the quality of programs, student activities, or teaching methods (Joseph, 2021). Educational Criticism is the "art of disclosing the quality" that connoisseurship perceives. It aims to provide a deeper understanding of the observed educational processes, not through negative judgment but by offering various interpretations (Joseph, 2021), much like an art critic analysing a scene of ethics. Eisner views education as a cultural art that requires artistic skills, and he emphasizes that educational evaluation should aim to improve teachers' skills, not just review outcomes. These artistic skills can help students to learn and think that ethics, cultural and civilization is unique. In this model, the evaluator acts as an art expert, describing, interpreting, and evaluating educational practices. The goal is to enhance both the evaluation process and the overall educational experience.

Tyler's Goal Attainment Model, also known as the Objectives-Centred Model, is a widely used framework in curriculum design, development, and evaluation. The model consists of four steps. The first step is to clearly define the learning objectives, ensuring they are relevant to the field of study and the overall curriculum. Tyler emphasizes the importance of aligning these objectives with the needs of students, society, and the subject matter. The next step involves selecting learning activities that help students achieve the defined objectives. Tyler stresses that these activities should enable students to discover content that is meaningful and useful to them, supporting a student-centred approach to learning. This student-centred approach can foster students' willingness to engage socially and learn about others who are different from themselves. It is a more effective way to promote unity among students. Once the learning activities are identified, they need to be organized in a way that effectively supports the attainment of the objectives. The final step involves evaluating and assessing the learning experiences to determine whether the objectives have been achieved. Tyler’s model emphasizes that curriculum objectives should be derived from three sources: the student, the society, and the subject matter (Joseph, 2021). He argues that if the curriculum does not address the needs and interests of these three factors, it will not be effective. Additionally, Tyler advocates for a student-centred approach, where learning activities are designed to engage students and make the content meaningful to them.

Then, the CIPP Model (Context, Input, Process, Product) developed by Stufflebeam in 1983 is a systematic approach to educational evaluation that supports rational decision-making. It helps identify potential alternatives and set up quality control systems for activities. The model evaluates four key aspects: merit (quality), worth (meeting beneficiaries' needs), probity (integrity and honesty), and significance (importance beyond the entity's context) (Stufflebeam, 2007). This model emphasizes the practical implementation of the program to produce tangible outcomes that benefit all stakeholders. It is particularly useful for programs related to ethics and civilization, as it imposes no limitations and promotes the genuine conduct of the learning process. Since ethics cannot be fully demonstrated through writing or answer sheets, this model allows the practical application of students' values and behaviours to be observed. The CIPP model can be applied in both formative and summative evaluation. The purpose of the CIPP model is to improve, not just prove, and it is particularly useful in evaluating curricula and projects. It has been applied in various educational settings, such as assessing academic advisor programs and evaluating undergraduate and master’s level programs.

Next, Kirkpatrick's four-level model, also known as the Hierarchy Model, is a structured approach to evaluating training programs, where each level builds on the information from the previous one. Evaluation should start at Level 1 and, depending on time and budget, proceed through Levels 2, 3, and 4 (Joseph, 2021). Each level serves as the foundation for the next. Level 1participants' reactions to the training program, focusing on their perceptions. Questions like "Was the material relevant to their work?" are asked, often using tools like "smile sheets." Kirkpatrick emphasizes that this level should always be evaluated to improve the program. Level 2 assesses the extent of learning, such as the improvement in skills, knowledge, or attitude. It typically involves pretests and posttests to evaluate how much participants have learned during the program. Level 3 evaluates whether the knowledge, skills, or attitudes acquired in the training are being applied in the participants' everyday work environment. Level 4 measures the overall success of the program in terms that are meaningful to schools and teachers, such as improved performance or outcomes. Kirkpatrick's model emphasizes a sequential approach, starting with reactions and progressively measuring deeper impacts, such as learning and real-world application of the training especially in practicing ethic (Joseph, 2021). This model allows for a detailed observation of how knowledge is transferred from educators to students. It ensures that all steps are aligned with and appropriate for the learning objectives and content.

Besides that, Logic Model is a structured framework used to evaluate how a program achieves its intended learning outcomes. It is influenced by systems theory, which emphasizes the relationships between various program components and their context. The model follows a sequence starting with inputs, which are the resources such as funding, staff, facilities, and skills available to the program. Activities are the planned actions or strategies to achieve the program's goals. Outputs are the indicators that show an activity is in progress or has been completed. Finally, outcomes represent the short-term, medium-term, and long-term changes expected from the program, such as knowledge or skill acquisition by learners, or changes in practice outcomes (Joseph, 2021). This model helps to trace the path from resources through activities to measurable results, guiding program evaluation and improvement. It can make the transfer of knowledge until maximum result.

The Countenance Model aims to understand the complexity of educational innovations by comparing intended and observed outcomes at different levels of operation. It involves three sets of data. Antecedents are the conditions or factors that exist before the implementation of the program, which may influence outcomes. Transactions are the activities and interactions that occur during the program’s implementation, such as student-teacher and student-student encounters. Outcomes are The results or impacts observed after the program has been implemented. The model emphasizes both description and judgment. Descriptions should capture both the intended aspects of the program and the actual events that occurred. Judgment involves evaluating these descriptions based on external standards and assessing the results against these standards. Stake argues that greater emphasis should be placed on describing the program and collecting data, as judgment comes from the analysis of this data (Joseph, 2021). Outcomes, in this model, are measured in terms of the impact on learners and others involved in the program. This model is also suitable for evaluating programs related to ethics and civilization, as it emphasizes the impact on students and the changes in their behaviour, encouraging them to practice ethical conduct in their daily lives.

Courses for engineering majors have distinct characteristics compared to those in non-engineering disciplines (Chunxing, 2019). Typically, practical teaching is an integral component of engineering courses. When evaluating the curriculum for engineering programs, it is essential to strike a balance between the emphasis on theoretical teaching and practical teaching. While there is substantial knowledge based on best practices in teaching evaluation, there is a notable gap in research on the specific teaching evaluation practices used in engineering programs (Villanueva, 2017).

Periodic review and improvement of engineering curricula are essential for ensuring the relevance and quality of undergraduate degree programs. This need for curriculum updates is driven by several factors, including the rapid advancement of technology, evolving social expectations, corresponding changes in legislation and regulation of engineering practices, and the shifting expectations of stakeholders in higher education which include students, faculty, government bodies, and accrediting organizations (Carew, 2008).

Engineering is a field where technological innovations constantly reshape the relationship between curricula and the tools used in industry, necessitating ongoing attention to maintain their relevance (Carew, 2008). While the fundamental principles of engineering like conservation of energy, corrosion chemistry, fluid mechanics remain relatively stable, technological advancements require that the examples used to demonstrate these principles evolve in line with current industry applications such as solar photovoltaic cells with nano-tech components, corrosion properties of new alloys, behaviour of particulates in reverse osmosis water treatment.

Another important aspect of staying current is ensuring that engineering curricula are updated to reflect emerging social and political pressures that increasingly influence engineers' daily work. Engineers are held accountable to various codes, regulations, and legislation, including building codes, emissions standards, occupational health and safety regulations, environmental management standards, and professional ethics codes. (Carew, 2008). Moreover, heightened public concern about sustainability has led to greater expectations that engineers consider the broader implications of their technical decisions, for example, life cycle analysis, ecological footprints, triple bottom line accounting and engage with diverse stakeholders in problem-solving which includes community consultation, deliberative democracy, and consensus conferencing. Consequently, engineering curricula must now equip graduates with the tools and attributes necessary to apply their technical knowledge responsibly in socio-political contexts (Mitchell et al., 2004).

In addition to staying current with technological advances and socio-political dynamics, changes in higher education require that engineering curricula also adapt in terms of teaching methods. Over the past decade, major accrediting bodies shifted their focus from "inputs" (what content is taught) to "outputs" (how well students learn). This aligns with a broader philosophical movement toward student-centred teaching (Biggs, 2003), which is now influencing the requirements of higher education regulators in globally. This shift means that it is no longer sufficient to merely outline the content students are exposed to; accrediting bodies and regulators now demand evidence that teaching methods lead to measurable student learning.

Therefore, engineering curricula and teaching strategies must be designed to ensure that students acquire a solid foundation in engineering principles, stay abreast of technological innovations, and develop the soft skills or graduate attributes required to navigate complex socio-political environments.

Ethics and Civilization in Higher Education

Ethical concerns have become a modern aspect of engineering education. The integration of ethics into the engineering curriculum began in the 1970s, with the emergence of engineering ethics research in academic journals and the publication of specialized textbooks (Mitcham, 2009; Weil, 1984). Historically, fields such as engineering, rooted in the exact sciences, were considered morally neutral (Roeser, 2012) or even inherently morally positive, and therefore did not necessitate ethical training (Ehrlich, 2010). As a result, the development of engineering ethics education has been gradual (Mitcham, 2009; Reed et al., 2004).

Enhancing students' understanding of the complexity of ethical concerns requires teaching engineering ethics at the undergraduate level. Students need to understand that major ethical dilemmas rarely have a single right response or solution. Undergraduate ethics instruction should focus on four main areas: academic dishonesty, punctuality, judgement, and moral behaviour. A study by Baugher, D., & Weisbord, E. (2009) investigates how gender and academic fields affect these four moral processes, looking at possible links between them and how they relate to ethical perceptions, such as those influenced by age, gender, and engineering education. According to Emerson and Mckinney (2010), codes of ethics play a crucial role in directing moral principles in engineering education. In essence, when students perceive that these codes are being properly enforced, they are more likely to view them as effective and hold high moral expectations for the ethical culture and members of the academic institution.

Academics and professionals in engineering are dedicated to fostering ethical behaviour within the field. Engineering ethics are crucial for sustaining public trust in the profession, particularly as engineers increasingly encounter complex global and social issues that present both technical and ethical challenges. Unethical practices in engineering can lead to legal consequences, financial limitations, and reduced efficiency for companies. To improve ethical awareness, it is essential to develop effective ethical education for students, focusing on enhancing their self-efficacy, preparedness, and understanding of the ethical challenges they may face.

The ability to identify a moral concern in a particular circumstance serves as a trigger in the awareness process, starting the ethical decision-making process. Role-playing is a component of moral awareness, but it also requires an understanding of how breaking a moral law or permitting unethical behaviour might impact other people's needs, beliefs, expectations, and health. Future and present engineers must maintain a strong work ethic and be aware of the ethical concerns they face. Therefore, it's critical to assess whether engineering students are ready for these problems as they prepare to enter the workforce (Levonisova et al., 2015).

In the opinion of Goldfinch et al. (2010), students in engineering fields mostly have long been subjected to a variety of stereotypes that often include some degree of social incompetence and cultural illiteracy. Understanding civilization, history, and cultural context is crucial, especially in global and interdisciplinary engineering practice. Recognizing the diverse cultural perspectives and values of different societies helps engineers design solutions that are respectful and inclusive. Most students and faculty are unaware of the prevailing cultural norms that shape the engineering profession (Casper et al., 2019). Diversity and inclusiveness are not often linked to engineering by students. However, studies have shown that students are exposed to new approaches to problem-solving that foster creativity and invention when they work with classmates from different backgrounds (Phillips, 2014). Additionally, diversified institutions are important for increasing creativity, strengthening decision-making skills, and improving problem-solving abilities. Strategies that focus on inclusivity, rather than just eliminating identifiers, have proven effective in fostering more equitable environments. This fosters collaboration in global teams and ensures that innovations meet the needs and expectations of various communities.

Knowledge of history provides valuable insights into past engineering failures and successes. It helps engineers avoid repeating mistakes and adopt proven solutions (Addis, 2017). Understanding historical contexts also inspires innovation by learning from different eras' technological advancements. In 1945, Stanley Baines Hamilton listed six reasons why engineers should study history: first, the detective interest in tracking down the origins of knowledge; second, the chance to interact with like-minded individuals, especially in societies like the Newcomen Society; third, the expansion of engineering's scope from a purely technical discipline to a more liberal and humane field of study; fourth, the understanding of the human mind that comes from studying invention and discovery; fifth, history provides a form of rest; and last, the history of technology contributes to a better comprehension of general history.

In a globalized world, engineers often work in cross-cultural teams. Familiarity with cultural and historical contexts promotes better communication, reduces misunderstandings, and encourages collaboration across borders, leading to more effective problem-solving. Global collaboration has become a growing trend in the STEM (science, technology, engineering, and math) disciplines in today's interconnected world (Bremer, 2008; Grandin and Hirleman, 2009). Preparing a future workforce that is culturally competent is becoming more and more important as the STEM sector looks for engineers who can work and communicate with colleagues from a variety of cultural backgrounds (Davis and Knight, 2018). Without the chance to practise these abilities, young people could have trouble communicating effectively, fostering tolerance, and forming wholesome bonds with others from various linguistic and cultural backgrounds. Stressing the value of cross-cultural communication when students are in college is essential to resolving this problem. Stated in distinct ways, it is imperative that the STEM curriculum incorporate cross-cultural communication (Del Vitto, 2008).

Many of today’s engineering challenges—such as climate change, public health, and urban development—are global in nature. Within an institution or organisation, the environment has a big impact on how engineering professionals, students, and professionals behave. Some experiences are produced by the culture and conventions that are fostered by established environments. Our understanding, identity, interests, and methods for resolving engineering challenges are all shaped by these culturally affected experiences. Our perspectives as members of our society are influenced by the different settings and cultures that we encounter in our homes, communities, schools, and workplaces (Carberry et al., 2018). By understanding different civilizations' unique challenges and contexts, engineers can create more adaptable, scalable, and locally appropriate solutions.

Technological advancements have different social, political, and economic impacts depending on the region. As our world confronts rapid changes and pressing challenges such as climate change, which poses a global threat to lives and property, there is an increasing need for urgent solutions that go beyond the current capabilities of science and technology (Rod McCrea et al., 2024). Understanding the context helps engineers predict and mitigate unintended consequences, ensuring that technology serves the broader well-being of all involved.

Ethics plays a crucial role in engineering education for various reasons, and movements advocating for the integration of ethics across the curriculum began in these fields before similar efforts emerged in engineering, which became more prevalent in the early 2000s (Bottomley et al., 2023). However, the integration of ethics within engineering education remains largely isolated, with the most notable examples found in biological and biomedical engineering. Despite the availability of ethics workshops and other resources, many engineering instructors may struggle to incorporate ethics into their courses (Bottomley et al., 2023). Engineering subjects like statics or circuits, for instance, do not naturally lend themselves to the inclusion of ethical case studies. As a result, ethics is often relegated to separate courses or limited to senior design projects.

An ethical framework created at James Madison University as part of an ethics across the curriculum program serves as the foundation for an alternate strategy for incorporating ethics into Science, Technology, Engineering, and Mathematics (STEM) education. A small team of academics at an NSF-sponsored workshop on the future of STEM education adopted this framework as a starting point (Bottomley et al., 2023). The framework, along with a tool created to help instructors at the college level incorporate ethical considerations into their courses, is designed to assist in selecting appropriate methods for ethical integration (Bottomley et al., 2023). These methods could include case studies, real-world examples, or even specific teaching strategies. In order to help include values, ethical context, epistemology, positionality, and pedagogy into the design of STEM courses—especially in the biological sciences—the Ethical Reasoning Instrument (ERI™) was created. Later, the tool was modified to be used in engineering classes as well. By employing the Eight Key Questions ethical reasoning framework, which was first created at James Madison University, the ERI™ makes it easier to integrate foundational, meta, and humanistic knowledge (Bottomley et al., 2023). Three significant components of instruction are informed by this framework: pedagogy, learning outcomes assessment, and student learning activities (Linder et al., 2020). By providing an organised method for creating courses, the ERI™ enables teachers to (Linder et al., 2020). The ERI™ offers a structured approach to course design, allowing instructors to intentionally map these ethical dimensions during the course development process (Bottomley et al., 2023).

In the domain of ethics, the ERITM integrates humanistic and meta-knowledge (Bottomley et al., 2023). Collaboration, communication, ethical decision-making introspection, problem-solving, and comprehension of the possible outcomes of decisions are among the meta-knowledge and abilities covered. Relationship building, cooperation, and intentionality are examples of humanistic features that centre on acknowledging multiple epistemologies influenced by various backgrounds and social identities. The concept that science and engineering are not value-neutral domains and that knowledge is dynamic and changes over time, with varying meanings for individuals, are two important factors to take into account.

The ERI™ helps course designers or instructors consider eight ethical dimensions to integrate both personal and disciplinary values frameworks alongside the core content of a course (Bottomley et al., 2023). It is primarily intended for embedding ethical considerations throughout the curriculum, rather than focusing solely on a single ethics course. While such courses are valuable, research (Loucks-Horsley et al., 2010) supports the view that effective professional learning is intensive, continuous, and closely linked to practice. This emphasis on ongoing adult learning connected to real-world practice suggests that teaching ethics within actual disciplinary engineering courses may more effectively help students learn ethics as a practical skill.

The Role of an "Appreciation of Ethics and Civilization" Course in Engineering Education

The Appreciation of Ethics and Civilization curriculum is designed to align with the Ministry of Higher Education's General Studies Subjects (MPU) objectives. The goal of MPU was to provide undergraduate students with knowledge relevant to nation building, strengthen and broaden their understanding of Malaysia, and the ability to employ soft skills (Saharia, 2015).

The National Education Philosophy's desired outcomes, which emphasise the integration of noble values and the development of well-rounded, balanced human capital, are in line with this course. Professional graduates who can progress knowledge, society, and the country are indirectly produced by it. As such, the implementation of the PEP course plays a crucial role in nurturing an ethical generation. The course's teaching and learning process (PDP) is designed to cultivate critical problem-solving skills, promote the development of professional character and ethics in students, and enhance their communication abilities, preparing them for an increasingly globalized world. The course presents a challenging experience for students (Abdullah et al., 2022).

This course consists of 10 chapters, organized according to key discussion areas and aligned with the guidelines provided by the Department of Higher Education. It introduces students to the concept of ethics from the perspective of various civilizations, aiming to explore the systems, levels of development, progress, and cultures across nations in strengthening social unity. Additionally, the course engages with contemporary debates on issues in economics, politics, society, culture, and the environment from an ethical and civilizational standpoint, fostering the development of morally grounded and professional students (Uqbah Iqbal, 2024). It also encourages students to ethically appreciate social life and apply what they have learned, considering current national issues. Efforts to preserve ethical appreciation alongside social innovation are integrated into our priorities, aligning with the need to build a strong Malaysian civilization.

The aim of this course is to understand the concept of ethics and civilization within a specific historical context. The learning outcomes include defining, interpreting, and identifying ethics and civilization, exploring the timeline of ethics from the precolonial, colonial, and postcolonial eras, explaining the significance of manners and customs in the context of Malaysian civilization, analyzing Malaysian ethics and civilization based on historical development, social structure, and biographies, and understanding the appreciation of ethics and civilization at individual, family, community, and societal levels (Uqbah Iqbal, 2024). The course content covers an introduction to ethics and civilization, key ethical terms and definitions, the ethical timeline across precolonial, colonial, and postcolonial periods, as well as an analysis of ethics and civilization in relation to history, social structure, and biography (Iqbal, 2024).

Additionally, completing the PEP course places a strong emphasis on comprehending ethics and the building of civilisation in a varied society. The goal is to improve comprehension of these principles and fortify national unity via nationalism and patriotism, which are modelled after the Malaysian model. Examining and debating ethics and civilisation within the context of Malaysia, which is founded on the Federal Constitution and Rukun Negara, is part of academic activity. As a result, valuing morality and civilisation demonstrates social responsibility and affects people on a personal, family, community, national, and international level. Completing the PEP course indirectly helps students at higher education institutions strengthen their soft skills (Sohaimi Esa et al., 2023).

According to a study by Zahid et al. (2022), the syllabus, teaching strategies, learning approaches, and assessment for the Appreciation of Ethics and Civilisation course are highly regarded by the students at the UiTM Penang Branch, especially those pursuing engineering. The course given under the General Subjects category is typically accepted by engineering students. The goals of the General Education Subject, which was introduced by the Ministry of Higher Education, are in line with this course. Comparatively speaking to the other claims, the statement "this course is suitable to be offered to undergraduate students" obtained a lower mean score of 3.90. The researchers postulated that some students thought the course material, which addressed subjects they had already studied in school, was repeated. As a result, they lost interest in the course and viewed it as a waste of time. The goal of the General Subject, as introduced, is to provide undergraduate students with knowledge related to nation-building, strengthen their understanding of Malaysia, and enable them to apply soft skills (Ismail, 2015).

The content of the course focused on a number of important topics pertaining to Malaysian ethics and civilisation. It begins by examining how ethics and civilisation are valued in Malaysia. Second, it tracks Malaysia's historical evolution from pre-colonial to post-colonial times, looking at the dynamics of ethics and civilisation. Third, it addresses how morality and civilisation are developed in a multicultural society with the goal of enhancing racial and national cohesion. Fourth, it explores Malaysia's civilisation model as a foundation for ethics and integration, as directed by the Federal Constitution. Fifth, it discusses how national unity is impacted by globalisation and technology progress, highlighting social responsibility on a personal, family, communal, and national level. The difficulties of upholding morality and civilisation in the face of social and economic change are also covered in the course. Key topics include the concept of ethics and civilization, national unity, ICT's role in integration, and current issues. It is important to assess the elements of this new course, in comparison to the previous course, Ethnic Relations (Esa et al., 2011).

Various of the platform such as Microsoft team, Google Meet, and the use of Live Chat, group chat, and WhatsApp chat were used in teaching this Appreciation of Ethics and Civilization course. The statement "Lecturers are always ready with what they want to teach" received the lowest mean score of 3.75. Approximately 22.4% of respondents were unsure, and 0.7% disagreed. The researchers suggest that certain challenges in the virtual classroom, such as technical issues, an unconducive environment, and insufficient skills in using the teaching platform, may have contributed to lecturers appearing less prepared. This indicates a need for improvement in the future. The quality of teaching could be compromised if lecturers do not prepare thoroughly and focus on the main content.

The assessment method for the course, which includes 20% for paperwork, 20% for presentations, 30% for article reviews, and 30% for the final assessment test, is well-received by the students. According to Saad (2021), the continuous assessment (PB) format is particularly beneficial for students, as it allows them to earn high marks compared to courses that combine continuous assessment (PB) with final assessment (PA). This indicates that the course curriculum is designed and integrated to meet students' needs, enabling them to apply what they learn in their personal lives (Esa et al., 2021). The statement "I am satisfied with the evaluation of the presentation mark of 20%" received the lowest mean score, with 18.4% of students being unsure and 3.3% strongly disagreeing. The researchers believe that some students are dissatisfied because they feel the 20% mark allocation does not fairly reflect the effort involved in preparing video presentations in a virtual learning environment, especially when compared to face-to-face presentations. This aspect should be reviewed for potential improvements.

In recent years, engineering education programs in developed countries such as Malaysia have made significant progress in recognizing the importance of ethical competency alongside technical skills. Engineering educators, who once focused solely on producing technical experts, have become increasingly aware of the need to explicitly incorporate responsible and ethical behaviour into the engineering curriculum (Mohamed & Faris, 2010). In reality, engineers must be aware of and abide by the professional norms established by their society. This includes evaluations of their worth as members of the community by coworkers, partners, trainees (who they mentor and educate), students, and society at large. It is commonly believed that trainees and students can observe and copy the behaviour of more experienced professionals. Unfortunately, emulating positive behaviour isn't always achievable, and even when it is, it might not be sufficient because everyone has a different way of consuming what other people are doing. Additionally, the reasoning behind any behaviour, even exemplary ones, is not always clear, especially when the issues are complex and multifaceted, requiring decisions to be made among competing interests and concerns.

In summary, being an engineering professional involves more than just technical expertise (Mohamed & Faris, 2010). Recognizing and respecting the professional values and standards of the community is a key indicator of one’s status within that community. Therefore, responsible and ethical engineering practices should be explicitly incorporated early on in one's engineering journey. An "Appreciation of Ethics and Civilization" course could enhance and reinforce the ethical and civil responsibility of engineering students, preparing them to apply these principles in their future professional practices.

Current Practices in Teaching Ethics and Civilization in Engineering

There is frequently scepticism regarding ethical instruction at engineering institutions (Nasef, Mohamed & Waleed Fikry Faris, 2010). The subject of whether ethics can be taught in engineering institutions effectively is one that frequently comes up, exposing a basic problem. The idea that by the time they enter higher education, university students have already formed their moral character is the source of this scepticism. Both inside and outside of academia, critics contend that moral character cannot be changed in a professional seminar or college classroom since it is formed in the community, at home, and in places of worship. Although there may be some validity to this viewpoint, it is debatable.

While morality certainly needs to be nurtured from an early age, moral development doesn't stop once we move past these formative years. This idea is supported by scholars like engineer Samuel Florman, who argued that while the foundation for goodness may be established early, we continuously wrestle with the definition of what is good, or at least acceptable, throughout our lives. Additionally, researchers such as James Rest and Muriel Bebeau have demonstrated that moral development continues at least until the completion of formal education. This ongoing development reflects, in part, a growing awareness and reevaluation of one's role in society as they transition into a professional (Mohamed & Faris, 2010).

Integrating ethics into education at all levels demonstrates to faculty and students that ethics is a core skill. Both "microlevel" and "macrolevel" ethical issues should be included in engineering ethics courses. According to Vanderburg, the latter deals with "technology as a whole," whereas the former concentrates on "individual technologies or practitioners." Professional ethics are divided into two categories by ethicist Ladd: "micro-ethics" and "macro-ethics." While macro-ethics stresses the engineering profession's collective social responsibility, micro-ethics concentrates on the interactions between individual engineers and their employers, clients, and colleagues. (Mohamed & Faris, 2010). To further enrich the conversation around engineering ethics, Herkert proposed incorporating the ethical implications of public policy relevant to engineering, such as risk, product liability, sustainable development, healthcare, and information technology (Herkert, 2000). As such, engineering ethics courses should encompass both micro-level and macro-level topics. These courses should cover foundational ethics concepts and methods, typical professional engineering codes of conduct, the history of engineering and technology, the balance between organizational loyalty and professional rights, engineers' environmental responsibilities, risk assessment in decision-making, whistleblowing, and the tension between social responsibility and legal liability.

The course begins by focusing on understanding core ethical frameworks through the use of case studies (Aufderheide, & Nare, 2022). Case studies are essential in engineering ethics education, providing students with real-world examples of ethical challenges faced by professionals. These authentic scenarios help students bridge the gap between theoretical knowledge and practical application. By analyzing case studies based on actual events, students gain insight into the complexities of ethical decision-making in engineering. Students critically evaluate the actions of individuals involved, considering the ethical principles and consequences of their decisions. Case studies reflect the diverse contexts in which engineers work, requiring students to adapt their ethical reasoning to specific cultural, regulatory, and project-related factors. This approach helps students understand that ethical decisions must be flexible and context-sensitive. Through case studies, students learn from both ethical failures and successes, reinforcing the importance of ethical behaviour. They also develop empathy by considering the perspectives of various stakeholders affected by engineering decisions, such as clients, communities, and the environment. The diversity of opinions during case study discussions fosters rich debates, enhancing students' ethical reasoning skills. Case studies prepare students to navigate ethical challenges in their future careers by teaching them to identify dilemmas, evaluate alternatives, and consider long-term consequences. Exposure to a variety of cases equips students with the tools to make ethically sound decisions with confidence and integrity.

Later sections address additional topics such as personal standards, professional standards, corporate ethics, safety, and quality control. Engineering ethics covers a range of topics, including responsibility, sustainability, health and safety, legislation, professional ethics, community engagement, humanitarian engineering, societal context, value-sensitive design, academic and research integrity, ethical theories, business studies, and military applications (Aufderheide & Nare, 2022). The core text for the course is Ethics in Engineering (2nd Edition) by Martin and Schinzinger, which offers an excellent collection of both small and large case studies that are thought-provoking and effectively explain the complexities of ethical theory and methodologies. The initial focus is on the introduction to ethics, moral reasoning, moral frameworks, and utilitarianism. Supplemental practical insights are provided through guest speakers with real-world experience.

Classroom-based instruction is a traditional but effective method for teaching engineering ethics. It involves lectures and discussions led by instructors to impart ethical knowledge and help students understand ethical principles in engineering practice. This approach provides a foundation for learning key ethical theories and concepts, such as utilitarianism, deontology, virtue ethics, and professional codes of conduct (Yusuff et al., 2024). The material is primarily covered through group work, where students collaborate on writing short briefs and giving presentations to the class. Each group presents on a different topic, allowing the class to discuss a broader range of material. While each group is responsible for their assigned topic, all students are expected to read the relevant chapters on all subjects. Quizzes are typically given for each chapter of material covered. Before beginning the briefs, a group discussion is held, where students establish ground rules for leading discussions, determining appropriate participation, and resolving conflicts if they arise (Aufderheide & Nare, 2022). The students followed these guidelines effectively throughout the course.

Another traditional approach, it involves studying historical accidents to analyse ethical conduct and social implications. Developing interactive, major-specific cases helps ensure students consider the social and environmental contexts of engineering. Another approach, suggested by Lynch and Kline, focuses on "culturally embedded engineering practice," which includes institutional and political aspects like contracting, regulation, and technology transfer. They argue that understanding these non-technical aspects equips engineers to foresee and prevent safety problems before they become disasters.

Experiential learning is a powerful method in engineering ethics education, focusing on hands-on activities and practical exercises to engage students with ethical challenges and decision-making processes. Unlike traditional theoretical approaches, this method encourages active participation, where students interact with real or simulated ethical scenarios, make decisions, and experience the consequences of their choices (Yusuff et al., 2024). It connects ethical dilemmas to real-world engineering contexts, making them more relevant and relatable. Through service-learning projects, internships, and practical exercises, students gain insights into ethical challenges they may face in their careers, applying ethical theories and principles to real situations. This approach fosters critical thinking, problem-solving, and empathy by encouraging students to analyse complex ethical issues, consider various perspectives, and understand the broader impact of their decisions. Immediate feedback from activities helps reinforce ethical reasoning, enhancing students' ethical identity and decision-making abilities. Overall, experiential learning helps shape students' ethical character, preparing them to navigate future engineering challenges with integrity.

Effective teaching of engineering ethics requires addressing ethical issues directly, promoting interactive discussions with students, faculty, and professionals, and involving multiple faculty members to emphasize the importance of responsible behaviour. It should focus on discipline-specific topics and local ethical challenges, starting early in the curriculum and continuing through graduate education. Programs should demonstrate the evolving nature of community standards and help students develop the ability to address complex problems. Additionally, professional standards and ethical values should be reinforced through various activities, including courses, team meetings, and informal discussions with mentors.

There have been several issues and a general discontent with the condition of engineering ethics teaching during the last few decades. Empirical and conceptual research shows that many of these issues are personal in nature, mainly related to instructors struggles to successfully align the various theoretical frameworks, learning objectives, instructional strategies, and assessment techniques (Keefer et al., 2014). This difficulty becomes worse by the lack of institutional support, programs, or instructional tools, as well as the lacking of ethics knowledge among engineering instructors. As highlighted by Colby and Sullivan (2008), a number of institutional issues have also been noted, such as the inconsistent implementation of ethics education and the comparatively low priority given to ethics. Students' and instructors' engagement with ethics is also impacted by issues that have their roots in the cultural context of engineering education, which influenced the present generation of engineering scholars. These problems show how difficult it is to apply and teach engineering ethics, which emphasises the need for more study and methods of structural support.

Engineering students are primarily focused on acquiring the technical knowledge and skills needed to become proficient professionals. However, there is a notable lack of opportunities for them to understand and embrace their role in promoting social justice, equity, and diversity in their future careers. This gap may be due to insufficient practice in sociotechnical thinking, leaving students ill-prepared for the challenges they will encounter in the workplace. Students often show disinterest, resistance, and difficulty when engaging with ethics and societal considerations (Polmear et al., 2018), and they struggle to emotionally engage with the course material (Balakrishnan & Tarlochan, 2015). Many students prefer ethics to be a non-compulsory subject that is not assessed (Sucala, 2019) and tend to invest less time preparing for ethics courses (Martin, 2020).

Several countries, including the United States and China, integrate ethics and civilization into their engineering education programs. Ethics remains a crucial factor in shaping future professional engineers. Various frameworks exist to integrate ethics into engineering curricula, one of which is the National Engineering Ethics (NEE) framework (Ali Dizani et al., 2024). The NEE framework provides a conceptual map for policymakers and educators to systematically understand and explain developments in engineering ethics within a specific country. It outlines key components that contribute to the development of engineering ethics and serves as a blueprint to assess the current state of ethics education and design strategies for improvement. While different frameworks may be used, the overarching goal remains the same: to cultivate ethical and professional engineers.

Challenges and Opportunities for Improvement

Evaluating the implementation of ethics and civilization courses in engineering programs presents several challenges. One key difficulty is measuring the long-term impact on students' behaviour and decision-making after graduation, as ethical principles often evolve due to external factors. The subjective nature of ethical judgments, influenced by personal values, cultural backgrounds, and career goals, complicates the establishment of universal success metrics. Additionally, these courses often face time and resource constraints, leading to superficial coverage that hinders deep learning. Many students perceive ethics as secondary to technical subjects, which can result in disengagement. To address these challenges, a comprehensive approach is needed, including longitudinal studies, better integration of ethics into the curriculum, and strategies to enhance student engagement.

Proposing future directions in engineering ethics education can enhance its effectiveness, especially for engineering students. Suggested approaches include integrating emerging technologies like virtual reality and interactive simulations for immersive learning experiences that promote critical thinking. Blended learning models combining classroom instruction with online resources cater to diverse learning styles. Gamification can increase engagement through ethical decision-making games, while role-playing and debates foster empathy and understanding (Latif et al., 2018). Collaborative learning environments encourage peer discussions to enhance critical thinking, and service-learning projects allow students to apply ethical principles in real-world contexts (Emma et al., 2023). Global perspectives on ethics, mentorship programs, and ethical leadership development empower students to become ethical advocates. Additionally, incorporating well-being and mindfulness practices can support emotional intelligence and resilience, while ethical innovation and design thinking promote creative solutions to ethical challenges in engineering.

While significant progress has been made in understanding the role of engineering ethics for university or college students, further research is needed to address key aspects. Specifically, there is a need to examine the impact of digital distractions and online ethics on their decision-making, and how these influences affect long-term ethical behaviour. Research into innovative teaching methods like gamification, role-playing, and experiential learning is also essential, particularly in assessing their long-term impact on ethical decision-making in professional careers. Understanding how ethics education influences engineers' attitudes and behaviours over time is crucial for refining curricula. Ongoing research will help improve ethics education, ensuring it remains effective, relevant, and responsive to the evolving landscape of engineering practice and societal needs.

Conclusion

Education encompasses various aspects, the affective dimension, particularly ethics, plays a crucial role in shaping an individual's behaviour and professional conduct. Despite the importance of ethics in fostering trust, fairness, and professionalism, it is evident that the current educational approach, particularly in engineering, may not be sufficiently effective in instilling the desired ethical standards. The findings from previous studies highlight a gap in ethical awareness among engineering students, pointing to the need for more impactful and comprehensive ethics education. Therefore, the introduction and ongoing evaluation of the "Appreciation of Ethics and Civilization" course are crucial in addressing these concerns and enhancing ethical outcomes for students in the field. This study conducted a systematic literature review, explaining the curriculum evaluation, roles of ethics and civilization, roles of "Appreciation of Ethics and Civilization" course in Engineering Education, current practices in teaching ethics and civilization in Engineering and also the challenges and opportunities for improvement.

Various curriculum evaluation models, such as Eisner’s Educational Connoisseurship and Criticism Model, Tyler’s Goal Attainment Model, the CIPP Model, Kirkpatrick's four-level model, the Logic Model, and the Countenance Model, provide valuable frameworks for assessing and improving educational programs, particularly in fields like ethics, civilization, and engineering. Eisner’s model emphasizes professional expertise in evaluating education as an art, while Tyler’s model aligns learning objectives with the needs of students, society, and subject matter. The CIPP Model takes a comprehensive approach by focusing on context, input, process, and product, ensuring that programs meet stakeholder needs and produce tangible outcomes. Kirkpatrick's model evaluates participant reactions, learning, application, and overall success, while the Logic Model maps resources, activities, outputs, and outcomes for clear understanding. The Countenance Model further adds a balanced perspective by comparing intended and observed outcomes. Together, these models highlight the importance of systematic, ongoing evaluation to foster effective, student-centred learning environments and ensure educational programs are relevant and impactful.

Ongoing curriculum evaluation is critical for engineering programs to adapt to technological advancements and societal changes. Engineering education must evolve to include new technologies, regulations, and ethical considerations, ensuring that graduates are equipped to tackle both technical and socio-political challenges. The integration of ethics into engineering education is increasingly important, with frameworks like the Ethical Reasoning Instrument (ERITM) offering structured approaches to embedding ethics throughout Science, Technology, Engineering, and Mathematics (STEM) curricula. This fosters continuous, practical ethical reasoning aligned with real-world practice. Despite challenges, such as resistance or disinterest from students, the incorporation of ethics frameworks like the National Engineering Ethics (NEE) ensures engineers are prepared for ethical complexities in their profession. Understanding history, culture, and diversity is essential for fostering collaborative, inclusive solutions, though effectively integrating ethics into technical courses remains a challenge for many instructors.

The "Appreciation of Ethics and Civilization" course plays a key role in shaping ethically aware engineering students, aligning with Malaysia's higher education objectives and National Education Philosophy. It integrates ethics with Malaysian history, culture, and society, aiming to develop critical thinking, ethical problem-solving, and communication skills for success in a globalized world. While students generally appreciate the content, challenges such as course delivery in virtual settings and perceived fairness of assessments remain. Despite these issues, the course is essential for developing ethical professionals capable of navigating moral dilemmas in their careers. It fosters social responsibility and cultural awareness, ensuring that future engineers contribute positively to society while developing both technical and moral competency.

The implementation of ethics and civilization courses in engineering programs faces significant challenges, particularly in measuring their long-term impact on students' behaviour and decision-making. Ethical principles are influenced by personal values, cultural backgrounds, and career paths, complicating the development of universal success metrics. Additionally, the perception of ethics as secondary to technical subjects and limited resources can hinder deep engagement. teaching of ethics in engineering faces significant challenges, including a lack of institutional support, the difficulty of integrating theoretical frameworks, and cultural barriers that may cause disengagement from ethics education. To address these issues, a more comprehensive approach is needed, including longitudinal studies, better integration of ethics into the core curriculum, and innovative strategies to boost student engagement. Current practices such as case studies, classroom discussions, and experiential learning are essential strategies for helping students grasp the real-world implications of their decisions. Through these methods, students gain valuable insights into the complexities engineers face when balancing technical expertise with social, ethical, and environmental considerations. Engaging with these approaches allows students to develop a deeper understanding of how engineering solutions must account for both practical functionality and broader societal impacts. Future directions should incorporate emerging technologies like virtual reality, blended learning models, gamification, and role-playing to foster critical thinking. Collaborative learning, service-learning projects, and mentorship programs can help students apply ethical principles in real-world contexts. Supporting emotional intelligence, resilience, and ethical innovation will also enhance their ability to tackle complex challenges. Continued research is essential to refine ethics curricula and ensure their relevance in light of evolving technological and societal changes.

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