Enhancing Ethical Awareness Through Reflective Journaling in a Computing Ethics Course

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Abstract: As digital technologies continue to shape society, fostering ethical awareness among computing students has become essential. However, traditional lecture-based approaches often fall short in engaging students, especially in newly introduced subjects like Ethics in Computing, where abstract concepts may seem disconnected from students' lived experiences. This action research explores the effectiveness of structured reflective journaling in enhancing students' understanding of ethics in a newly introduced Ethics in Computing subject. The study was conducted over one semester with diploma-level students in computing. Instead of weekly entries, students completed three key reflective journals, which were submitted at the beginning, middle, and end of the course. Each journal was guided by prompts designed to help students connect ethical theories and course content to real-world computing issues and personal values. Data were collected through rubric-based analysis of the three reflections and student feedback. Results show noticeable improvement in students' ethical reasoning, particularly in their ability to identify dilemmas, apply ethical frameworks, and express informed opinions. Despite initial unfamiliarity with ethical concepts, students responded positively to the structured reflection process, which encouraged deeper engagement and critical thinking. The study concludes that even with a minimal number of journal entries, reflective writing is a practical and impactful strategy for supporting ethical development in computing education, particularly in contexts where the subject is newly implemented.

Keywords: *Ethics in Computing, Reflective Journal, Ethical Awareness, Action Research, Computing Education.*

1.0 INTRODUCTION

As digital technologies continue to evolve and become more embedded in everyday life, ethical awareness among computing students has become increasingly vital. Computing professionals today face complex and often ambiguous moral and ethical dilemmas related to data privacy, algorithmic bias, intellectual property, artificial intelligence, and cybersecurity (Floridi & Taddeo, 2016; Quinn, 2020). These issues have significant implications not only for individuals but also for institutions, governments, and global society at large. Consequently, there is a growing consensus that computing education must move beyond purely technical competencies to include ethical literacy and digital responsibility (Burton et al., 2018; Boddington, 2017). In response, educational institutions around the world are integrating ethics courses into computing curricula. However, the introduction of ethics in technical programs poses pedagogical challenges. Many students struggle to engage with abstract ethical theories, perceiving them as disconnected from the practical realities of computing work (Gotterbarn et al., 2018). Traditional lecture-based delivery often limits students' ability to internalize ethical concepts or apply them meaningfully in real-world contexts. As such, fostering meaningful ethical understanding requires more than theoretical instruction; it demands critical reflection and experiential engagement (Nash & Bouchard, 2020).

Reflective journaling, as an educational strategy, encourages students to contemplate their own experiences, beliefs, and responsibilities, fostering moral reasoning through introspection (Rogers,

2001). In computing education, this practice has been shown to bridge the gap between theoretical ethics and real-world application, promoting deeper understanding and critical thinking (Goldman & Wayland, 2002; Davis & Koepfler, 2022). Structured reflection activities help students articulate their evolving ethical perspectives and recognize the social implications of their technical decisions. Furthermore, tools like the Critical Reflection and Agency in Computing Index highlight how reflection fosters ethical competence and agency, which refers to the ability to act intentionally and ethically in real-world situations (Bandura, 2001; Mann, 2024). When guided by reflective frameworks, students are more likely to shift from passive rule-following to active ethical reasoning, which is critical for future computing professionals.

The introduction of the Ethics in Computing course at Sultan Abdul Halim Mu'adzam Shah Polytechnic (POLIMAS) represented the first formal initiative by the Department of Polytechnic and Community College Education to engage diploma-level computing students with critical ethical issues in the field. Early classroom observations revealed that many students perceived ethics as abstract and rule-based, lacking personal relevance to their academic and career goals. This gap in ethical understanding is particularly concerning given the increasing expectations placed on technologists to make socially responsible decisions. To address this challenge, there is a pressing need for pedagogical approaches that not only deliver ethics content but also cultivate personal reflection and critical reasoning. Reflective journaling offers a promising solution by enabling students to relate theoretical knowledge to personal and professional contexts. It fosters the development of ethical awareness, moral sensitivity, and digital citizenship, all of which are essential skills in today's technology-driven landscape.

This action research investigates the effectiveness of using structured reflective journaling as a tool to enhance ethical reasoning and awareness among diploma-level students enrolled in the newly introduced Ethics in Computing course. By capturing students' ethical thinking at three key points in the semester, specifically at the beginning, middle, and end of the course, the study seeks to evaluate how reflective practice can foster ethical growth, engagement, and professional identity in a computing education context.

2.0 LITERATURE REVIEW

As part of efforts to align computing education with global ethical standards and to produce responsible digital citizens, the Ethics in Computing course (DFC30333) was introduced at POLIMAS under the Department of Information and Communication Technology (JTMK). This course was developed in response to the growing demand for computing professionals who are not only technically proficient but also ethically conscious in their decision-making. The course provides students with the knowledge of the philosophical bases for computer ethics and social issues, including the reliability and safety of computer systems, protection of software and other intellectual property, privacy, and information-

related concerns. It also introduces strategies for evaluating the impact and control of computer technology. Upon completion, students are expected to be able to apply professional codes of ethics in real-world computing environments.

This initiative also supports the strategic direction outlined in the Polytechnic transformation roadmap 2023–2030, which emphasizes the development of holistic, ethically grounded, and digitally competent graduates. In particular, the course aligns with national efforts to cultivate digital citizenship, critical thinking, and ethical responsibility among TVET learners. The Polytechnic Transformation agenda calls for a shift beyond technical mastery to include values-based education that prepares students to act as ethical professionals in a technology-driven society (Department of Polytechnic and Community College Education, 2023).

However, given that the subject is newly introduced and most students come from technically oriented backgrounds, many enter the course with little to no formal exposure to ethical theory, critical reflection, or structured ethical reasoning. Initial classroom observations revealed that students tend to approach ethical content with a rule-following mindset, often viewing it as theoretical or irrelevant to their future roles. Few have considered the ethical implications of their actions in digital environments, nor have they engaged with moral dilemmas in a structured academic setting. This presents a significant pedagogical challenge regarding how educators can shift students from a basic understanding of compliance and regulation to a more reflective, value-driven, and internalized sense of ethical responsibility.

In addressing this challenge, reflective practice has gained attention as a powerful pedagogical strategy in ethics education. Reflection enables learners to engage deeply with course content, linking theoretical frameworks to personal beliefs and lived experiences. It promotes active meaning-making, encourages critical evaluation of ethical issues, and helps students articulate their evolving moral perspectives. Among the range of reflective strategies available, structured reflective journaling has emerged as a particularly effective tool. It allows students to process complex ethical scenarios at their own pace, enhances metacognitive awareness, and fosters critical thinking and ethical decision-making (Rogers, 2001; Goldman & Wayland, 2002). In particular, the Critical Reflection and Agency in Computing Index developed by Mann (2024) emphasizes the importance of nurturing ethical agency, which is defined as the ability to act intentionally and responsibly in morally complex computing contexts (Bandura, 2001).

This action research responds to these contextual needs by implementing and evaluating a structured reflective journaling intervention across three key points in the semester: Pre, Mid, and Final. These journal entries were strategically aligned with core syllabus topics to guide students' ethical thinking as they progressed through the course. By positioning journaling as both a learning and assessment tool, the study aims to investigate the extent to which structured reflection can support the development of ethical awareness, reasoning, and professional identity among first-time learners of this subject. This

approach not only supports the intended learning outcomes of the course but also contributes to broader educational goals outlined in the national polytechnic transformation framework, particularly the cultivation of lifelong learning, values-based education, and ethical digital citizenship in the context of 21st-century TVET (Department of Polytechnic and Community College Education, 2023).

3.0 METHODOLOGY

This action research aims to explore how structured reflective journaling can enhance ethical awareness among diploma-level computing students, incorporating both quantitative analysis of rubric scores and qualitative insights from student feedback. Action research is particularly suited for educational settings where the goal is both to improve practice and to investigate the effectiveness of interventions in real-time classroom environments (Stringer, 2007). The following subsections describe the action research model employed, the intervention design, and the methods used for data collection and analysis.

3.1 Action Research Model

This study adopts the action research cycle model proposed by Stringer (2007), which comprises three core phases, namely look, think, and act. This research was conducted over one semester and involved 22 diploma-level students enrolled in the Ethics in Computing course at POLIMAS. Basically, there are three phases in this cycle, namely look, think, and act (Figure 1). During the first look phase, researchers engage in active observation and data collection to gain a comprehensive understanding of the problem or issue under investigation. Next phase, which is think dedicate the researcher's attention to analysing and reflecting upon the data collected in the previous look phase. Lastly, the act phase moves from analysis and reflection to taking concrete action based on their findings. This phase involves devising and implementing interventions or strategies aimed at addressing the identified problem.

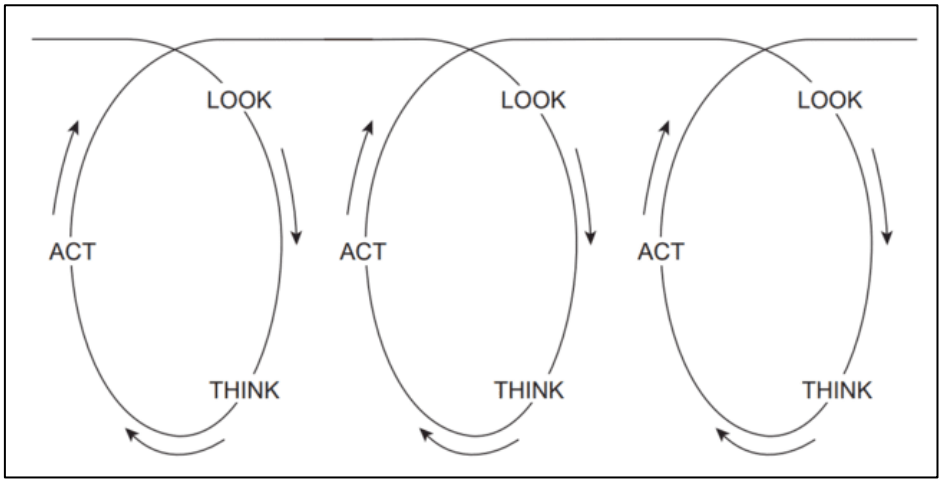

Figure 1: Action Research Cycle Model Adapted from Stringer (2007)

3.11 Look Phase (Problem Identification)

The initial phase focused on identifying the core issue. Preliminary observation and informal discussion revealed that students struggled to relate abstract ethical concepts to real-world computing issues. Many viewed ethics as rule-based and external, rather than as a personal responsibility integral to their professional identity. These insights guided the formulation of the research focus which was improving ethical reasoning through reflective practice.

3.12 Think Phase (Data Collection and Analysis)

Data were collected from three structured reflective journals submitted at key points in the semester: Week 1 (Pre), Week 5 (Mid), and Week 14 (Final). Each journal was guided by prompts linked to the course syllabus, encouraging students to apply ethical frameworks and articulate their evolving perspectives. Journal entries were evaluated using a 4-point rubric based on five criteria which were relevance to the prompt, use of ethical concepts, depth of reflection, connection to course content and expression of personal values.

3.13 Act Phase (Implementation and Reflection)

The intervention consisted of structured reflective journaling, integrated into the course as both a learning and assessment tool. The pre-journal captured students' initial understanding. The Mid journal was used to gauge progress in applying course content. The final journal served as a summative reflection, allowing students to demonstrate their ethical growth. The researcher provided minimal feedback to encourage authentic student voice. Rubric scores and selected qualitative excerpts were analysed to assess growth in ethical reasoning and awareness. Results informed both instructional adjustments and recommendations for future course offerings.

3.2 Intervention

The intervention employed in this action research was the use of structured reflective journaling, strategically integrated into the Ethics in Computing course. As this course was newly introduced and students had limited prior exposure to ethical theory, reflective journaling was selected to guide learners in connecting ethical concepts to their values, experiences, and real-world computing practices. The intervention was implemented at three key points in the semester, namely the beginning, middle, and end. Each stage was aligned with the progression of the syllabus topics.

To initiate the process, an orientation session was conducted in the first week of class to introduce the purpose and expectations of reflective journaling. Students were briefed on how journaling could support their ethical reasoning and personal engagement with the subject matter. During this session,

examples of reflective writing and rubric assessment criteria were shared to establish clear standards. The goal was to help students see journaling not just as an assignment, but as a self-exploration tool that supports their identity as ethical digital citizens.

Each reflection was guided by structured prompts aligned with course themes. For instance, the Pre-reflection asked students to define what ethics in computing meant to them and identify ethical concerns they had observed in real life. The Mid-reflection focused on applying ethical theories and codes to case-based scenarios such as software piracy or data misuse. The Final reflection invited students to evaluate how their ethical understanding had evolved and how it might influence their future behaviour as computing professionals.

Students submitted their responses via a digital form (Google Form), and each entry was assessed using a rubric with five key dimensions: relevance to prompt, use of ethical concepts, depth of reflection, connection to course content, and articulation of personal values. The structured approach encouraged students to think critically and independently while fostering a deeper engagement with the course material. This intervention aimed not only to improve students' academic performance in ethics but also to instil lifelong habits of ethical reflection, which are essential for their future roles in technology development and participation in digital society.

4.0 DATA ANALYSIS AND FINDINGS

This section presents the key findings from the implementation of the action research conducted within the Ethics in Computing course. The research utilized a mixed-method approach to evaluate the effectiveness of the intervention in addressing the identified problem of students' initial lack of engagement with ethical reasoning in a newly introduced subject. Quantitative data were obtained from the analysis of Pre, Mid, and Final reflection scores using a standardized rubric, allowing for measurable comparisons of students' progression over time. In parallel, qualitative insights were drawn from students' reflective journal entries, which provided a deeper understanding of how students engaged with ethical concepts, internalized course content, and developed their moral reasoning.

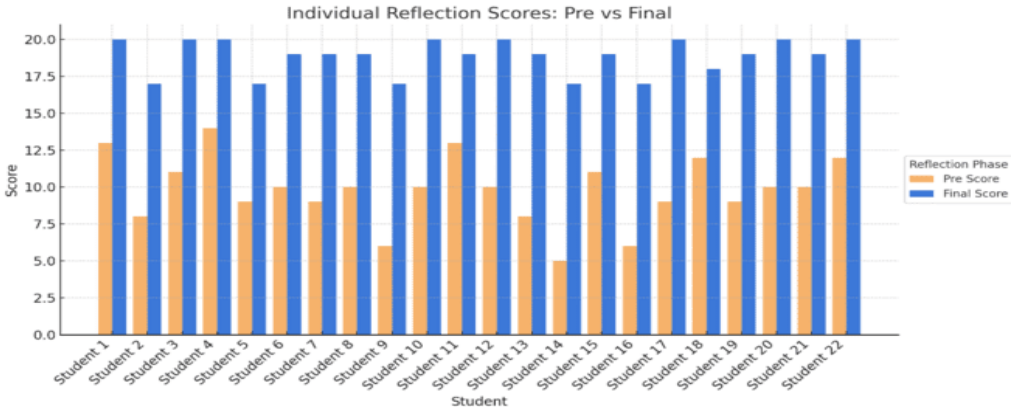

Figure 2: Individual Reflection Score

The chart above, as shown in Figure 2, illustrates the individual progression of students' scores from the Pre to the Final reflection. A consistent upward trend is evident across all 22 students, with each demonstrating measurable improvement in their reflective writing and ethical reasoning. Notably, students who began with lower Pre scores, such as Student 14 and Student 9, exhibited some of the most significant gains, improving by over 200% in some cases. Meanwhile, students who started at a moderate level also achieved full or near-full scores in the Final reflection, showing that growth was not limited to initially low-performing students. This individual-level data reinforces the effectiveness of the structured reflective journaling intervention, which provides students with opportunities to internalize ethical concepts and apply them critically across the semester. The widespread increase in scores indicates that the intervention was inclusive and impactful for students at varying levels of initial ability, fostering a more consistent and mature engagement with ethical reflection by the end of the course.

Furthermore, the students' reflection scores were classified into three performance levels to evaluate the quality of their ethical reasoning and depth of reflection. Scores ranging from 20 to 18 were categorized as *Excellent*, indicating strong articulation of ethical understanding and personal insight. Scores between 17 and 14 were classified as *Good*, reflecting competent engagement with the reflection prompts and ethical content. Scores of 13 and below were placed in the *Basic* category, suggesting limited depth, minimal application of ethical concepts, or surface-level responses. This classification provided a clear framework for analysing individual and overall growth throughout the intervention.

Next, Figure 3 shows the performance level distribution across the Pre, Mid, and Final reflections, revealing a clear trajectory of growth in students' ethical reasoning and reflective engagement throughout the Ethics in Computing course. In the Pre-Reflection, the majority of students (21 out of 22) were categorized at the *Basic* level, indicating limited initial understanding of ethical concepts and minimal ability to connect theoretical knowledge to personal or professional contexts. Only one student reached the *Good* level, and none were classified as *Excellent*, reflecting the cohort's unfamiliarity with structured ethical reflection at the start of the semester.

By the mid-Reflection, noticeable improvement was observed. The number of students achieving the *Good* level increased to 14, while those in the *Basic* category dropped to 8. This shift suggests that the reflective journaling intervention began to take effect, enabling students to apply ethical theories more confidently and to engage more thoughtfully with the ethical dimensions of real-world computing issues.

The Final Reflection phase marked the most substantial transformation. A total of 15 students were assessed at the *Excellent* level, with the remaining 7 classified as *Good*. Importantly, no students remained in the *Basic* category. This significant shift illustrates not only the impact of sustained reflective practice but also the development of higher-order ethical reasoning and the internalization of key ethical principles. Students demonstrated greater depth in their analysis, clarity in applying ethical

frameworks, and a more mature articulation of their personal and professional values. Taken together, these results provide compelling evidence of the effectiveness of structured reflective journaling in fostering ethical awareness, critical thinking, and value-driven decision-making among diploma-level computing students.

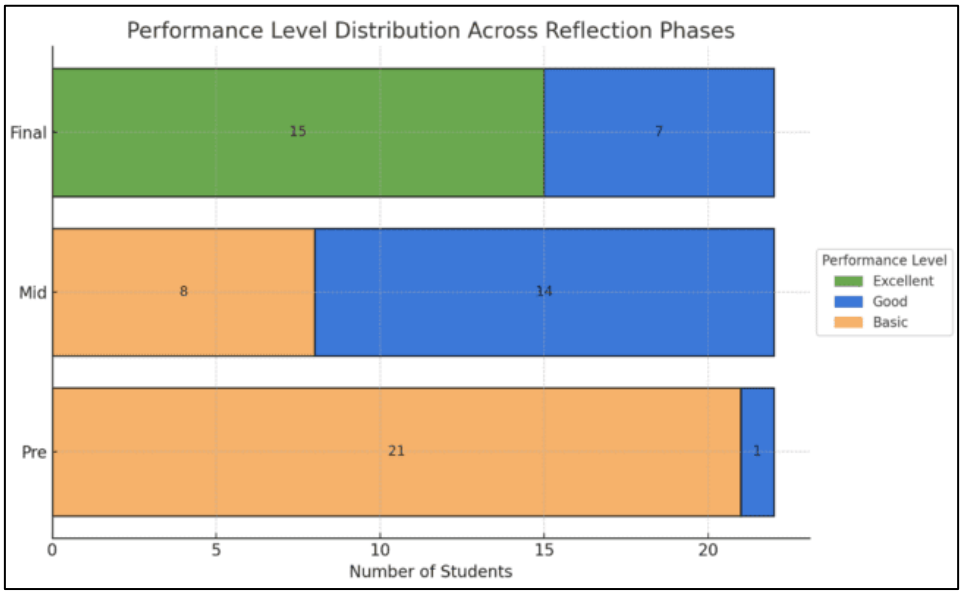

Figure 3: Performance Level Distribution Across Reflection Phases

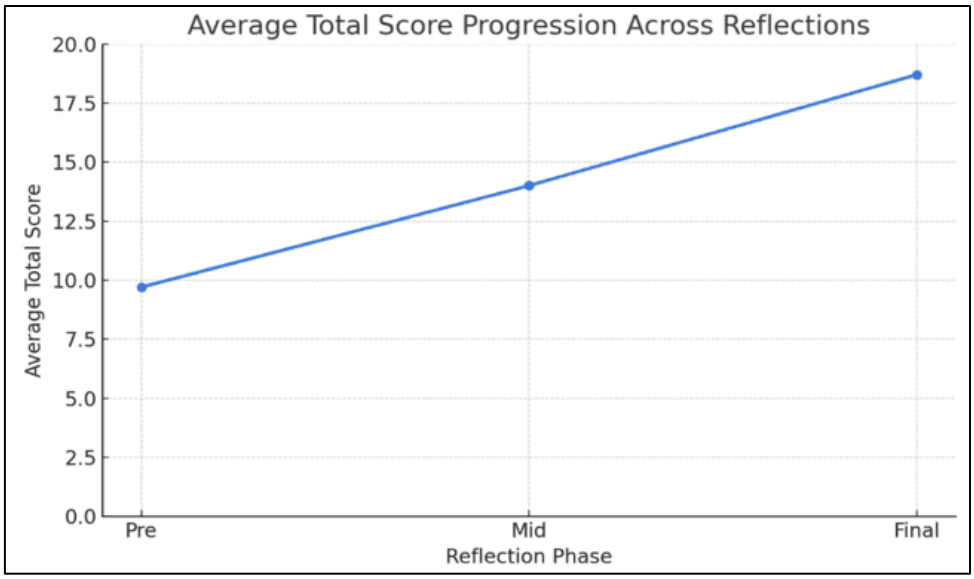

Figure 4: Average Total Score Progression Across Reflections

The line chart, as shown in Figure 4, illustrates the progression of students' average total scores across the three reflection phases of Pre, Mid, and Final. At the Pre-Reflection stage, the average score was relatively low at 9.7, reflecting students' limited initial understanding of ethical concepts and reflective practice. A notable improvement is observed during the Mid-Reflection, where the average

increased to 14.0, indicating growing familiarity with ethical reasoning and greater engagement with the journaling prompts. The most significant growth occurred by the Final Reflection, with the average score rising to 18.7, placing the overall class performance within the *Excellent* range. This upward trend confirms a positive impact of the reflective journaling intervention, suggesting that students progressively developed deeper insights, stronger ethical reasoning, and greater confidence in articulating their values. The consistent improvement across all three phases provides strong evidence of the effectiveness of the intervention in supporting meaningful learning and ethical growth.

In addition to the rubric-based scores, this action research also analysed students' responses from the same reflective journals to explore their ethical reasoning, awareness, and personal growth through qualitative analysis. These qualitative excerpts from the students' reflective journals provide insight into their ethical development and further support the quantitative findings. For example, Student 3 reflected, *"I thought ethics in computing was just about avoiding illegal stuff, but now I see it's also about responsibility and impact on others."* The student demonstrates recognition that ethical computing involves considering how one's actions affect users, communities, and society. Another student 7 remarked, *"My understanding of ethics in computing has expanded. At first, I only knew that ethics was about doing good, but now I know it's about protecting privacy, respecting users, and following digital laws."* This quote reflects a clear shift from a general view of ethics to a more applied understanding, showing the student's growing ability to relate ethical principles to real-world computing responsibilities.

Next excerpts related to awareness of critical issues as Student 3 stated, *"The ethical issue that concerns me most is privacy, because if it's not protected, people's personal lives can be exposed without consent*". This response demonstrates the student's awareness of data privacy as a critical ethical concern in computing. It reflects an understanding of the potential harm caused by irresponsible data handling, showing the student's ability to recognize real-world implications of ethical lapses in digital environments. Another student 8 added the concern about "*The misuse of artificial intelligence, especially in education and healthcare".* This response highlights the student's growing concern about AI misuse in sensitive domains, suggesting an awareness of how emerging technologies can impact human well-being and the need for ethical oversight. It reflects an understanding of the broader societal consequences of unethical computing practices.

Finally, the reflections highlight students' emerging awareness of professional responsibility and their developing capacity for ethical decision-making within computing contexts. As student 7 stated, *"Be a responsible person and have ethical decision-making when developing systems."* This quote reflects the student's growing sense of professional responsibility, indicating an awareness that ethical considerations must be integrated into technical decision-making. It shows a shift toward internalizing ethical values as part of their identity as a future computing professional. Subsequently, Student 5 expressed, *"Maybe I do think about the consequences that may happen if I do wrong."* Although

tentative in tone, this statement suggests an emerging moral awareness, where the student is beginning to reflect on the potential outcomes of their actions. It marks a step toward ethical sensitivity and self-regulation, key aspects of ethical growth in professional practice.

In summary, both the quantitative and qualitative findings demonstrate a clear progression in students' ethical reasoning, awareness, and reflective depth throughout the Ethics in Computing course. The structured reflective journaling intervention proved effective in supporting this development, as evidenced by improved rubric scores and student reflections that revealed deeper understanding, concern for real-world ethical issues, and a growing sense of professional responsibility. These findings suggest that reflective practice can play a meaningful role in ethics education, particularly for first-time learners. The next chapter will discuss these results about existing literature and implications for future teaching practice.

5.0 DISCUSSION AND CONCLUSIONS

In this section, the results are discussed in light of the research objectives and relevant literature, followed by the conclusion of the study. In findings, the quantitative results indicate that students experienced significant improvement across all three stages of reflection. The increase in average scores from 9.7 in the Pre-Reflection to 14.0 in the Mid-Reflection and finally to 18.7 in the Final Reflection reflects a steady trajectory of growth in students' ability to articulate and apply ethical concepts. These results support prior research emphasizing the value of reflection in cultivating higher-order thinking and ethical decision-making in computing education (Goldman & Wayland, 2002; Boud, Keogh, & Walker, 1985).

The classification of scores into performance levels further highlights the impact of the intervention. At the start, nearly all students were categorized as *Basic*, revealing a limited grasp of ethical issues. However, by the Final Reflection, none remained at this level; instead, the majority (15 out of 22) reached the *Excellent* category, with the rest achieving *Good*. This shift demonstrates the effectiveness of reflective journaling in helping students transition from rule-based understanding to more nuanced, principled ethical reasoning (Rogers, 2001).

The qualitative data corroborate and enrich the quantitative findings by revealing students' growing conceptual understanding and critical thinking. Their reflections indicated a shift in perception moving beyond viewing ethics solely as adherence to laws or rules, toward understanding it as a matter of social responsibility and accountability. Many students demonstrated an increasing awareness of the importance of protecting user privacy, respecting individuals in digital spaces, and upholding ethical standards in real-world computing contexts (Bandura, 2001). Moreover, students demonstrated awareness of real-world ethical issues such as data privacy and AI misuse, aligning with global concerns in the digital landscape. Their reflections also revealed a developing sense of professional responsibility and moral sensitivity, which are vital for future practitioners in the computing field. This aligns with

Bandura's (2001) concept of ethical agency, where individuals not only understand ethical standards but also take responsibility for upholding them.

These results also resonate with the goals outlined in the *Polytechnic transformation roadmap 2023–2030* (Department of Polytechnic and Community College Education, 2023), which emphasizes the need to produce digitally competent and ethically responsible graduates. The improvement seen in students' ethical thinking through journaling aligns with the vision of producing holistic, reflective professionals who are prepared to navigate ethical challenges in a technology-driven world. Therefore, this study contributes to the growing body of evidence supporting reflective practice as a key pedagogical strategy in ethics education, particularly within technical and computing disciplines. By integrating structured reflective journaling into a newly introduced Ethics in Computing course, the intervention successfully enhanced students' ethical reasoning, critical reflection, and awareness of real-world digital dilemmas.

Future research could build on this foundation by combining reflective journaling with collaborative strategies such as peer dialogue, digital storytelling, or e-portfolio assessments to further deepen ethical learning and foster peer-supported ethical discourse. Additionally, longitudinal studies could explore whether such interventions have lasting effects on students' ethical decision-making beyond the classroom. As it stands, this study offers a practical and adaptable model for educators aiming to cultivate ethical competence, digital responsibility, and moral agency in technical education settings. It highlights the potential of reflection-based interventions to go beyond compliance-based teaching and instead promote thoughtful, self-aware, and socially responsible computing professionals.

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