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AI in Education: Shaping the Future of Teaching and Learning

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Abstract

This study examines the impactful incorporation of Artificial Intelligence (AI) in higher education, emphasizing its ability to improve teaching methods, simplify administration, and facilitate individualized learning. By analyzing literature and assessing case studies, this study demonstrates how AI promotes creativity, enhances critical thinking, and provides personalized learning experiences. Moreover, AI streamlines repetitive tasks like scheduling and communication, allowing educators to concentrate on impactful student interaction and instructional creativity. Nonetheless, the research also highlights significant challenges, including ethical worries regarding data privacy and algorithmic bias, issues of equity such as the digital divide, and the dangers of reduced human interaction. Tackling these challenges necessitates careful design and teamwork to guarantee that the incorporation of AI is in harmony with educational principles. The results indicate that, if applied thoughtfully, AI has the potential to transform higher education into a more adaptive, inclusive, and effective system, aligning technological advancements with the fundamental goal of promoting fair and significant learning opportunities.

Keywords: Artificial intelligence, Educational technologies, Emulating human-like processes, Human-like thinking

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Introduction

The concept of creating artificial Intelligence—constructing beings with human-like intellect—is often portrayed in contemporary discussions as cutting-edge and trendy. However, its roots can be linked to ancient Greek civilization, where it evoked a mixture of awe and dread. This fascination has been highlighted in many literary works, such as Gustav Meyrink's (1915) The Golem and Mary Shelley's pioneering novel Frankenstein (1818). As an established academic discipline, Artificial Intelligence (AI) has existed for approximately 68 years, evolving through different levels of respect. Initially seen as an unrealistic scholarly pursuit (Sheikh, Prins, & Schrijvers, 2023; Genin & Grote, 2021), AI has later been both excessively praised and underestimated concerning its capabilities (Koseler & Stephan, 2017). Even with extensive research, the region does not have a commonly accepted definition of AI, as various interpretations reflect the diverse opinions and objectives within the field.

The origins of Artificial Intelligence (AI) trace back to 1956, when John McCarthy introduced the term, building upon the foundational work of Alan Turing (1950) in computational theory. McCarthy's (1955) groundbreaking definition of AI as "the science and engineering of creating intelligent machines" supports its transformative uses in higher education. Artificial Intelligence encompasses tailored learning, automated administration, and advanced data analysis for research. Turing's (1950) groundbreaking investigations into intelligent reasoning and the potential for machines to mimic human-like thinking established the foundation for this domain. Combined, Turing's theoretical insights and McCarthy's formal definition are crucial for comprehending AI's changing significance across industries, highlighting continuous technological progress.

McCarthy's definition, considered one of the most lasting interpretations, highlights Intelligence as the capability of machines to execute tasks generally linked to intelligent entities, including humans and various non-human animals. Turing, a British mathematician and logician, conducted pioneering research on intelligent reasoning, investigating if machines could mimic human cognitive functions. Since its official start in 1956, the definition of AI has changed with the swift progress in the domain. In this discussion, AI is defined according to the Oxford English Dictionary as the method through which computers or machines display or mimic intelligent behavior, along with the field of study focused on this phenomenon.

In contemporary terms, AI is defined as "computing systems capable of emulating human-like processes, including learning, adaptation, synthesis, self-correction, and sophisticated data processing" (Popenci and Kerr, 2017, p. 2) and underscoring the breadth and depth of AI's capabilities in today's context. This definition encompasses the capacity of digital computers or computer-controlled robots to perform tasks typically associated with intelligent beings. AI's scope extends to crafting systems with intellectual processes akin to humans, enabling reasoning, discerning meaning, generalizing, and learning from past experiences. While computers have demonstrated proficiency in conducting complex tasks, such as discovering mathematical theorems or excelling in games like chess, a complete emulation of human flexibility across extensive domains or tasks requiring extensive everyday knowledge remains an ongoing challenge. Nonetheless, specific AI programs have achieved performance levels that are on par with those of human experts and professionals in particular domains (Pan et al., 2024; Sun & Yaho, 2024).

Problem Statement

The swift incorporation of Artificial Intelligence (AI) into educational frameworks signifies a transformative change in teaching and learning models (Vincent-Lancrin & Van der Vlies, 2020). However, this integration highlights a complicated web of challenges and unanswered questions. At the forefront is AI's dual-edged influence: it provides unique opportunities for tailored education and teaching innovation yet simultaneously presents significant ethical, equity, and accessibility challenges (Li & Jan, 2023). Instructors find themselves at a pivotal moment, needing to transition into roles as facilitators and mentors in an AI-driven learning setting but frequently lacking the necessary support or structure to do so successfully (Abulibdeh et al., 2024). Additionally, the potential of AI to improve student engagement and learning results is challenged by worries regarding data privacy, the digital divide, and the possible decline of essential human interaction in education (Southworth et al., 2023). The issue, consequently, focuses on closing the divide between AI's technological progress and the educational, moral, and accessibility challenges it brings, making sure that AI's incorporation into education improves rather than diminishes the learning experience.

Purpose of the Study

The rapid integration of Artificial Intelligence (AI) into education offers transformative benefits such as personalized learning and pedagogical innovation (Holmes et al., 2019; Bates et al., 2020; Luckin et al., 2021). However, it also raises ethical concerns over data privacy and algorithmic bias, as well as equity issues that exacerbate digital divides and marginalize vulnerable populations (Eynon & Malmberg, 2021).

AI's reliance on sensitive data and potential for biased algorithms risk perpetuating inequality, while digital divides in underfunded schools limit access to its benefits (Nguyen et al., 2023; Slimi & Carballido, 2023). Educators also face evolving roles without adequate training or support (Luckin et al., 2021), and the growing dependence on AI threatens meaningful student engagement (Williamson, 2020). Thus, collaborative action is urgently needed to address these challenges by prioritizing ethical design, equitable access, and robust training to ensure AI enhances the educational experience.

Method

This study takes a nuanced approach to examining the impact of Artificial Intelligence (AI) on education through a comprehensive conceptual analysis. Grounded in a selective literature review, focus on AI's transformative potential across pedagogical strategies, educator roles, and student learning experiences. This exploration draws on a range of scholarly articles and reports to uncover AI's diverse applications in educational contexts, pinpointing both innovative opportunities and significant challenges, particularly in terms of access and equity. The study integrates illustrative case studies carefully constructed from literature-derived insights to bridge theoretical insights with practical realities. These scenarios are designed to vividly demonstrate AI's practical applications in educational settings, shedding light on potential innovations as well as foreseeable hurdles. They serve not only to ground the theoretical discussion in tangible examples but also to provoke thought on the

pragmatic aspects of AI implementation in education.

Thus, the methodology aims to enrich the academic conversation on AI in education, offering a balanced view that highlights AI's capacity to innovate alongside the critical considerations it necessitates. By weaving together targeted literature review findings with hypothetical application scenarios, the study provides a comprehensive picture of AI's role in shaping the future of educational practices, aiming to inform ongoing debate and guide future research and application strategies in the field. Additionally, the approach facilitates a dialogue between abstract concepts and their practical manifestations, contributing to both academic discourse and the strategic integration of AI in educational practices.

Results

The following section explores the findings derived from a thorough exploration of AI's role in higher education, presenting insights that trace its historical evolution, current applications, and associated challenges. By examining both theoretical frameworks and practical implementations, this analysis seeks to provide a nuanced understanding of AI's transformative potential within the academic landscape. Through this lens, the results illuminate key milestones, highlight innovative applications, and underscore critical considerations for AI's integration into educational practices.

Historical Perspectives on AI in Higher Education

A clear understanding of the historical context of AI in higher education offers invaluable insights into its evolution and eminent impact on the educational sector. The annals of AI in higher education trace its origins, seminal moments, and significant milestones. The integration of AI in higher education has seen a rapid ascent in recent years, reflecting broader technological advancements. A systematic review by Crompton and Burke (2023) provides a comprehensive overview of AI in education research, indicating an expanding geographical and disciplinary scope. This evolution underscores AI's potential to cater to a wide range of users within the educational ecosystem, offering diverse applications from administrative support to personalized learning experiences (Crompton & Burke, 2023).

The application of AI in higher education has transitioned from theoretical explorations to practical applications, significantly affecting the various components of teaching, learning, and administrative functions. Vanderbilt's (2012) insights into the evolution of Massive Open Online Courses (MOOCs) highlight AI's capacity to revolutionize access to education. Vanderbilt lays a foundation for discussion on transitioning from traditional educational delivery methods to interactive, problem-solving-oriented online courses, expanding educational opportunities beyond conventional classroom settings. The contemporary landscape of AI in higher education is characterized by a myriad of tools designed to support administrative and academic processes. AI applications now extend to data analysis for recruitment and retention, adaptive learning systems for personalized education, automated grading, and research assistance. These tools streamline operations and enhance the educational experience by providing tailored learning paths and insights (Inside Higher Ed, 2021).

However, considering AI in higher education is not without fierce challenges. Areas in ethical considerations, defined potentials for adverse outcomes, and legal concerns regarding privacy and data protection are critical factors that institutions must navigate. The assumed effectiveness of AI systems is hinged on the judicious interpretation of their outputs and the thoughtful implementation of their insights. Moreover, when coupled with the risk of reinforcing existing biases or creating new ones, the complex nature of AI algorithms underscores the need for transparency and accountability in their deployment (EDUCAUSE Review, 2020). The historical evolution of AI in higher education reveals a narrative of transformative potential tempered by caution. As institutions continue to embrace AI, they must address ethical (Siau & Wang, 2020; Kirpichnikov et al., 2020; Renda, 2019), legal (Dwivedi, 2021), and operational challenges to harness its full potential responsibly (Buhmann and Fieseler 2021). The journey of AI in higher education is a testament to the dynamic interplay between technological innovation and educational practice, promising a future where education is more accessible, personalized, and efficient.

Early Theoretical Foundations

As a keen contributor, Sidney Pressey is credited for his creativity in developing one of the maiden teaching machines in the early 1920s. His invention was purposed to administer multiple-choice questions to students, with the ability to provide immediate feedback upon answering. Pressey's machine was a precursor to computer-based learning, highlighting the potential for automated systems to support educational processes. These early theoretical foundations have profoundly influenced the trajectory of AI in higher education. Over the decades, the principles identified by Skinner and Pressey paved the way for the development of purposeful AI technologies. The genesis of Artificial Intelligence (AI) in education, in general, is deeply rooted within theoretical frameworks established by luminaries like B.F. Skinner (1958) and Sidney Pressey (1926). These early endeavors aimed at integrating mechanized methods into educational practices set the stage for the subsequent development of AI in learning environments. Skinner (1958), a prominent figure in behavioral psychology, introduced the concept of programmed instruction in the mid-20th century. Skinner emphasized using machines for educational purposes, proposing a method where subjects could learn at their own pace through a series of incremental steps.

These early theoretical foundations have profoundly influenced the trajectory of AI in higher education. As Skinner's (1958) and Pressey's (1926) teaching principles were embraced, they paved the way for developing sophisticated AI technologies. These technologies can deliver personalized learning experiences, adapt to individual learner needs, and evoke real-time feedback - among other functionalities. When successfully implemented, real-time feedback is specific to highlight a long-standing commitment to leveraging technology and thus improve educational achievements. With ongoing advancements in AI, these contributions exemplify the persistent pursuit of inventive methods in education and instruction.

An Embrace of Intelligent Tutoring Systems

The deployment of Intelligent Tutoring Systems (ITS) represents a significant transformation in higher education. In the utilization of capabilities of artificial Intelligence (AI), these systems offer highly personalized learning

experiences, adjusting dynamically to the distinct needs and learning preferences of each student (Ciolacu et al., 2018). ITS employs sophisticated data-driven algorithms to replicate the detailed dynamics of personal tutoring interactions, providing students with customized support directly relevant to their educational challenges and goals.

In the higher education environment, the adoption of ITS introduces numerous advantages. These systems are adept at handling intricate topics, making them applicable across various subjects and courses available at colleges and universities. They provide scalable solutions for personalized education, addressing the diverse needs of a large student population while maintaining a high standard of instruction. ITS could analyze detailed data on student performance, identify areas of concern, and adjust the pedagogical approach based on student abilities. This level of customization of teaching enhances student engagement while facilitating a profound understanding and contributing to improved academic outcomes.

The architecture of ITS includes several critical elements such as a knowledge base, which houses the content to be taught; a student model, which continuously updates to reflect the learner's understanding, misconceptions, and progress; a tutoring model, which adapts instructional strategies based on the student model; and a user interface, which enables interaction between the learner and the system (Nwana, 1990; Woolf, 2009). The flexibility offered within the ITS structure allows the possibility for a personalized learning experience that mimics the benefits of one-on-one tutoring within a digital environment. Research has demonstrated the effectiveness of ITS in improving student learning outcomes across a variety of subjects. A VanLehn (2011) meta-analysis study found that it can be as effective as human tutoring in specific contexts, highlighting their potential to augment traditional educational approaches.

Evolving Role of Instructors in the AI-Infused Classrooms

College instructors have transformed themselves from simple transmitters of information to designers of customized learning experiences. Incorporating AI into their teaching methods has significantly altered the conventional roles of course instructors, particularly in settings where AI-based tools and platforms are adopted. In the realm of AI-enhanced education, the instructor's role goes beyond traditional delivery, evolving into a multifaceted position that requires instructional skill, technological knowledge, and flexible teaching approaches (Luckin et al., 2022).

In the new framework, educators are seen as facilitators of learning experiences, utilizing AI technologies to tailor teaching methods and meet each student's needs, abilities, and learning styles. Zawacki-Richter et al. (2019) underscore the transformative possibilities of AI in customizing educational experiences, stressing the need to prepare course instructors to handle the difficulties of efficiently incorporating AI tools. Furthermore, faculty need to gain expertise in analyzing data from AI platforms since these technologies frequently produce large datasets regarding student performance and engagement. This analytical method enables educators to make knowledgeable choices, fostering and pushing students while identifying areas needing intervention and chances for additional enrichment (Holmes et al., 2019).

Moreover, course instructors need to serve as intermediaries between AI tools and learners, guaranteeing the ethical and efficient application of these technologies. By doing this, educators preserve the vital equilibrium between the efficiency of technology and the fundamental human aspects of teaching. As AI emerges in educational environments, the necessity for continuous professional growth has become increasingly essential (Luckin et al., 2022; Zawacki-Richter et al., 2019; Holmes et al., 2019). Academic instructors need to consistently evolve by developing skills that smoothly incorporate AI into teaching methods, maintaining their proficiency in an AI-augmented learning environment.

AI as a Teaching Assistant

Within the context of college education, the role of graduate teaching assistants (TAs) in delivering undergraduate coursework has evolved significantly with the integration of AI as a pedagogical aid. This advancement enriches the instructional capabilities of graduate TAs and reshapes the traditional dynamics of undergraduate teaching. AI provides practical solutions by automating tasks like grading, course management, and addressing routine inquiries, allowing TAs to focus on dynamic class discussions, individualized feedback, and mentorship. This integration enhances both the teaching experience for TAs and the academic journey for undergraduate students (Bhutoria, 2022; Chen et al., 2020).

By incorporating AI tools into their pedagogical strategies, graduate students can create responsive and adaptive educational environments. AI's ability to analyze student performance data supports a nuanced understanding of learners' progress, enabling TAs to tailor instruction to meet diverse needs effectively. Such strategic applications elevate the quality of teaching, particularly in large undergraduate classes where students' backgrounds and learning styles vary widely (Tapalova & Zhiyenbayeva, 2022; Abulibdeh et al., 2024).

AI-driven adaptive learning platforms help scale personalized learning experiences by delivering customized content aligned with students' pace and interests, fostering engagement and comprehension. Moreover, AI aids graduate TAs in balancing teaching and research responsibilities by integrating current research into coursework and offering analytical tools for academic productivity (Vincent-Lancrin & Van der Vlies, 2020). The thoughtful implementation ensures that AI complements the human touch, which is critical to effective teaching, refining education to become more streamlined and tailored to evolving academic demands. For instance, Luckin et al. (2022) emphasize that AI serves as a "pedagogical partner," analyzing student learning behaviors to enhance personalization while preserving the centrality of educators. Additionally, Zawacki-Richter et al. (2019) highlight similar advancements, describing how intelligent tutoring systems and data-driven insights enable institutions to deliver personalized education while addressing ethical and accessibility challenges. This integration cultivates an educational atmosphere that is flexible, inclusive, and geared toward student success (George & Wooden, 2023; Qadir, 2023).

Integrating AI as a teaching assistant in higher education offers unparalleled opportunities to personalize learning experiences and enhance teaching effectiveness. A compelling example is illustrated in the case of a medium-sized university (*Case Study 1*) that implemented AI-driven analytics platforms to tailor instruction for

undergraduate students. By analyzing diverse data points such as engagement metrics, assessment outcomes, and discussion participation, the university transformed its instructional framework to align more closely with individual learning needs and preferences.

Case Study 1: Implementing AI-Driven Tailored Instruction in Higher Education

Background

In an innovative effort to improve educational results, a medium-sized university incorporated AI-driven analytics platforms into its instructional framework. This initiative was designed to personalize the learning journey for every student, acknowledging the variance in learning styles, preferences, and achievement rates. This case study examines the implementation process, the obstacles faced, the strategies developed to overcome these challenges, and the effects of customized teaching on student engagement and success rates.

Implementation

The university collaborated with a premier AI solutions company to implement an advanced analytics platform in numerous undergraduate courses. This platform was engineered to evaluate multiple data points, such as student engagement with online materials, submission of assignments, quiz results, and participation in discussion forums.

Process

The implementation process was meticulously planned to ensure seamless integration of the AI-driven analytics platform with existing educational practices. The process involved several key steps:

Data Collection: The first step involved systematically collecting student data across digital platforms used for learning and assessment.

Analysis and Insights: AI algorithms processed the collected data to identify patterns, preferences, and learning gaps among students.

Personalized Learning Paths: Based on the insights, instructors could customize their teaching approaches, materials, and assessments to address the individual needs of students.

Each step was critical in transitioning to a data-informed educational approach, aiming to enhance learning outcomes through personalized instruction.

Challenges and Solutions

Privacy Concerns: The collection and analysis of student data raised privacy issues. The university addressed these by implementing stringent data protection policies and securing explicit student consent.

Instructor Training: Faculty required training on how to use the analytics platform and interpret its insights effectively. The university organized workshops and provided ongoing support to ensure instructors were well-equipped.

T*echnology Integration:* Integrating the AI platform with existing educational technologies was initially challenging. A phased integration strategy and technical support teams were crucial in overcoming these obstacles.
Outcomes

Enhanced Student Engagement: Tailored instruction led to a noticeable increase in student engagement, as materials and teaching methods resonated more with individual learning preferences.

Improved Academic Performance: The personalized approach helped students grasp concepts more effectively, reflected in improved grades and lower dropout rates.

Equitable Learning Opportunities: The initiative made education more accessible to students with diverse learning needs, promoting a more inclusive academic environment.

Conclusion

The experience of this mid-sized university highlights the transformative power of AI-driven personalized instruction within higher education. Using AI to pinpoint and cater to the distinct needs of every student, educators could markedly improve learning outcomes. Despite facing initial hurdles, the effective execution of this initiative emphasizes the critical role of

technological integration, privacy concerns, and faculty backing in adopting AI-based educational strategies. As AI technologies continue to advance, their contribution to fostering personalized learning environments holds the potential to render education more efficient, inclusive, and fair.

This case study illustrates how AI-driven analytics can revolutionize higher education by fostering personalized learning environments. By addressing challenges such as privacy concerns and faculty training, the university demonstrated the importance of thoughtful implementation, setting a benchmark for using AI to create equitable and effective education systems. Further supporting these claims, Lin et al. (2024) highlight how generative AI tools like GPT-Assisted Summarization Aid (GASA) enhance reflective thinking, collaborative problem-solving, and learning outcomes, providing empirical evidence for the transformative potential of tailored AI interventions in education.

Identification of At-Risk Students

During a period where educational institutions are actively seeking innovative approaches to enhance student support and success, artificial intelligence (AI) has risen as a critical resource in identifying and assisting students who are at risk. Introducing AI technologies into academic settings creates unparalleled opportunities for pre-emptively tackling students' difficulties during their educational path. AI's ability to meticulously analyze performance data, attendance records, and engagement levels transforms educators' methods to pinpoint students needing assistance. This progressive strategy facilitates the customization of support for individual students and represents a shift toward a more inclusive and supportive educational framework.

The ability of Artificial Intelligence (AI) to identify at-risk students early in their educational journey exemplifies its transformative role in modern education. Vincent-Lancrin & Van der Vlies (2020) emphasize the scalability of AI solutions, which allows educational institutions to apply these technologies across diverse settings to improve student engagement systematically. While specific interventions for at-risk students depend on analyzing performance metrics, attendance, and engagement data, broader AI-driven innovations underscore the potential for fostering personalized academic support strategies. García-Martínez et al. (2023) emphasize the measurable impact of AI and computational sciences on student performance, highlighting the scalability of such technologies to improve educational outcomes systematically. Building on these findings, AI interventions that leverage data-driven insights can transform traditional educational systems into dynamic, adaptive frameworks that proactively support diverse student needs. For example, a private, non-religious college implemented an AI-powered platform to identify and assist at-risk students, significantly enhancing retention rates and tailoring support strategies. *Case Study 2* exemplifies the practical application of AI in addressing student challenges while sparking broader discussions about its potential to create transformative educational strategies.

Case Study 2: Early Identification and Support of At-Risk Students Through AI

Context and Problem

In a private, non-religious college, the academic support team observed a decrease in both retention rates and academic performance across the student population. Despite having multiple support services available, many students were still falling behind, often going unnoticed by the administration until it was too late for impactful intervention. The critical challenge lies

in identifying and aiding at-risk students early enough to alter their academic trajectory significantly.

AI Implementation

The university deployed an AI-powered platform designed to sift through student data, including performance metrics, attendance records, and levels of engagement within digital learning spaces. With the inclusion of machine learning algorithms, the system could detect patterns and indicators suggesting a student was potentially falling behind or losing engagement with their coursework.

> *Solution:* The AI platform was smoothly incorporated into the university's digital framework, aggregating data from diverse sources to compile detailed profiles for each student. By analyzing this data, the AI system could predict which students were at risk with remarkable precision. It highlighted students exhibiting signs of academic difficulty, including dropping grades, poor attendance, or diminished activity in online discussions.
>
> *Intervention:* Once the system pinpointed students who were at risk, the academic support team received immediate notifications via real-time alerts. This functionality enabled them to extend personalized support and resources proactively. The range of interventions was explicitly designed to meet each student's unique challenges and needs, encompassing customized tutoring sessions, personal counseling, and bespoke learning strategies.
>
> *Outcome:* Support from the AI system yielded a tangible impact on student retention and academic outcomes. Early identification allowed for timely and effective interventions, often before students recognized the extent of their struggles. As a result, the university saw a significant improvement in retention rates, with a notable increase in student engagement and academic performance. Furthermore, students appreciated the personalized support and felt valued and understood by the institution.

Conclusion

The success of this AI initiative demonstrated the potential of technology to transform education by ensuring that students receive the support they need when needed. The university improved academic outcomes by leveraging AI to identify at-risk students early. It enhanced the overall well-being of its student community, making education more inclusive and accessible for all.

Case Study 2 emphasizes the considerable promise of AI in fostering an inclusive and encouraging educational environment. By promoting proactive strategies and customized support, AI transforms educational institutions into more considerate and empathetic settings where each student is appreciated. The achievement of this initiative highlights AI's crucial role in enhancing retention rates and student success, paving the way for a more equitable and efficient education system. A significant contribution of AI to education is its capability to predict and recognize students at risk early in their educational path. By examining trends and patterns in performance indicators, attendance records, and engagement cues, AI algorithms can notify educators about students who are struggling. The collected data enables instructors to respond promptly with focused support and tools. Adopting these proactive measures can enhance student retention rates, academic achievement, and overall wellness, ensuring that all students are considered.

Curriculum Design Transformation through AI Insights

The dynamic landscape of modern education necessitates a curriculum design approach that is adaptable and responsive to student needs and industry trends. Artificial Intelligence (AI) offers a pioneering route for educators to enhance and tailor educational materials, guaranteeing alignment with the workforce's evolving requirements and students' diverse learning styles. Utilizing AI to sift through vast amounts of educational data allows institutions to pinpoint curriculum areas needing updates—complexity, engagement levels, or relevance. This process establishes a vital feedback mechanism for the ongoing improvement of educational materials, leading to a more customized, impactful, and industry-relevant learning experience. The following case study showcases

the role of AI-driven analytics in optimizing curriculum design, underscoring the value of leveraging data in making educational decisions.

Rivertown University embraced AI-driven analytics to address challenges in keeping its curriculum aligned with workforce demands and student needs. By implementing a bespoke AI platform, the institution identified areas for improvement, such as low engagement in outdated computer science modules, while highlighting high-demand fields like AI and machine learning. This data-driven approach led to curriculum updates that increased student engagement, improved job placement rates, and enhanced retention.

Case Study 3: Enhancing Curriculum Design with AI at Rivertown University

Background

Rivertown University, a forward-thinking institution committed to innovation in higher education, recognized the need to continuously adapt its curriculum to meet the changing demands of the workforce and the diverse needs of its student population. Despite the faculty's expertise, identifying areas for curriculum improvement was often based on anecdotal evidence and periodic student feedback, leading to delayed updates and missed opportunities for alignment with industry trends.

Challenge

The main challenge faced by Rivertown University was the lack of a systematic, data-driven approach to evaluating and updating the curriculum. Traditional curriculum assessment methods were time-consuming and failed to provide real-time insights into student engagement, learning outcomes, and the relevance of course content to current industry requirements.

Implementation of AI

Rivertown University partnered with an EdTech company specializing in AI-driven educational analytics to address this challenge. Together, they developed a bespoke AI platform capable of analyzing vast amounts of data from various sources, including student performance metrics, engagement in online learning platforms, feedback surveys, and job market trends.

Process

The AI platform utilized machine learning algorithms to identify patterns and correlations in the data, revealing insights into areas where the curriculum could be enhanced. For example, it pinpointed several modules in the computer science degree that were consistently associated with lower student engagement and performance, alongside a growing demand for skills in emerging technologies not adequately covered in the existing curriculum.

Action Taken

Armed with these insights, the curriculum development team at Rivertown University embarked on a comprehensive review and revision process. They introduced new modules focused on artificial Intelligence, machine learning, and data science, which AI highlights as high-demand fields. They also restructured existing courses to incorporate more interactive and practical components based on the AI's analysis of student engagement data.

Results

The impact of implementing AI-driven curriculum design was profound:

- Student engagement increased significantly, as measured by online activity, class attendance, and participation in direct projects.
- Feedback from students and faculty was overwhelmingly positive, with many noting that the curriculum felt more relevant and engaging.
- Graduates reported feeling better prepared for the workforce, with a noticeable uptick in job placement rates in high-demand sectors.
- The university observed a marked improvement in student retention rates, attributed to the more responsive and relevant curriculum.

Conclusion

Rivertown University's journey illustrates the transformative power of AI in reshaping curriculum development. Through data-driven insights, educational institutions can keep their programs aligned with the latest academic and industry advancements, thereby more effectively equipping students for the dynamics and opportunities of today's job market. This case study is a persuasive demonstration of how adopting innovative technologies like AI can promote a perpetual

enhancement and adaptability culture within educational environments.

Case Study 3 underscores AI's significant role in aggregating and analyzing institutional data to inform curriculum development. Educators can harness AI insights to pinpoint areas within the curriculum that may pose challenges or fail to captivate students. Such a feedback loop is vital for the ongoing refinement of educational content, ensuring it remains engaging, relevant, and coordinated with student needs and the latest industry trends. Additionally, AI's ability to outline the high-demand skills and knowledge enabled faculty to adjust curricula better to prepare students for academic success and career readiness. The data-driven decision-making facilitated by AI arms both faculty and administrators with the necessary tools and insights to craft personalized, effective, and adaptive educational experiences. This strategy improved learning outcomes and fostered a culture of continuous innovation and responsiveness within academic institutions. By leveraging AI-driven analytics, an institution is thus equipped to ensure that its teaching strategies, curriculum designs, and the students' support mechanisms consistently align with the best interests of its students. In so doing, it thus sets the stage for a future where education is more personalized, accessible, and impactful.

The integration of data-driven decision-making, facilitated by AI, endows educators with the requisite tools and insights to establish a learning environment that is customized and flexible. Such a strategy elevates student performance and encourages a culture of perpetual innovation and adaptability within educational settings. This foundation paves the way toward an educational future that is more personalized, accessible, and influential, thereby substantially improving students' academic journey and achievements.

Cultivating Students' Creativity and Critical Thinking

Incorporating Artificial Intelligence (AI) into educational environments unlocks exceptional opportunities to bolster creativity and critical thinking among students, transforming them into initiative-taking participants in their academic journey. Educators, including graduate teaching assistants, are progressively embracing AI-powered tools to nurture these competencies, leveraging AI as a dynamic force for innovation and analytical thinking (Vincent-Lancrin & Van der Vlies, 2020). Enhanced AI algorithms discern individual learning preferences and styles, allowing educators to devise personalized learning trajectories that challenge students and expand their cognitive horizons. By customizing problems and projects aligned with learners' interests and skills, instructors ignite curiosity and encourage deeper engagement with the material. AI simulations and virtual settings immerse students in real-world challenges, enabling them to test hypotheses and explore solutions in controlled environments (Southworth et al., 2023). These experiences enrich students' educational journeys, preparing them for complex future scenarios.

AI fosters collaboration by streamlining communication, assigning roles, recommending resources, and supporting peer evaluation across diverse learning activities (Southworth et al., 2023). These tools are especially effective in approaches like Project-Based Learning (PBL), which immerses students in real-world challenges that demand innovative solutions. By providing access to rich data resources, facilitating collaboration, and generating simulations, AI enhances students' problem-solving capabilities while fostering innovation and teamwork (Chan & Tsi, 2023). AI also supports learning beyond collaborative environments by integrating cross-disciplinary

knowledge into educational activities. This support helps students connect diverse subject areas and encourages holistic problem-solving (Abulibdeh et al., 2024). Educators can further use AI tools to empower students to explore their interests independently and deepen their engagement (Qadir, 2023). By enabling students to bridge knowledge domains and pursue personalized goals, AI creates a learning ecosystem that fosters creativity, critical thinking, and adaptability essential for success in academic and professional contexts.

A compelling example of AI's transformative impact comes from a small liberal arts college that sought to enhance peer feedback processes using AI-supported tools. The institution implemented a platform designed to guide students in providing constructive critiques based on predefined criteria such as clarity of communication, problem-solving effectiveness, and contribution levels. Real-time suggestions ensured feedback was actionable and supportive, while aggregated data highlighted common areas for improvement. This iterative approach led to measurable enhancements in students' evaluative skills, project quality, and classroom culture, reinforcing AI's potential to nurture critical thinking and collaboration within academic settings. Let us examine the case study below:

Case Study 4: Enhancing Peer Feedback with AI-Supported Collaboration Platforms

Background

A small liberal arts college embarked on an inventive project to utilize artificial Intelligence (AI) in revamping the traditional peer feedback system into a more engaging, efficient, and encouraging learning process. The goal of the project was to foster critical thinking, assessment abilities, and a mindset of ongoing enhancement in students participating in group learning tasks.

Implementation

The organization implemented an AI-assisted collaboration tool to help students give feedback and evaluate each other in project-based learning settings. The platform was incorporated into different classes, allowing students to collaborate on projects and use AI tools for feedback.

Process

AI-Guided Feedback: The AI system was programmed to guide students in providing constructive feedback based on specific criteria such as clarity of communication, contribution to the project, and problem-solving effectiveness.

Criteria-Based Evaluations: The platform used AI algorithms to help students focus on critical aspects of their peers' work, encouraging thoughtful evaluation and constructive criticism.

Real-Time Suggestions: As students composed their feedback, the AI provided real-time suggestions to improve the quality of their input, ensuring that comments were supportive, focused, and beneficial.

Feedback Analysis: The platform analyzed the feedback for common themes, strengths, and areas for improvement, presenting aggregated insights to students and instructors.

Continuous Learning Loop: This process fostered a constant learning loop, where students could reflect on feedback, improve, and develop their evaluative skills over time.

Outcomes

Enhanced Evaluative Skills: Students demonstrated significant improvement in their ability to assess their work critically and that of their peers, developing a deeper understanding of the criteria for success in collaborative projects.

Cultural Shift: The project contributed to a cultural shift within the classroom, promoting a more supportive and constructive environment where students felt empowered to give and receive feedback openly.

Improved Project Outcomes: Projects benefitted from the iterative feedback process, with noticeable enhancements in clarity of communication, problem-solving approaches, and overall project quality.

Insights: Instructors gained valuable insights into students' understanding and application of project criteria, allowing them to develop targeted teaching strategies focused on addressing identified gaps.

Conclusion

This case study exemplifies how AI-supported collaboration platforms can revolutionize the peer feedback process in educational settings. By leveraging AI to guide and improve the feedback mechanism, the initiative enhanced students' evaluative and critical thinking skills and fostered a more supportive, engaged, and continuously improving learning community. This approach represents a significant step forward in utilizing technology to enrich educational practices, particularly in fostering critical skills essential for success in both academic and professional arenas.

AI-enhanced collaboration platforms streamline peer feedback and evaluation by assisting students in offering constructive insights based on metrics such as communication clarity, project contribution, and problem-solving efficacy. The inclusion of collaboration fosters critical thinking, evaluative competencies, and a culture of continuous improvement and support within academic communities. By enabling iterative enhancements and fostering critical skills, AI drives innovation in teaching and learning while offering scalability across diverse educational settings to improve engagement and outcomes (Vincent-Lancrin & Van der Vlies, 2020; Bhutoria, 2022). For instance, AI's capacity to analyze performance data and create personalized learning pathways helps educators address challenges faced by students with varied needs and abilities (Tapalova & Zhiyenbayeva, 2022; Sajja et al., 2024).

Moreover, AI tools automate repetitive tasks, such as grading and attendance tracking, freeing educators to focus on mentorship and instructional innovation. This shift enhances the quality of student interactions and fosters dynamic, human-centered education (Chen et al., 2020; Southworth et al., 2023). To fully harness AI's potential, institutions must adopt thoughtful and ethical approaches, including integrating robust training for educators, ensuring equitable access to AI tools, and addressing issues of bias and inclusivity. These measures enable education systems to evolve into adaptive frameworks that prepare students with the creativity, critical thinking, and adaptability needed to thrive in a technology-driven future (Abulibdeh et al., 2024; Qadir, 2023; George & Wooden, 2023).

Implementing Artificial Intelligence (AI) tools in modern education's Project-Based Learning (PBL) and collaborative learning platforms marks a transformative era. This integration significantly enriches the educational landscape by fostering active learning, promoting student engagement in real-world challenges, and enhancing teamwork and problem-solving capabilities. The employment of AI within these educational frameworks seamlessly complements the foundational objectives of Project-Based Learning (PBL), which aims to equip students for the intricacies of today's world through direct, experiential learning opportunities. AI applications in PBL settings function as catalysts for profound engagement, permitting students to explore complex real-world challenges with a level of depth and sophistication previously inaccessible. These AI tools facilitate the examination of solutions and the practical application of theoretical knowledge, effectively narrowing the divide between scholarly learning and its real-world implementation. The dynamic essence of AI-integrated PBL guarantees that education remains pertinent and flexible, responding adeptly to the shifting

requirements of society and the professional domain.

Furthermore, incorporating AI into collaborative learning platforms marks a transformative leap in educational technology (Walter, 2024). These platforms offer a vibrant, interactive landscape that simplifies logistical operations, tailors educational experiences to individual learner profiles, and enhances the effectiveness of communication and feedback mechanisms. Such advancements elevate the productivity of collaborative endeavors, ensuring that each student's educational journey is meticulously customized to align with their unique needs and preferences. The outcome is a more captivating and inclusive educational atmosphere that nurtures the development of teamwork and critical thinking capabilities within a supportive and dynamic context.

The confluence of AI with project-based and collaborative learning platforms illustrates the complex role that technology plays in the realm of education. It highlights a progressive educational ethos that adeptly addresses the nuances of contemporary life, equipping students with the competencies required to navigate and contribute meaningfully to the world. As AI technology matures and becomes more deeply woven into educational methodologies, it signals promising developments for enhancing individual learning paths and the overarching educational landscape. This evolution signifies embracing technological progress and a steadfast commitment to nurturing a flexible and anticipatory educational milieu. It prepares learners to meet future challenges and seize opportunities with agility and insight.

Leveraging AI for Administrative Tasks to Free Up Instructor Time

The infusion of Artificial Intelligence (AI) within the educational sphere is heralding a transformative era, revolutionizing pedagogical methodologies and administrative operations. By leveraging AI-powered scheduling tools, educational institutions can significantly improve class schedules, meeting times, and office hours, taking into account both student and educator preferences to minimize conflicts and maximize convenience. An illustrative example of the effectiveness of such technology can be drawn from the theoretical study by Ciolacu et al. (2018), which discusses AI's potential in scheduling optimization to enhance academic achievement by analyzing patterns in student performance and preferences.

Furthermore, AI advancements in communication platforms offer rapid, customized responses to student queries, substantially alleviating the workload on educators and enhancing student satisfaction. Kuhail et al. (2023) research into AI-based chatbots in university settings underscores the efficiency of these platforms in managing student inquiries, demonstrating their positive impact on reducing administrative burdens and improving the student-educator communication channel.

AI's capability to process and analyze extensive educational data—including student records and academic studies—facilitates easier retrieval, analysis, and presentation of information. This functionality aids educators in making informed decisions and supports the personalization of learning experiences. Reviews by Raffaghelli et al. (2020) emphasize the pivotal role of AI in managing educational data, enabling data-informed decision-making, and enhancing organization efficiency. Research by Southworth et al. (2023) highlights AI's

transformative potential in tailoring learning pathways, fostering data literacy, and ensuring fair data use within educational institutions. These underscore the importance of AI in creating more responsive, inclusive, and effective educational environments.

Moreover, AI's ability to automate routine administrative responsibilities allows educators to focus on student engagement and instructional innovation. A striking example is the implementation of an AI grading system at a mid-sized public university (Case Study 5), where faculty faced excessive grading workloads. This system, leveraging natural language processing and machine learning, automates grading tasks, provides detailed feedback, and enables instructors to prioritize direct interactions with students. The successful implementation and outcomes of this approach demonstrate AI's potential not only to simplify administrative tasks but also to redefine how education systems fundamentally operate.

Case Study 5: Implementation of the AI Grading System

Context

The faculty faced a growing challenge at a mid-sized public university known for its commitment to innovation in education and in many other areas. Results from a recent study in selected disciplines revealed that faculty faced a growing challenge as they were spending excessive time grading assignments, which reduced their ability to engage directly with students and provide personalized teaching. The university acknowledged the necessity of a solution to improve efficiency while maintaining educational standards, so they investigated the possibilities of using Artificial Intelligence (AI) for this purpose.

Implementation of an AI System

The university decided to pilot an AI grading system designed to automate grading tasks for assignments, quizzes, and exams to reduce the amount of time it takes to complete the task. This system utilizes natural language processing and machine learning algorithms to provide grades and constructive feedback on student submissions. Faculty from disciplines as varied as Literature and Computer Science participated in the pilot to ensure the system's versatility and effectiveness across different assignments.

Challenges and Solutions

A significant hurdle was the initial skepticism among a cross-section of faculty regarding the system's ability to grade as effectively as a human. To address this, the AI system developers conducted workshops demonstrating AI's grading accuracy, ability to learn from previous grading decisions, and ability to adapt to different grading rubrics. A feedback mechanism was also established, allowing instructors to review and adjust AI grading decisions when necessary, ensuring the system's continuous improvement and alignment with educational standards.

Impact and Benefits

The turnaround duration of graded student work was significantly reduced with the implementation of the AI grading system, with preliminary results showing a 50% decrease on average. This efficiency gain allowed instructors more time to engage with students through interactive discussions, one-on-one mentoring, and the development of innovative teaching activities. Moreover, the timely and detailed feedback provided by the AI system improved student satisfaction and performance, as learners could quickly understand their strengths and areas for improvement.

> *Lessons Learned:* The transfer of grading tasks to the AI grading system considerably cut down grading time, with initial findings indicating an average 50% drop. This increase in efficiency enabled instructors to have additional time to interact with students through interactive conversations, individual mentoring, and the creation of new teaching methods. In addition, the prompt and thorough feedback given by the AI system enhanced student satisfaction and performance by helping learners identify their strengths and areas needing improvement quickly.
>
> *Knowledge gained from experiences:* The successful implementation of the AI grading system underscored the importance of faculty involvement in adopting modern technologies. It also highlighted the ability of AI to make administrative tasks more efficient and enhance the educational experience for course instructors and students. The university intends to increase the utilization of AI in additional administrative duties and investigate more ways to incorporate technology into educational processes.

Conclusion

Introducing an AI grading system at this university showcases how AI is revolutionizing the education sector. By automating grading and assessment duties, the university has improved how faculty time is utilized and fostered a conducive atmosphere for enhanced teaching and increased student involvement. This case study clearly shows how AI can completely change educational practices, paving the way for a future where technology and academic success come together to enhance the

educational experience.

AI technologies have transformed the assessment procedure by providing scalable and efficient solutions for grading student assignments (Dimari et al., 2024). AI systems utilizing natural language processing and machine learning algorithms can effectively evaluate assignments, quizzes, and exams, offering prompt feedback to students. A transfer of some of the faculty grading tasks speeds up the process of grading and guarantees uniformity and impartiality in evaluation. For course instructors, this automation cuts down significantly on the time typically dedicated to grading, freeing up more time for developing curriculum, engaging students, and providing personalized instruction (Schiff 2021). Additionally, AI-powered evaluation instruments are capable of dynamically examining students' answers, providing valuable information on their learning habits and challenging areas, thus guiding teaching approaches and interventions.

Artificial intelligence-powered scheduling tools are capable of improving class schedules, meeting times, and office hours by considering the preferences and availability of both students and educators in order to reduce conflicts and increase convenience. Communication platforms improved by AI can give quick, customized answers to students' questions, lessening the workload for educators and enhancing student happiness. Moreover, AI technology can handle extensive amounts of educational information, including student files and academic studies, making it easier to retrieve, analyze, and present data. Enhancing organizational efficiency and backing data-informed decision-making allows institutions to address the needs of their students and faculty effectively.

Streamlining Administrative Efficiency with Artificial Intelligence

Integrating Artificial Intelligence (AI) into educational administration marks a pivotal shift in how academic institutions handle operational tasks. From scheduling improvements to communication enhancements and data management, AI has demonstrated its capacity to transform the administrative landscape in education. Studies such as Li and Jan (2023) emphasize how AI-enabled systems improve productivity and reduce stress among students through intelligent scheduling and task management. Additionally, research by Maida et al. (2024) highlights the potential of AI-powered communication platforms to reduce educators' workloads while enhancing student satisfaction, freeing faculty to focus on teaching and mentoring.

A compelling example of AI's impact in this domain comes from a large public university (Case Study 6 below) that implemented AI-driven solutions to address administrative challenges. Faced with the growing complexity of managing course schedules, faculty assignments, and student inquiries, the institution leveraged AI to enhance both scheduling and communication processes. The AI system, using machine learning algorithms to analyze historical data on course registrations, faculty availability, and classroom capacities, generated optimized schedules that minimized conflicts and maximized resource utilization. This effort was further complemented by the deployment of an AI-powered virtual assistant capable of responding to routine student inquiries through natural language processing (NLP).

Case Study 6: Implementing AI for Administrative Efficiency in a Large Public University

Context

A major public university in a big city decided to tackle the difficulties of managing a growing student population and the intricate administrative responsibilities. A study emerged that explored efficient ways to streamline its administrative tasks. This study's goal was to increase efficiency, reduce faculty workload, and improve student experiences by enhancing scheduling systems and communication channels.

The current obstacle to overcome

The university was faced with difficulties that consistently produced inadequate scheduling, leading to clashes in course timetables, poor resource management, and dissatisfaction among students and faculty. Additionally, the administrative team was overwhelmed by a large volume of basic inquiries from students, which made it challenging to prioritize important tasks and help students. The study further suggested an AI approach, where the system employed machine learning algorithms to analyze historical data on course registrations, faculty availability, and classroom capacities in order to generate optimal scheduling solutions that minimized conflicts and maximized the use of university resources.

Integration of AI Solutions

With additional input from faculty and staff, the University leadership voted to move forward with the acquisition of AI to enhance scheduling efficiency in areas that include scheduling classes, exams, and faculty office hours in an automated manner. The system used machine learning algorithms to analyze historical data on course enrollments, faculty availability, and classroom capacities in order to generate optimal scheduling solutions that minimized conflicts and maximized university resources, ultimately improving scheduling efficiency with the help of AI technology.

Improving communication through artificial Intelligence

In order to enhance communication, the university implemented an AI-driven virtual assistant that can be accessed through the university's online portal and mobile application. With the help of natural language processing (NLP), the assistant can offer personalized responses around the clock, leading to a decrease in response times and allowing administrative staff to focus on handling more challenging inquiries.

Results and Effects

The scheduling tool powered by AI decreased scheduling conflicts by 40%, resulting in improved student satisfaction levels and increased efficient utilization of campus facilities. Faculty expressed higher satisfaction with their schedules, providing them with increased flexibility to manage teaching, research, and personal obligations. The virtual assistant powered by AI significantly decreased the number of fundamental questions handled by office employees by around 60%, enabling them to concentrate on delivering better assistance for intricate student requirements. More than 80% of students were satisfied with the accuracy and speed of responses from the virtual assistant, showcasing high engagement.

Lessons Learned

The success of the AI implementations at the university underscored the importance of clear goals, stakeholder engagement, and ongoing training for staff to adapt to new systems. It also highlighted the potential of AI to significantly improve administrative efficiency and support the institution's educational mission.

Conclusion

This case study exemplifies AI's profound impact on administrative efficiency within higher education institutions. By leveraging AI for scheduling and communication tasks, the university optimized operational processes and enhanced the educational experience for students and educators alike. As AI technology continues to evolve, its role in supporting and transforming the academic sector is set to expand, promising a future where administrative efficiency aligns seamlessly with educational excellence.

The results were transformative – for example, scheduling conflicts were reduced by 40%, and student satisfaction with course availability and timetable increased significantly. Faculty reported greater satisfaction with their schedules, allowing them more flexibility to balance teaching, research, and personal obligations. Additionally, the AI-driven virtual assistant handled approximately 60% of routine inquiries, enabling administrative staff to focus on more complex tasks. With over 80% of students expressing satisfaction with the virtual assistant's

accuracy and speed, the university successfully streamlined its operations while improving the overall student and faculty experience.

Integrating Artificial Intelligence (AI) in handling administrative duties in the educational sphere marks a pivotal shift in how academic tasks are approached and executed. The utilization of AI for scheduling improvements, communication enhancements, and efficient data management exemplifies this transformation. Studies like that by Li and Jan (2023) highlight the impact of AI in enhancing productivity and reducing stress among students through intelligent scheduling and task management, suggesting a path toward the simplification of administrative operations. Furthermore, AI-driven communication platforms, as noted in other research, can offer customized answers, reducing educators' workloads and enhancing student satisfaction. These advancements in administrative efficiency and personalized communication pave the way for a future where educators have more time to dedicate to teaching, mentoring, and inspiring students (Southworth et al., 2023; Qadir, 2023).

The grading automation and the simplification of administrative operations through AI solutions allow educators to recapture precious time. This reclaimed time enables them to concentrate on the fundamental objectives of education - teaching, mentoring, and inspiring students. As AI technologies advance, they hold immense promise for augmenting administrative effectiveness and bolstering the quality of education. This progress signals a promising horizon where educators can channel increased focus toward the transformative elements of their profession, enhancing the learning experience and fostering a more dynamic educational environment.

Senthilkumar and colleagues (2024) provide a comprehensive analysis of the integration of AI in Library and Information Science, illustrating AI's capability to manage and streamline large volumes of educational data. Al-Marzouqi (2024) further explores the role of AI in education, highlighting its potential in information systems and knowledge management, thereby ensuring that educators can fully immerse themselves in their students' intellectual and creative development. Thus, the introduction of AI in education enables a more sophisticated and adaptable learning setting that caters to the unique learning speeds, preferences, and interests of individual students. This personalization guarantees that education is not a standard product but a tailored experience that acknowledges and adjusts to unique learner differences.

Al-Marzouqi's (2024) study on ChatGPT's power and risks in educational settings highlights AI's ability to create tailored learning experiences for students with varying requirements. In addition, Sherif, Salloum, and Shaalan's (2024) systematic analysis on utilizing AI tools in knowledge management within Industry 4.0, despite being industry-centric, offers valuable perspectives on how AI can enhance information and resource management in education. The review's principles can easily be put into practice in educational settings, showing how AI can simplify information management, improve accessibility, and support a more efficient learning environment.

The shift towards a more AI-enhanced educational environment will prioritize the essential human aspects of teaching and learning (Chiu et al., 2023), ultimately reshaping the focus of education. It emphasizes how crucial student-instructor interactions are in creating a learning environment that encourages curiosity and sparks a love for learning throughout life. AI in education not only helps to improve but also motivates, creating a new approach

for both the faculty members and students to delve into the vast array of opportunities available.

Discussion

The integration of Artificial Intelligence (AI) into higher education offers a powerful opportunity to enhance academic practices and reshape the learning environment. Diwaker, Sharma, and Tomar (2021) note AI's role in augmenting educators' efforts by enabling personalized instruction, streamlining administrative processes, and fostering deeper student engagement. This technological evolution is not confined to education alone but intersects with other domains, such as finance and employment, presenting both opportunities and challenges. To ensure AI's benefits are maximized and its risks mitigated, a deliberate, ethically grounded, and scholarly approach to its integration into education is paramount.

Improving Teaching Methods

Artificial Intelligence (AI) can transform conventional teaching techniques by customizing education and encouraging teamwork. By utilizing adaptive learning pathways, AI customizes education to meet the unique requirements of each student, allowing the course instructors to tackle various strengths and difficulties effectively. Vincent-Lancrin and Van der Vlies (2020) emphasize that AI offers flexible resources for developing personalized learning experiences and fostering enhanced involvement. Likewise, AI-driven project-based learning platforms improve critical thinking, creativity, and problem-solving abilities by promoting peer feedback and collaborative learning settings (Southworth et al., 2023). These advancements highlight AI's ability to make education an engaging and student-focused experience.

AI-powered collaborative tools also enable students to engage actively in their educational journey. Chan and Tsi (2023) illustrate how AI improves teamwork and evaluation skills via advanced collaborative platforms. Nonetheless, to optimize these advantages, instructors need to take on supportive roles, incorporating AI as an auxiliary resource instead of a replacement for conventional techniques. Abulibdeh et al. (2024) highlight that the successful application of AI necessitates a strategic connection to instructional objectives, enabling educators to enhance their teaching methods while utilizing technology.

Operational Productivity and Management Change

The incorporation of AI into administrative workflows demonstrates its capacity to improve organizational effectiveness. Automating tasks that occur repeatedly, like scheduling, grading, and tracking attendance, lessens the burden on faculty, allowing more time for mentoring and curriculum development (Chen et al., 2020). Additionally, virtual assistants powered by AI enhance communication by providing rapid and effective replies, improving the overall experience for students (Qadir, 2023). These applications not only enhance processes but also bolster the institution's ability to address student needs efficiently.

In spite of these developments, scalability continues to be an issue, particularly in organizations with intricate

administrative frameworks. Tapalova and Zhiyenbayeva (2022) contend that effective AI integration demands involvement from stakeholders and thorough training to tackle usability and collaboration issues. Strategic planning is crucial to guarantee that AI systems correspond with institutional objectives and deliver real advantages for educators, administrators, and students.

Ethical Aspects and Fairness

The integration of AI in education brings substantial ethical issues, especially regarding data privacy, bias in algorithms, and fair access. AI systems rely on large datasets, rendering student information vulnerable to abuse if strong protections are not established. Moreover, biases embedded in AI algorithms might inadvertently sustain inequalities, disproportionately impacting marginalized communities (Li & Jan, 2023).

Fair access to AI technologies is another urgent concern. Lesser-funded or smaller institutions frequently encounter obstacles in implementing advanced AI systems, which worsens inequalities in educational standards. George and Wooden (2023) highlight the significance of inclusive policies that encourage equitable access to AI tools. Additionally, incorporating ethical principles into AI development, as proposed by Maida et al. (2024), guarantees that fairness, transparency, and accountability stay fundamental to implementation initiatives.

Future Directions

As AI continues to advance, its integration into education must be evaluated against evolving societal and technological contexts. Long-term research should focus on its impact on student outcomes, educator roles, and institutional efficiency. Collaborative efforts among technologists, educators, and policymakers are critical to developing frameworks that consider balancing innovation with ethical considerations.

Southworth et al. (2023) highlight the need for institutions' iterative feedback loops to ensure AI applications remain adaptive and inclusive. By addressing challenges related to equity, ethics, and scalability, higher education institutions can fully leverage AI's transformative potential while safeguarding its mission of fostering equitable, meaningful, and future-oriented learning experiences.

Conclusion

The incorporation of Artificial Intelligence (AI) in education signifies a significant change in the methods used for learning and administrative and other routine tasks. By promoting creativity, critical analysis, and teamwork, AI prepares students with the abilities necessary to succeed in a more intricate world. Simultaneously, its ability to simplify administrative duties and tailor learning experiences enables educators to concentrate on their primary goal of mentorship and teaching innovation.

Nonetheless, the effective implementation of AI necessitates a careful equilibrium between utilizing its advantages and tackling issues like data privacy, fairness, and algorithmic bias. Institutions should focus on ethical

application, inclusiveness, and continuous cooperation among faculty, technology experts, and policymakers. As AI progresses, its influence in education will undoubtedly grow, presenting fresh possibilities to rethink teaching, learning, and institutional productivity, all while focusing on the essential aim of fair and impactful education.

Author(s)' Statements on Ethics and Conflict of Interest

Ethics Statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute. This study does not involve qualitative or quantitative data collection methods that require ethics committee approval, such as surveys, interviews, focus groups, observations, experiments, or similar techniques. Therefore, obtaining approval from an ethics committee does not apply to this research.

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Cross-Cultural Challenges: Bullying Experiences of Indonesian Expatriate Students in Malaysia

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Abstract

This qualitative study examines the phenomena of bullying and cyberbullying among Indonesian students in Malaysia whose parents are expatriates. The focus on this specific demographic aims to uncover how their unique sociocultural backgrounds shape their experiences related to bullying, both as victims and perpetrators. Utilizing semi-structured interviews with 21 students from Sekolah Indonesia Kuala Lumpur, the research delves into their understandings and encounters with various forms of bullying, including physical, verbal, and cyber aspects. Thematic analysis of this group's vulnerabilities and behavioral patterns reveals a complex interplay of cultural integration challenges and social dynamics. The findings highlight a dual role of students as both targets and agents of bullying, influenced heavily by their transnational identities. This study proposes the development of culturally sensitive interventions that cater specifically to the needs of transnational students, aiming to enhance the efficacy of anti-bullying strategies within multicultural educational settings. By addressing the nuanced needs of these students, the research underscores the importance of implementing targeted educational and psychoeducational programs that promote understanding, empathy, and resilience across diverse student populations. This tailored approach is anticipated to foster safer, more inclusive school environments that prevent bullying and support expatriate students' holistic well-being.

Keywords: Bullying dynamics, Cultural integration, Cyberbullying, Multicultural education, Transnational students.

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Introduction

Bullying remains a profound challenge within educational settings, exerting detrimental effects on both perpetrators and victims. This concern is especially pronounced in Malaysian schools, where student interactions frequently escalate into varied forms of aggression. A comprehensive study by Sabramani et al. (2021) reveals that both victims and perpetrators in Malaysia engage in aggressive behaviors, encompassing physical actions like hitting or pushing and verbal abuses such as insults or threats. Such findings underscore the multi-dimensional nature of bullying, which includes physical, verbal, antisocial, and cyberbullying, each contributing uniquely to the hostile school environment.

Physical bullying in schools predominantly manifests through confrontations such as beatings and shoving, clearly showcasing aggression that can cause immediate physical harm. Conversely, verbal bullying involves insults and mockery, which can severely impact a victim's psychological health over time. Antisocial behaviors lead to social exclusion, subtly undermining a student's relationships and status among peers. Additionally, cyberbullying uses digital platforms to extend harassment beyond the school environment, showcasing the complexity of modern bullying dynamics (Nur et al., 2023). These varied forms of bullying not only reflect individual aggressive behaviors but also point to systemic issues within school cultures that permit or ignore such negative interactions. The intricate social dynamics in schools are further strained by behaviors such as extortion, defensive aggression in response to provocations, and discrimination against academically superior peers, all of which signify a deeply entrenched culture of intimidation (Salleh & Zainal, 2014). Such behaviors reflect individual aggressiveness and suggest a broader, systemic issue within the school culture that supports or overlooks such dynamics.

Bullying, a global concern, has been extensively studied for its pervasive impact through various lenses, emphasizing its repetitive nature and the power imbalances it creates (Berger, 2007; Hymel & Swearer, 2015). These incidents are not isolated, but rather form a consistent pattern that reinforces the victim's sense of helplessness and vulnerability over time. Farrington & Ttofi (2009) and Smith & Brain (2000) highlight that the consequences of bullying extend beyond immediate emotional and physical damage to include severe long-term outcomes like mental health issues, physical health problems, and significant academic difficulties (Graham, 2016). Beside that Bullying, including cyberbullying, profoundly affects mental health, with victims experiencing anxiety, depression, low self-esteem, and suicidal ideation (Agustiningsih et al., 2024; de Freitas et al., 2024).

Moreover, the propensity for bullies to develop further aggressive and violent behaviors into adulthood suggests that early bullying behavior is a significant predictor of future antisocial outcomes (Ttofi et al., 2012). This correlation underscores the urgent need for effective preventive and remedial strategies in schools to address not only the symptoms but also the root causes of bullying, preventing a cycle of violence that might continue outside the school environment.

In Selangor, Malaysia, the selection of the region for this research was driven by its diverse demographic composition and significant representation of the broader national context regarding bullying incidents. Specific instances in this area have shown that bullying victims experience traumatic stress impacting their academic

performance and psychological well-being. The prevalence of such cases in Selangor is indicative of the urgent need for effective interventions, as the lack of comprehensive and systematic anti-bullying programs in schools exacerbates these effects, leaving many victims without adequate support (Sudan, 2016). Several measures have been adopted across schools in Selangor to counteract these dynamics, including the implementation of strict classroom rules, the reinforcement of teachers' roles as counselors, consistent enforcement of school policies, and broad socialization efforts aimed at promoting an inclusive and supportive educational environment (Muluk et al., 2021). This regional focus provides a critical lens through which to examine the effectiveness of existing policies and to develop targeted strategies that address the unique challenges faced by students in Selangor.

This study takes a novel approach by focusing on a specific demographic—Indonesian students in Malaysia whose parents are expatriates. This group provides a unique lens through which to examine bullying, considering the additional challenges of cultural integration and the impacts of living in a foreign environment on student behavior and social interactions. The purpose of this study was to investigate the specific understandings and experiences of these transnational students, assessing how their unique sociocultural backgrounds influence their involvement in bullying, both as victims and perpetrators. This study sought to identify and analyze the specific vulnerabilities and behavioral patterns exhibited by this group to develop tailored interventions that address the diverse needs of this population, thereby increasing the effectiveness of anti-bullying strategies in multicultural school settings.

Method

This study used a qualitative design with a semi-structured interview approach. Moreover, this study used open-ended questions to explore participants' in-depth understanding and experiences related to bullying, including cyberbullying. This method allowed participants to express their views and experiences freely, providing rich and diverse insights into the various forms of bullying, the mechanisms by which it occurs, and its emotional and social impacts. This approach also allowed researchers to capture the complexity and nuances of the bullying experience to figure out and develop effective intervention strategies in school environments.

Participant

Twenty-one students from Sekolah Indonesia Kuala Lumpur (SIKL) participated in this study. Participants were males (10 participants) and females (11 participants), ranging in age from 13 to 16 years. Before the interview, all participants were given clear information about the purpose of the study, procedures, potential risks, and benefits. They were informed that their participation was completely voluntary and that they could withdraw from the study at any time without negative consequences. Participants were also assured of the confidentiality of their responses and that all data would be anonymized in the final report.

Interview Guide

The interview questions were developed based on a review of existing literature on bullying and cyberbullying, as well as theoretical frameworks that highlight the relational and contextual aspects of bullying. The primary aim

was to capture participants' attitudes and lived experiences in a transnational setting—particularly the ways Indonesian expatriate students in Malaysia understand and respond to different forms of bullying. Each question served a distinct role in eliciting detailed, nuanced insights into their perceptions, feelings, and behaviors. Questions asked included:

1. What do you know about bullying?
2. Have you ever been involved in a situation where bullying occurred?
3. What do you know about cyberbullying?
4. Have you ever experienced cyberbullying?
5. What forms of bullying have you seen or experienced? Can you explain how it happened?
6. In the bullying situations you have experienced, what role did you play? Can you describe your thoughts and feelings at the time?

Data Analysis

Data were analyzed using thematic analysis, guided by Braun and Clarke's (2006) framework. This method was chosen to capture the depth and variability of participants' perspectives, illuminating how SIKL students perceive and experience bullying in both physical and digital contexts. Thematic analysis was deemed suitable given the need to explore subjective experiences across diverse individual backgrounds. The analytic process consisted of familiarizing oneself with the data, generating initial codes, searching for themes, reviewing themes, and defining and naming themes. Importantly, coding was conducted by three experts in qualitative research, ensuring thoroughness and mitigating potential bias. By systematically identifying and categorizing key patterns related to bullying, the findings offer a robust account of participants' experiences while maintaining the study's reliability and validity.

Results and Discussion

The purpose of this study was to investigate the specific understandings and experiences of transnational students regarding bullying and cyberbullying. The study sought to assess how their unique sociocultural backgrounds influence their involvement both as victims and perpetrators. The WordCloud result is shown in Figure 1. Generated from the data analysis highlights critical terms such as bullying, cyberbullying, harassment, physical, social, and verbal. This reflection of the student's experiences indicates that bullying encompasses more than just physical aggression. It also involves verbal and social harassment, mainly through online platforms like social media and the internet. Furthermore, the roles of victim and perpetrator are prominently featured in WordCloud. This suggests that transnational students are involved in bullying either directly or as bystanders. Their diverse sociocultural backgrounds shape their understanding of intimidation, humiliation, and dominance as central aspects of bullying behavior. These findings reveal that the students' sociocultural environments significantly influence their experiences and perceptions of bullying. This emphasizes the need for interventions considering cultural differences among transnational students when addressing bullying issues.

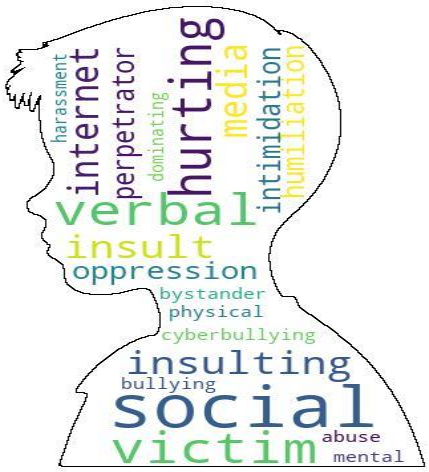

Figure 1. Worldcloud bullying experience

Students' Understanding of Bullying Types

Students explained the various forms of bullying, namely physical violence (e.g., hitting, body shaming), verbal abuse (e.g., name-calling, teasing), and online harassment (cyberbullying). Students recognized that physical violence includes acts of being hit or knocked down, which have a direct impact on the victim's body. Students also mentioned specific examples, such as body shaming, where students are teased or insulted based on their body shape. This understanding is important because physical violence is often the most visible form of bullying and has a significant direct impact on the victim.

> "Bullying is a condition where it can occur physically or non-physically. Usually, bullying occurs in groups."
> *(participant, 15 years old)*
> "Bullying is an aggressive act that is usually done by someone to intimidate or dominate another person."
> *(participant, 14 years old)*

These results indicate that the educational program can provide students with a comprehensive understanding of bullying behavior, including its forms and impacts (Hateriah & Sarkiah, 2023) and raise awareness of the importance of anti-bullying efforts (Razzaq et al., 2023). Psychoeducation is successful because of its comprehensive approach, providing students with in-depth knowledge about bullying, including its impact on both victims and perpetrators. Through psychoeducation, students become more aware of the negative consequences of bullying, which motivates behavioral change. The program also teaches social skills, allowing students to better understand others' perspectives and respond to bullying situations in a constructive manner, thus creating a safer and more enjoyable school environment.

Bullying Characteristics

Students explain the characteristics of bullying, namely aggressive behavior that aims to intimidate or dominate

students considered weaker. The intention to cause physical or emotional harm is the beginning of problems that often arise. Students understand that bullying occurs because there is an imbalance of power between the perpetrator and the victim. Bullies tend to target individuals whom they consider weaker, either physically, emotionally, or socially, to assert their dominance. This understanding is essential because it makes students aware that bullying is not just violent behavior, but also involves elements of systematic intimidation. Psychoeducation has succeeded in helping students recognize that bullying is not behavior that occurs by chance or due to misunderstanding but is a deliberate act to hurt others. This understanding can help students distinguish between ordinary conflict and bullying and encourage them to be more alert to early signs of bullying behavior.

> "aggressive actions that are usually carried out by someone to intimidate or dominate another person who is considered weaker."
> *(participant, 14 years old)*

Bullying as phenomenon deserves special attention by educators, parents, and schools because of two reseasons. Firstly, the prevalence of bullying and the harm that it causes are seriously underestimated by many children and adults. The violance prevention strategy is critical to raise the awareness of children, school staff, and parents. Secondly, the nature of bullying does not necessarily lend itself to the same interventions because it involves harassment by powerful children against children with less power. Therefore, common conflicet resolutuin strategies such as mediation may not be effective (Limber & Nation, 1998).

Psychoeducational programs can effectively improve emotional regulation, especially in the context of anger expression among adolescents, meaning that psychoeducational interventions can prevent bullying and violence in the school environment (Iuso et al., 2022). Psychoeducational programs are effective in improving emotional regulation because they equip adolescents with the skills to identify, understand, and manage their emotions, especially anger. By understanding the causal factors and learning self-control strategies, adolescents can express anger in healthy ways rather than through aggressive actions. When emotional regulation improves, the likelihood of engaging in bullying at school decreases, making psychoeducation an important role in preventing bullying and creating a safer and more enjoyable environment.

Impact on Victims

Students understand the emotional impact on victims, leading to depression, hurt feelings, and social isolation. It demonstrates a strong awareness of the serious consequences that bullying can have on mental health. Students' understanding that bullying can lead to depression demonstrates an awareness of how the psychological stress of persistent mistreatment can lead to severe mental disorders. Depression in victims of bullying can affect many aspects of their lives, including academic achievement, social relationships, and general well-being. Students recognize that bullying causes deep hurt feelings in victims. It demonstrates an understanding of how aggressive words and actions can hurt a person's feelings, causing emotional wounds that are invisible but very real.

> "Bullying is not a good example and makes people feel depressed."
> *(participant, 14 years old)*

"Bullying can make the victim feel hurt and offended by the treatment."
(participant, 13 years old)

Continuous bullying can result in severe emotional and psychological problems, including trauma, fear, depression, and anxiety. These effects can reduce academic performance and lead to other deviant behaviors (Hateriah & Sarkiah, 2023). Both victims and bullies experience negative impacts, such as decreased self-esteem and increased mental health problems. Victims of bullying often experience emotional dysregulation, which can manifest as difficulty managing emotions such as anger, sadness, and anxiety. It can lead to impulsive behavior and increased emotional responses, reducing emotional well-being (Iuso et al., 2022). Moreover, chidlren who had vivid memories of being victim of an aggresive act manifested a high level of post-traumatic stress (Houbre et al., 2006).

In addition, there are some bullying victims who choose to forgive despite feeling sad but ultimately surrender their grievances to a higher power, focus on their education, and forgive the perpetrators even though they no longer want to be involved with them. This process is often supported by close relationships and a desire to avoid the burden of revenge (Warnaningrum & Na'imah, 2016).

Studies of bullying suggest that there are short- and long-term consequences for both the perpetrators and victims of bullying. Longitudinal studies have found that victims of bullying in early grades also reported being bullied several years later. Another study found that aggresive behavior at the age of 8 was a powerful predictor of criminality and violent behavior at the age of 30 (Limber & Nation, 1998)

Forms of Cyberbullying

Students described cyberbullying in various forms, including online bullying, bullying through social media, and bullying carried out using devices such as mobile phones. Students' comprehensive understanding of various forms of cyberbullying indicates that they have a strong awareness of the dangers in the digital world. Students not only recognize cyberbullying in general but also understand the various methods that perpetrators can use to harm others online. These results also emphasize the importance of digital literacy among students. With the increasing development of technology and social media, understanding cyberbullying is becoming increasingly crucial to protect oneself from these dangers. This awareness is an essential first step in educating students to use technology responsibly and avoid actions that can harm others.

These findings suggest that psychoeducation about ethics in social media effectively increases students' awareness of cyberbullying, as supported by the study (Jalal, 2022), which recorded a 38% increase in students' understanding after the intervention. These results indicate that education focusing on digital ethics plays a vital role in equipping students with the knowledge needed to recognize and prevent cyberbullying, which can help reduce cases of online bullying.

"Distant/online bullying, on social media"

(participant, 14 years old)

"Cyberbullying is bullying that occurs using social media and the internet. Cyberbullying can also happen to anyone. Usually, the perpetrator will send something to the victim to bully the victim."

(participant, 16 years old)

“An oppression of the vulnerable or weak that is done online”

(participant, 14 years old)

Cyberbullying Characteristics

Students understand that cyberbullying is characterized by the use of technology for intimidation, humiliation, and social isolation and that it is anonymous and carried out remotely. Students understand that cyberbullying is the use of technological devices, such as computers and smartphones, to intimidate or pressure another person. This bullying can occur through various digital platforms, including social media, text messages, email, or online forums. Students' understanding of the characteristics of cyberbullying demonstrates that they are aware of the unique challenges of this form of bullying. This awareness is important because cyberbullying differs from traditional bullying in its methods, scope, and impact, which are often broader and more challenging to address.

“Being bullied on social media."

(participant, 15 years old)

“To scare, anger, or embarrass those targeted."

(participant, 15 years old)

Cyberbullying is caused by anger, hurt, and a desire for revenge, or arises from frustration and the urge to show power through excessive ego, causing them to hurt others. Therefore, there needs to be sanctions for perpetrators of cyberbullying, for example, being expelled from school and returning to the family to receive guidance and severe punishment (Akrim & Sulasmi, 2020). Through socialization efforts, students can increase their understanding of cyberbullying, essential for effective prevention. This awareness is expected to lead to more responsible behavior among teenagers using social media (Sari et al., 2023). Cyberbullying manifests through various forms of online interactions, where individuals can engage in harmful behavior without face-to-face confrontation, making it different from traditional bullying.

Cyberbullying may manifest through various channels, including the posting or dissemination of harmful comments and embarrassing videos, rumor-spreading, or explicit threats across multiple technological platforms such as text messages, emails, social media, online gaming, websites, and video chats (Agatston & Limber, 2018). For children and adolescents, who are navigating critical developmental milestones, the adverse effects of cyberbullying can be especially detrimental. This period of rapid cognitive, emotional, and social growth heightens their vulnerability to identity confusion, reduced self-esteem, and impaired peer relationships. Consequently, effective interventions should address not only the technological aspects of cyberbullying but also the developmental needs of this young age group—providing them with the tools to bolster resilience, develop healthy coping mechanisms, and maintain positive social bonds as they transition through these formative years.

Studies found strong associations between the perpetration of traditional bullying and cyberbullying, and between cyber victimization and traditional victimization. Those who had been cyberbullied, also tend to bullied in at least one 'traditional way'. Similarly, among youth who had cyberbullied others, they also had bullied others in at least one 'traditional' way. (Kowalski et al., 2014; Olweus, 2013).

Conclusion

This study offers a novel and insightful examination of bullying among Indonesian expatriate students in Malaysia, focusing on the unique sociocultural dynamics that shape their experiences both as victims and perpetrators. By focusing on this specific demographic, the research highlights these students' additional vulnerabilities, including cultural integration challenges, social isolation, and the pressures of living in a foreign environment. Through a qualitative approach using semi-structured interviews, this study successfully captured the nuanced and multifaceted nature of bullying experiences in physical and digital spaces. The thematic analysis identified significant findings regarding students' understanding of bullying, its forms, and its emotional and psychological impacts on victims. Notably, the results emphasize the critical need for anti-bullying interventions tailored to the distinct needs of transnational students. These interventions must address not only the overt physical and verbal aspects of bullying but also the subtle, often overlooked dynamics of cyberbullying, which presents unique challenges due to its anonymity and the extensive use of technology by students in this demographic.

Recommendations

This research underscores the importance of comprehensive psychoeducation programs focusing on emotional regulation, social skills development, and digital literacy. Such programs can enhance students' ability to navigate complex social environments and reduce their susceptibility to bullying behaviors. By fostering greater awareness and empathy, these programs contribute to creating safer, more inclusive school environments that cater to students' diverse cultural backgrounds. Beyond these immediate implications, future research could build on the current findings in several ways. Comparative studies with other expatriate or transnational student populations would help clarify whether the vulnerabilities identified here are unique to Indonesian expatriate students in Malaysia or generalizable across different cultural contexts. Longitudinal studies tracking the long-term impact of tailored anti-bullying interventions could further elucidate how well programs aimed at emotional regulation, social skills, and digital literacy sustain their effectiveness over time. Overall, the study offers valuable insights into the specific vulnerabilities of expatriate students in Malaysia, laying a foundation for interventions aimed at addressing bullying in multicultural educational settings. The findings highlight the necessity of culturally informed approaches to bullying prevention and underscore the importance of continued efforts to protect the mental health and well-being of transnational students.

Author(s)' Statements on Ethics and Conflict of Interest

***Ethics Statement*:** We hereby declare that this study adhered to established research and publication ethics, as

well as proper citation principles, at every stage. We accept full responsibility for the content of the paper in the event of any dispute. This research was approved by the Faculty of Health Sciences Ethics Committee, Universitas Muhammadiyah Purwokerto (KEPK/UMP/126/III/2024).

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Higher Education and Cultural Capital: The Role of Parental Education in Greek Medical School Choices

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Abstract

This study examines the relationship between parental educational attainment and access to Greek medical schools from 2006 to 2014, employing Bourdieu's concepts of cultural capital and habitus as a theoretical framework. The findings reveal a strong association between students' access to prestigious medical schools and their parents' educational attainment, with 72% of entrants having parents holding tertiary qualifications. This pattern reflects the systemic advantage conferred by higher cultural and social capital, which equips students from privileged backgrounds with the resources and dispositions necessary to succeed in competitive academic environments. Despite policies aimed at expanding higher education access, the results highlight persistent stratification, where students from lower socioeconomic backgrounds remain underrepresented. While the Greek economic crisis temporarily influenced admission thresholds, particularly among middle-class families, it did not significantly disrupt existing hierarchies within medical education. These findings align with global studies demonstrating that widening access does not inherently eliminate qualitative disparities within elite educational pathways. The study underscores the need for comprehensive policy reforms addressing structural inequalities in higher education, emphasizing not only expanded access but also equitable representation in high-status fields like medicine.

Keywords: Higher education, Cultural theory, Habitus, Bourdieu, Social origin, Parental education, Greek medical schools

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Introduction

Following the devastating aftermaths of World War II, a paradigm-shift from an industrial economy to a knowledge-and information-based society took place, which significantly transformed the structure of social and economic relationships, prioritizing the efficient use of information and knowledge. This transition, facilitated by advancements in modern technology, necessitates a highly trained workforce for both personal and national development (Kumar, 1998). Education and particularly, Higher Education, has therefore assumed a pivotal role in preparing individuals to engage in such societies, facilitating smoother transition into the labor market, fostering social mobility and enhancing their life prospects (Luthra & Flashman, 2017).

Since the 1990s, the European Union in collaboration with National efforts/policies, have sought to expand University access, encompassing initiatives designed to create an inclusive higher education system, by addressing social, cultural, economic, and institutional barriers, that deter marginalized groups (Allen and Storan, 2005). These efforts led to significant increases in higher education enrollment, nearly doubling the participation rates, for example in Sweden and UK (Johansson et al., 2005). Similar results were achieved in Greece's tertiary education, where by 2015 the attainment rate reached ca 40%, surpassing the European Union average of ca 38% (De Lel et al., 2015).

In Greece, the admission to higher education is determined by nationwide university entrance exams (Panhellenic Exams) conducted annually, after High School, where the number of available places is regulated by The Ministry of National Education. Inevitably, a strong competition has been established between candidates for the limited spots in the privileged departments. These include: a) Medical schools, which require the highest admission scores, b) Technical schools, c) Law schools, and d) Schools and Departments corresponding to modern branches of the Financial system (Gouvias, 2010; Kyriazis & Asderaki, 2008).

Social Origin and Access to Higher Education

In the last decades, it is a fact that the impressively large increase in admissions to Higher Education, has caused the overproduction of graduates, the inflation of degrees, resulting in the discounting of their symbolic value and their reduced utilization in the labor market, leading to lower absorption in the professional arena. Thus, the degradation of degrees with lower absorption has led to a hunt for the 'right' university schools and departments by candidates and their families, in order to ensure not only access for potential students but also their professional rehabilitation and social prestige. Inevitably, a competition has been created between candidates for the privileged departments, which promise the best prospects both economically and socially.

Equality of opportunity in education has the ultimate goal of giving all stakeholders equal opportunities to access the highest positions in society, characterized by prestige, high pay and values. However, recent sociological studies reveal that despite the increasing number of young people gaining access to higher education, the distribution of the student population in highly prestigious schools is disproportional, favoring people from privileged social strata due to their greater cultural, social, and economic capital (Jerrim, 2013), while students

from lower socioeconomic backgrounds tend to enroll in less prestigious schools (Lucas and Byrne, 2017). In this respect, increasing access to higher education alone does not guarantee equity; rather, the stratification within the system perpetuates existing inequalities, which tend to favor students from already affluent socioeconomic and cultural backgrounds (Kyridis, 2015; Sianou-Kyrgiou, 2006, 2008, 2010; Thompson, 2009; Whelan & Hannan, 1999)

A strong correlation has been identified between the social background of subjects and their academic choices (Sianou-Kyrgiou & Tsiplakides, 2009; Hatcher, 1998). Entrants choices are influenced by political, economic and social factors, as well as gender and cultural-formative capital, i.e. the ethos, values and dispositions of their family (Bourdieu, 2002:207). The social background of potential students seems to determine their educational path, without of course implying that it is the only factor that influences educational inequalities.

In higher education, social inequalities occur both at the level of access and at the level of allocation to schools. They become more acute as competition in demand for prestigious schools increases and as the socio-economic environment deteriorates. The social and cultural background of students' families in turn contributes to shaping their own culture through the accumulation and development of a system of dispositions that influence their educational success. The amount of cultural, social and economic capital available to the family, contributes significantly to the choices that determine the educational path of young people (Tsikalaki & Kladi Kokkinou, 2016).

Finally, a number of other inequalities, stemming from the external economic, social, cultural, environment, intensify inequality in education, such as the funding model, regional unequal distribution of funds, bureaucratic control, local society and culture, etc. Such a strong external economic factor was the *Economic Crisis* that started in Greece in 2010 until 2018. The economic crisis was a period of deep, prolonged recession where unemployment, part-time employment and unpaid work skyrocketed, public and private funding plummeted leading to the social disintegration of structures, including universities. Thousands of students in Greece, in a climate of collapse, were called upon to make crucial decisions about their future, which were taken in the context of a family strategy, directly linked to the wider socioeconomical context, which required the family to make high financial expenditures for tuition, an expenditure that was a one-way street even for parents from a lower social class (Kyridis, 1997).

Cultural Theory, Habitus and Educational Choices

Cultural theory was developed by Bourdieu in the 1960s. According to this theory, education is part of a superstructure that emphasizes the cultural capital that parents pass on to their children, which is socially differentiated and which rewards the children of the upper-dominant class in terms of their school and educational progress (Sianou-Kyrgiou, 2010:77). In this theory, the focus shifts from economic factors - i.e. the economic capital that each family possesses to help its children's careers - to cultural factors, i.e. the cultural - spiritual and symbolic sovereignty with which each family provides its offspring, its heirs. In other words, cultural capital is 'the sum total of the intellectual, primarily intellectual elements, such as knowledge, attitudes, skills, which the

young person acquires from his immediate family environment and which is differentiated according to his social class. More specifically, it concerns the social relations of the family, help with schoolwork and information about education and the paths it leads to. Other expressions of cultural capital include attending and participating in cultural events, the art of conversation, such as pronunciation and the 'correct' tone and style of voice, 'good' taste, style, wit and, in general, socially acceptable ways of doing and saying things. In sum, we could say that parents, depending on their level of education, directly influence their children's future choices, in this case for their studies (Paterekas, 1986).

Candidates who succeed in gaining admission to prestigious schools and departments with significant career prospects are usually children of the upper classes, who have grown up in a privileged environment and have inherited from their parents not only an economic, but mainly a cultural heritage (Kirides, 1997:108; Bourdieu, 1994:67)**.** Furthermore, the results of recent sociological research show that the family model, as well as the cultural, economic and social capital of the family, have a significant impact on the educational choices of middle- and working-class young people. This in turn influences the differentiated educational opportunities and perspectives of social subjects. In particular, young people from the middle social strata have stronger 'stocks' of 'family' cultural, economic and social capital and are oriented towards choosing studies with high social and academic prestige, such as medicine and law. The experiences of the parents of young people from middle-class backgrounds, who have graduated from higher education seem to reinforce the choices and orientation of their children towards university studies. In this case, both young people and their parents aim, through high-quality student choices, to maintain their social status and ensure the reproduction of their social privileges.

On the other hand, young people from working-class backgrounds, whose families have low levels of social, economic and cultural capital, tend to make 'pragmatic' choices in search of more 'compromising' educational outlets. International research shows that children from upper-class families with high educational capital and prestigious professions, such as scientists, senior civil servants and businessmen, are more likely to succeed in school and go to university than middle- and even lower-class children. Also, as far as the children of teachers are concerned, although they belong to the middle classes, they are a special category as they have the highest success rate.

As Bourdieu points out, even if some educational policy provides equal economic opportunities for all subjects, the gaps caused by the lack of cultural heritage cannot be filled. To prove this point, Bourdieu refers to the research of M. Paul Clerc (1964) who showed that students from families with the same educational background but different economic levels do not show any difference in their school performance. On the contrary, students coming from families with the same economic status but different educational capital differ in their performance. High educational and cultural capital of the family has a positive impact on school success, as children from these families perform better in all cognitive domains such as written and spoken language, mathematics, have higher academic achievements and more years of study.

In addition, Bourdieu's concept of *habitus* offers a robust framework for understanding how social and cultural factors shape students' educational trajectories. *Habitus* refers to the system of dispositions, attitudes, and

behaviors that individuals develop through their socialization within particular cultural and social contexts. It mediates the transfer of cultural capital, as it reflects the internalized experiences of an individual's family, social environment, and class position, influencing their perceptions, aspirations, and actions. Bourdieu posits that *habitus* develops through the accumulation of experiences, influencing the choices of social subjects and the achievement of their goals, arguing that it is a system of enduring, transferable dispositions that unifies past experiences, functions at any given moment as a matrix of perceptions and enables the achievement of various tasks (Bourdieu, 1977:83).

According to Bourdieu, the *habitus* formed during childhood through direct experiences or familial, often spontaneous, education does not rigidly determine an individual's attitudes, beliefs, and practices throughout their life. Instead, while *habitus* evolves with new experiences, the primary *habitus* shaped by family influences serves as the foundational framework for later dispositions of thought, perception, and action. This foundational influence makes educational choices, including the pursuit of high-level studies, deeply rooted in class-based *habitus*, which itself reflects the social origins of individuals (Bourdieu, 2006; Accardo, 1991). However, *habitus* is not entirely immutable. Exposure to higher education environments through programs aimed at widening participation can challenge and reshape existing *habitus* by equipping students with cultural and social resources they might otherwise lack. To be effective, such interventions must transcend merely increasing enrollment; they must dismantle systemic barriers within the education system to ensure that students from diverse backgrounds can access and succeed in prestigious academic fields (Reay et al., 2005).

It is important to point out that the influence of *habitus* extends beyond socioeconomic status to intersect with other variables, such as gender and geographic location. For instance, research shows that gendered expectations within families can channel male and female students toward different academic fields, reflecting the gendered nature of *habitus* (David et al., 2003).

In conclusion, parents coming from the upper social layers/strata, parents with a high level of education, apart from education, seem to have a remarkable general culture, are confident in themselves, confident and self-respecting for their professional and financial success, elements that they successfully transmit to their children, thus creating internal motivation and ambitions for the same level of career, in order to set high goals and claim high-ranking schools for their offsprings. The choice of higher education is essentially a social choice. Therefore, the social structure is reproduced through higher education.

Method

Based on the aforementioned literature review, which highlighted the fact that higher education is a highly stratified sector, i.e. students from different socioeconomic groups/origins attend different higher education institutions and courses of study, this case study aims to examine, under the prism of Cultural Theory, the relationship between the educational level of students' parents and their choice of Greek Medical schools, for the years 2006-2014, including the effects of Greek Economic Crisis. It is worth noting that Medical Schools were

specifically chosen not only due to their prestigious reputation, resulting in both high demand and high required admission scores, but also because of the professional opportunities they offer to their graduates.

The first stage of the present research for the years 2006-2014, including the period of Greek Economic Crisis, is related to the search and retrieval of the statistical data available in the database of the Hellenic Statistical Authority (ELSTAT, https://www.statistics.gr/), regarding the admission scores and number of entrants per year per Medical School (Health Sciences). All seven Greek Medical Schools were considered, i.e. Athens, Thessaly, Thessaloniki, Thrace, Ioannina, Crete and Patras.

ELSTAT also collects demographic data from all first-year students who enter higher education. Both parents' educational levels/degrees were considered as the demographic index of interest, spanning from: i) Doctoral (PhD)/Master's degree (MSc), ii) Higher Educational Institution degree (HEI)-Bachelor's degree, iii) Higher Technological Educational Institution degree (HTEI) or equivalent Technical School, iv) High School diploma, v) Junior High School diploma, vi) Primary Education diploma and vii) not completing Primary education or Illiterate. The data where stored, organized accordingly and processed using Microsoft Excel. The result findings are presented below.

Results

This section presents the results of the collected data analysis for the Greek Schools of Medicine from 2006 to 2014. The results are split in two sections, the first with regard to the admission scores and number of entrants and the second part regard the entrant's parental education level.

Admission Scores and Number of Entrants

Figure 1, plots the admission points (the score of the last admitted student) evolution for the seven Medical Schools of the country during the academic years of this study, 2006 to 2014. With a maximum attainable score of 20000 points and a total of ca 1000 available places for entrants per year, it is evident that the required admission points *for all Medical Schools* of the country, were amongst the highest in the Panhellenic examinations, reflecting not only the high demand and prestige of the medical profession, but the strong competition between the candidates as well.

In the same graph, it is shown that the Medical School in the largest urban center of the country, Athens, has consistently the highest admission scores for all years, compared to the other departments in the country. This persistence can be explained by the fact that large urban centers, let alone the largest one, are home to the largest number of candidates, who wish to enter the Medical School and stay in their place of residence for financial reasons. Moreover, it expresses the desire of many candidates from all over Greece to study Medicine in large urban centers, since these centers accumulate and provide high cultural capital, which is an important attraction for young people, especially students.

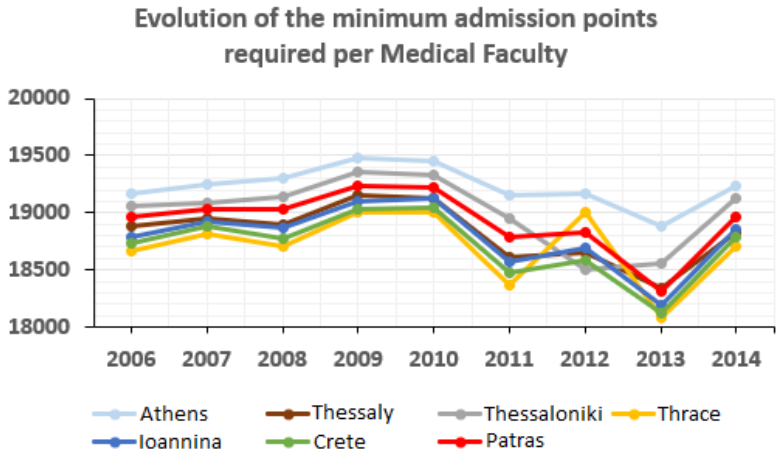

Figure 1. Minimum Admission Points for Medical Schools (2006-2014).

Regarding the evolution of the required admission threshold points over the years, it is interesting that during the academic years from 2006 up to the financial crisis of 2010, the trend was upward with little variation for all Medical Departments, while from 2011 to 2013, there is a clear downward trend with greater variation in almost all Schools of Medicine, until the year 2014 where the admission scores recover. A possible, but not the only one -due to the limited data and parameters studied- explanation of this behavior can be attributed to the aftermath of the economic crisis of 2010, that hit all social strata economically, especially the middle class, from which, as we have seen in the theoretical analysis, most of the candidates originate.

A last notable observation in Figure 1 concerns the rise of the admission threshold for Thrace Medical School for the academic year 2012. A plausible explanation for this spike could be the high order of preference due to the lower admission threshold of the previous years, i.e. candidates, due to their "low" performance in the Panhellenic examinations in 2012, knowing that in previous years Thrace Medical School had consistently the lowest admission scores amongst the other medicine schools, chose it with a higher order of preference in order to ensure their access, causing an increase in demand for the department with a concomitant rise in its admission threshold.

In Figure 2, the evolution of first year admitted students at the Greek Medical Faculties is shown. We first observe that the number of entrants is highest in the three major urban centers of Greece i.e. Athens, Thessaloniki and Patras. It exhibits an upward trend for almost all Medical Schools and for all academic years under study, with the exception of the Medical School in Thessaloniki, which in 2010, exhibited a drop in the number of admissions, of ca 35% from 2006.

In the upper part of the same graph, the total number of new entrants to all medical schools by academic year is shown. This graph confirms the upward trend shown by all faculties where in particular, an increase of 43% in

2014 compared to 2006 in the total number of new entrants is observed, declaring that medical schools maintained their high demand and prestige amidst the economic crisis.

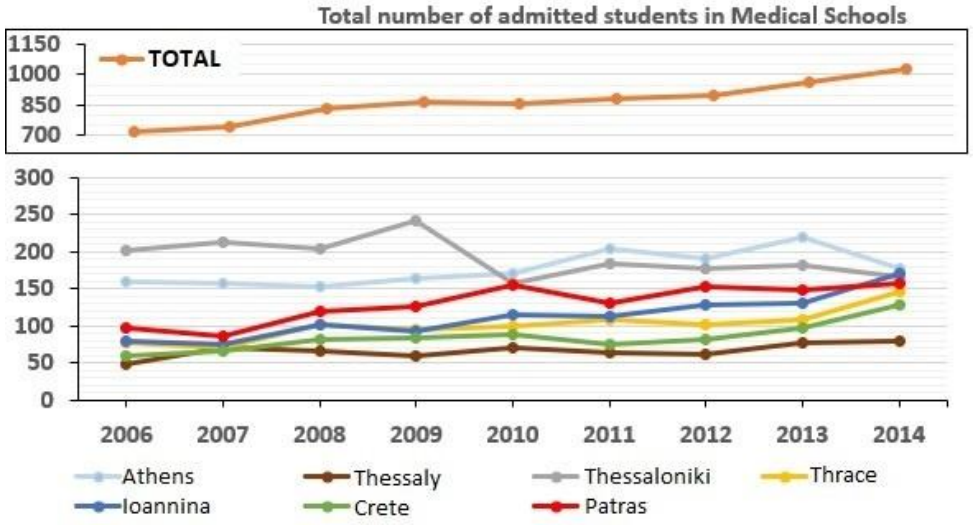

Figure 2. Top: Total Number of Admitted Medical Students Per Academic Year. Bottom: Number of Admitted Students Per School of Medicine.

Entrants Parents' Education Level

Bar Figure 3 present the percentage of students' parents (father and mother) sorted by educational level, for the Medical Schools of the three (for brevity) largest Greek urban centers, for the academic years 2006-2014. It is clear that the highest percentage (>40%). However, since the proportion of educational level of the other categories shows greater variation by Medicine School, to get a global view, Figure 4 shows the overall distribution of parents of new admitted students distributed by their educational level, for all medical schools and for all academic years (2006-2014).

According to Figure 4, out of the 23293 parents in total, 42.9% of them hold a university degree (HEI), 22.2% a master's or doctoral degree, 21.2% are High School graduates, 6.8% hold a HTEI degree or from a similar institution, 3.5% are parents who completed Junior High School, similarly 3.2% have completed only Primary School while a small 0.2% belongs to those who haven't completed primary school education or are illiterate.

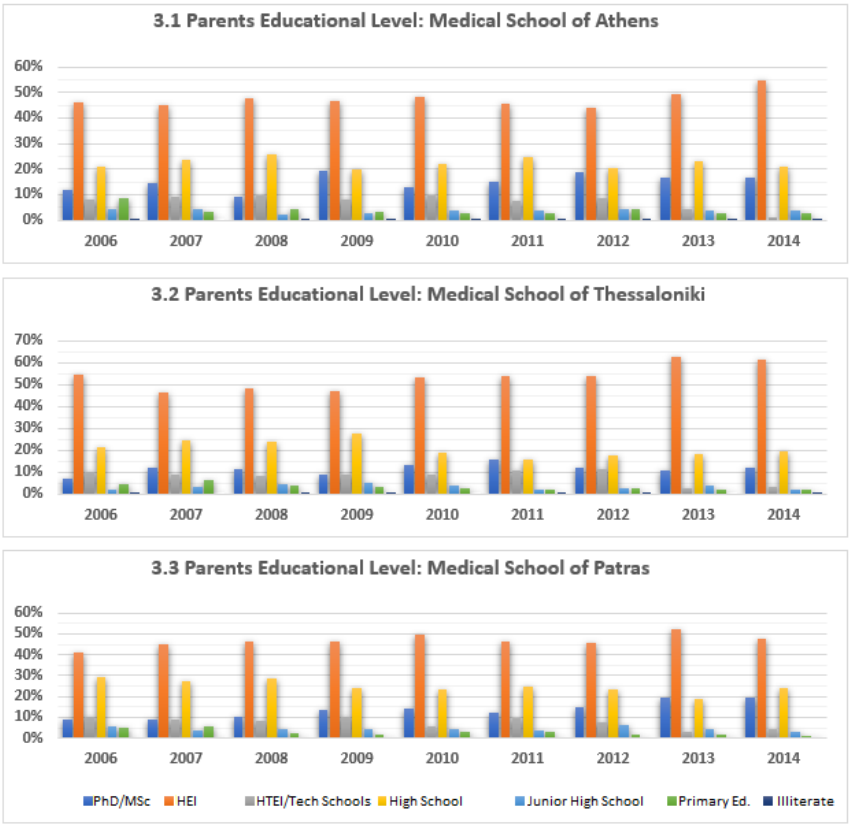

Figure 3. Parents' Educational Level Distribution for Three Medical Schools (2006-2014).

By summing the number of PhD/MSc and HEI holders we observe that 71.9% of student's parents (ca 7 out of 10) have successfully completed tertiary education, 24.7% of parents are graduates of secondary education (High School and Junior High School) and the remaining 3.4% have a background from primary education. These percentages confirm the influence of parents' educational level on their children's choice of schools for tertiary education, without, of course, ignoring the economic factors, since parents coming from tertiary education usually have higher income and hence can finance much more comfortably their children's educational needs.

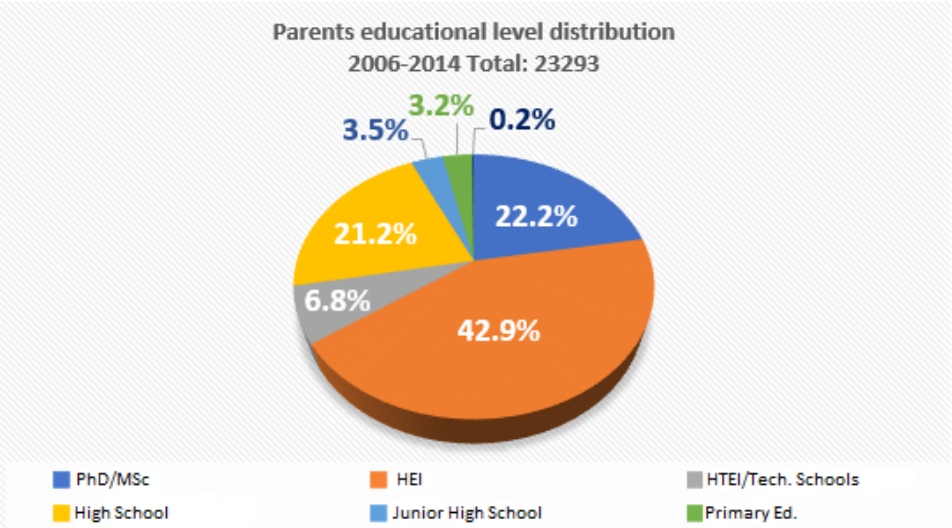

Figure 4. Parents' Educational Level Cumulative Distribution Across all Medical Faculties (2006-2014).

Finally, in Figure 5, we present the evolution of the absolute number of parents, by level of education, for the considered nine academic years and all Medical Schools, as the number of new medical students increases. It is highly evident that during these years, the number of parents who hold an HEI degree is not only greater than the rest educational levels, but is constantly increasing.

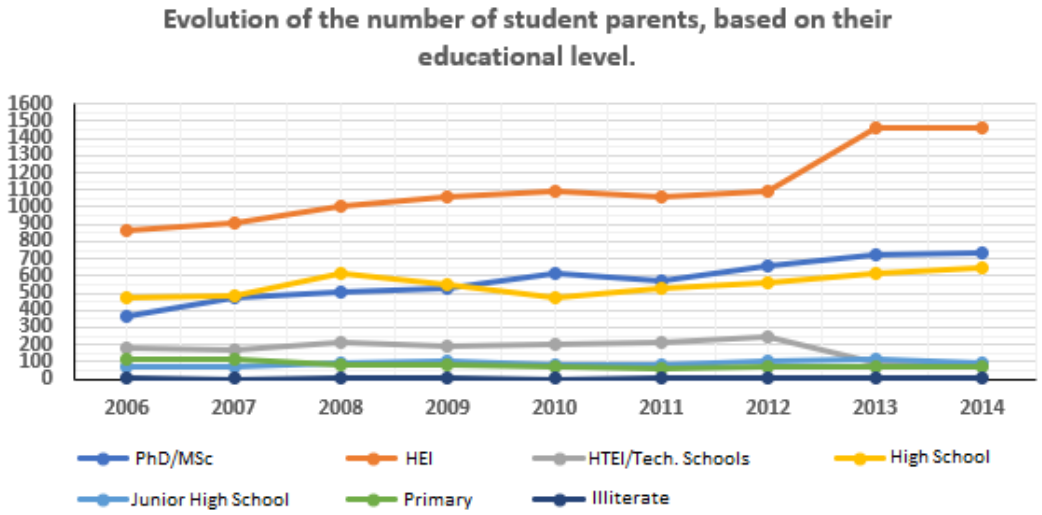

Figure 5. Yearly Evolution of Parents' Education Levels Across all Medical Schools.

A similar upward trend is exhibited by the category of parents who hold a Master's or Doctoral, degree as well as those who are high school graduates. The remaining categories show minimal variation. This demonstrates that parents with higher educational level are directing their children to prestigious and professionally promising Schools, while parents of lower educational levels and HTEI (KATEE/ATEI) choose different and more practical professional approaches, which require less years of study. As a side note Greek Medicine Schools' curricula require at least 6 years of study for General Medicine which is further increased depending on the specific Medical Specialty requirements.

Discussion

The findings of this study underscore the critical role of parental education as a marker of cultural capital in shaping access to Greek medical schools from 2006 to 2014. Bourdieu's cultural theory and the concept of *habitus* offer an insightful framework for understanding these dynamics. Bourdieu posits that cultural capital—manifested in the knowledge, dispositions, and intellectual resources transmitted by families—enables children from privileged social backgrounds to navigate competitive educational environments with relative ease (Bourdieu, 2002). This study affirms that students from families with higher educational attainment are overrepresented in Greek medical schools, with 72% of entrants having parents who hold tertiary qualifications (HEI, Master's, or Ph.D.). These findings align well with earlier research demonstrating that higher cultural capital shapes students' choices towards prestigious and demanding fields like medicine, law and engineering (Sianou-Kyrgiou, 2010).

The persistent overrepresentation of students from privileged social strata reflects the enduring stratification of

higher education. Bourdieu's notion of *habitus* and theory of cultural capital is particularly relevant here, as it encapsulates the dispositions and inclinations shaped by familial and social contexts that guide students' educational choices. For example, families with higher cultural capital tend to instill ambitions for prestigious careers, channeling their children toward high-status fields such as medicine. This process aligns with recent findings (Sianou-Kyrgiou, 2010; Sianou-Kyrgiou & Tsiplakides, 2009; Tsiplakides, 2018), who highlighted that access to elite educational pathways is systematically mediated by socioeconomic and cultural advantages. Conversely, students from working-class families, constrained by limited cultural and economic capital, often gravitate toward less prestigious educational opportunities, as also observed by Reay (2001) in Britain, claiming that they feel familiar to such an environment and they believe that it is easier to adjust.

The finding that ca 21% of the parents are High School diploma holders, demonstrates that medical schools are not entirely inaccessible to families with lower formal educational attainment, indicating some level of upward mobility within the education system. While these families may lack formal tertiary education, they might still possess certain forms of capital—such as strong familial support, high ambitions, emphasis on academic achievement, or even access to external preparatory resources—that enable their children to succeed.

The stratification observed in this study suggest that while policies aiming to expand access, such as the EU's widening participation initiatives, may increase enrollment, they fail to address the deeper structural inequities embedded within the education system. The persistence of these patterns aligns with the broader literature on educational stratification. Lucas (2001), for example, proposed the *Effectively Maintained Inequality* (EMI) theory, which suggests that socioeconomic inequalities are maintained not only through access but also through differentiation within educational systems. While Marks (2013) critiques EMI, arguing that academic ability and interests often mediate outcomes, his findings nonetheless highlight the complexities of how *habitus* interacts with other factors to shape educational choices.

The economic crisis in Greece between 2010 and 2018 further amplified these disparities. The study shows a temporary decline in admission thresholds during the crisis years, likely reflecting the financial hardships disproportionately impacted middle and lower socioeconomic groups. This observation echoes research by Kyridis (1997) and Gouvias (2010), who emphasized the vulnerability of educational aspirations to economic pressures, particularly in disciplines with long study durations and significant financial demands. Nevertheless, the resilience of medical schools' prestige and demand amidst the crisis indicates the enduring societal value and allure attributed to the medical profession.

Research Limitations and Future Recommendations

Even though the insightful findings of this work are in good agreement with current and earlier studies in the literature, this study is still constrained by its focus on quantitative data based on the parental educational attainment index, which captures only a single dimension of a complex and multifaceted phenomenon, neglecting qualitative insights into the motivations or challenges faced by prospect students from diverse backgrounds. Future research could incorporate interviews or surveys to explore the nuanced motivations and barriers faced by

students from diverse backgrounds and include more variables such as gender, etc. in order to capture the complex nature of *habitus*.

Conclusion

This study highlights the enduring influence of cultural capital, as conceptualized by Bourdieu, on access to Greek medical schools in the years 2006-2014 including the effects of the Greek Economic Crisis. The findings reveal that despite increasing enrollment rates and efforts to democratize higher education, access to prestigious fields like medicine remains heavily stratified, favoring students from families with higher educational attainment. These disparities underscore the persistence of systemic inequalities in educational pathways, perpetuated through familial transmission of cultural and social capital. In particular, the majority of parents (more than 72%) were graduates of higher education, holding university degrees (BSc, MSc and PhDs). There was also a significant number of parents (ca 21%) who came from secondary education, actively seeking a better future for their children with social and professional recognition and prospects respectively. The economic crisis in Greece further complicated these dynamics, momentarily lowering admission thresholds and reflecting broader societal vulnerabilities. In conclusion, the interplay of cultural, social, and economic factors continues to shape educational trajectories in ways that reproduce social hierarchies, emphasizing the need for ongoing research and targeted interventions to foster genuine equity in higher education.

Author(s)' Statements on Ethics and Conflict of Interest

***Ethics Statement*:** We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute. This study does not involve qualitative or quantitative data collection methods that require ethics committee approval, such as surveys, interviews, focus groups, observations, experiments, or similar techniques. Therefore, obtaining approval from an ethics committee does not apply to this research.

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Sustainability Education and Critical Thinking Integration in General Education

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Abstract

Education and critical thinking are integral in the achievement of Sustainable Development Goals. Thus, this study aims to examine the level of integration of sustainability education and critical thinking in General Education. Descriptive quantitative research design was employed in the study. Weighted mean was used to analyze the level of integration of General Education courses in terms of sustainable development key concepts and themes, critical thinking skills, and values and attitudes. The participants of the study were General Education faculty from three universities. The self-assessment results indicate moderate to high integration of sustainable development concepts, values, attitude, and critical thinking skills in GE. Consequently, the integration of specific sustainability concept, critical thinking skills, and values varies from high to weak level for individual courses. Noticeably, some courses have weak integration of environmental and economic concepts along with the critical thinking skill of theory building and synthesis. While integration is observed to some extent, overall results suggest a need for improvement in integration and interrelating the different dimensions of sustainability within each course as sustainability education advocates interdisciplinarity to address multifaceted problems and issues. Thus, faculty training in interdisciplinary and learner centered teaching is recommended to allow flexibility in integrating sustainability content and complex critical thinking skills in the course design. Moreover, further studies on curriculum alignment and teaching belief are recommended to corroborate with the results of this study.

Keywords: Critical thinking, General education, Sustainable development goals, Sustainability education.

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Introduction

Quality education has a central role in allowing individuals to live a sustainable life in a sustainable community. As mentioned by Tikly (2021), quality education capacitates individuals in realizing their capabilities and becoming productive contributors in the development of sustainable livelihoods, enhancement of well-being, and peaceful and democratic societies. Furthermore, quality education is the means to implement sustainable development as it provides an avenue for economic, social and environmental growth to be considered within a single goal of sustainable well-being (James & Ofei-Manu, 2015). Thus, the pursuit for quality education has always been a pursuit for sustainable development.

Despite efforts to integrate sustainability education in curriculum and instruction, several related research and studies have pointed out different issues in its practice and implementation. As summarized by Abera (2023), these issues include: (1) curricular and instructional alignment of education with sustainable development (Buckler & Creech, 2014), (2) unclear sustainability outcomes of curriculum and teaching (UNESCO, n.d.), (3) mismatch in teaching-learning approaches, (4) limited positive impact of educational strategies, (5) lack of interest of learners and teachers, (6) overwhelming content for teachers and students, and (7) indoctrination instead of promotion of critical skills like reflection (Carew et al, 2008). Moreover, central to these issues is seemingly the curriculum and instruction structure where the integration of sustainability education operates. This is exemplified by Culala and De Leon (2020) citing that the main challenge in the implementation of sustainability education is the practice of organizing sustainability content to traditional practices in teaching, thus failing to capture students' learning of sustainability skills. This may relate to the findings of Khadim, Qureshi, and Khan (2022) on the problem of sustainability education, which points out how sustainability content is integrated into narrow-focused courses. Similarly, the study of Wilhelm, Förster, and Zimmermann (2019) discusses how faculty often lack pedagogical competence to teach sustainability, while the results published by Ssossé, Wagner, and Hopper (2021) discusses how transmission of knowledge is prioritized rather than the development of skills for sustainable development.

Thus, this study aims to examine the extent of sustainability education (SE). Specifically, the study will examine the extent of integration of sustainability education in General Education (GE) courses. Thus, the central question explored in this paper is "What is the extent of integration and alignment of sustainability education in teaching and learning?"

Sustainability Education

Education is a key element in the progress and achievement of Sustainable Development Goals. Evidently, each chapter of the Agenda 21 states that education is integral in achieving sustainability as it promotes sustainable development processes and builds capacity for people to address development issues. The United Nations (1992) mentions that education and training is critical as it establishes the consistency of people's knowledge, skills, values, and attitudes with sustainable development principles and decision-making. As such, this implies that education should integrate sustainability content and skills through curriculum and instructional design to aid

global goals. Education for Sustainable Development (ESD) is a form of curriculum and instructional integration in sustainability education. As defined by UNESCO (2012):

> ESD, in its broadest sense, is education for social transformation with the goal of creating more sustainable societies. ESD touches every aspect of education including planning, policy development, programme implementation, finance, curricula, teaching, learning, assessment, and administration. ESD aims to provide a coherent interaction between education, public awareness, and training with a view to creating a more sustainable future. (p. 33)

By definition, ESD seems to touch many aspects of teaching and learning as it runs across the administration and management of educational policies, aside from curriculum and instruction. Furthermore, UNESCO characterized ESD pedagogies as those that utilize participatory learning, such as simulations and issue analysis techniques. Moreover, it encourages learners to ask questions, analyze issues, and make decisions. All these features imply a deviation from teacher-centered model and rote learning to a more student-centered and collaborative learning framework.

ESD also has five components as defined by McKeown (2006) in the UNESCO Education for Sustainable Development Toolkit. These 5 components are: (1) knowledge that includes disciplinal to transdisciplinal knowledge to support ESD; (2) understanding of issues on society, economics, and the environment that relates to sustainability; (3) skills to capacitate people to live sustainably: (4) perspectives that serve as lenses in understanding both global and local sustainability and development issues; and (5) understanding of societal, one's, and others' values in worldview that drives actions and practices.

It is important to note that ESD insists that sustainable development is integrated together rather than independent from one another. That is, the identified sustainability content is used to facilitate learning of transferable skills under behavioral conditions. All of which should be consistent with sustainable values and attitudes. Rickmann (as cited in Violanda & Madrigal, 2021) envisioned ESD in empowering learners to make informed and responsible decisions and actions through infusion of sustainability knowledge, skills, values, and attitudes in teaching and learning.

Challenges in Integrating Sustainability

Despite these efforts, UNESCO (2021) emphasized the challenges faced by the Philippines and other Southeast Asian countries in the implementation of ESD. Based on its 2021 education policy report, the following were found as barriers in the implementation of ESD:

- Differences and dynamism of current socio-cultural, -political, and -economic background,
- Surface level understanding of ESD by educators,
- Lack of school level support in ESD implementation,
- Overstretched curriculum, and
- Disparity in access to teaching and learning (especially during the COVID-19 pandemic).

On a related note, Malik (2018) remarked on the need of learning institutions to shift paradigms to respond to the demands of the 21st century. He argues that the dominant lecture-centric model of teaching cannot prepare students for the challenges of today. Further, he emphasized that skills needed by both teachers and students for teaching and learning are continuously changing. But the current school systems fail to catch up by still adhering to the dominant and outdated paradigm of education. As such, attempts to shift educational paradigms in response to the 21st century challenges of sustainable development would encompass a variety of reforms and multiple aspects in curriculum, assessment, pedagogy, administration, and technology integration.

While learning sustainability knowledge and skills through ESD is possible, putting it to actual practice is a different conversation. As sustainable development is a paradigm composed of belief systems and principles, it will require learners to shift their impressions and attitudes towards sustainability as well. Sterling and Thomas (as cited in Thomas, 2009) described ESD as a 'bolt-on' response or a change in cosmetic form in targeting education with sustainability. He envisioned ESD as instrumental to a stronger form of sustainability education, described as a 'build-in' response that targets education for sustainability. Moreover, Thomas (2009) emphasizes sustainable education as the strongest form of sustainability education preceding ESD and as a redesigned response targeting a widely integrative infusion of sustainability and interdisciplinary education. Thus, one needs to examine the strength of integrating ESD to proceed further towards sustainable education. Education is a key element in the progress and achievement of Sustainable Development Goals. Evidently, each chapter of the Agenda 21 states that education is integral in achieving sustainability as it promotes sustainable development processes and builds capacity for people to address development issues. The United Nations (1992) mentions that education and training is critical as it establishes the consistency of people's knowledge, skills, values, and attitudes with sustainable development principles and decision-making. As such, this implies that education should integrate sustainability content and skills through curriculum and instructional design to aid global goals.

In the Philippines, General Education (GE) has been revised by the Commission on Higher Education (2013) to hone sustainable development competencies among tertiary students such as intellectual competencies, imbued personal and civic responsibilities, and practical skills, to develop individuals who are conscious of their self and others and can contribute meaningfully to the Filipino society and the global community. Consequently, GE courses are described to go beyond traditional orientation of specific disciplines through interdisciplinary approach which then requires utilization of reading, research, and writing competencies into instruction. Despite efforts to integrate and align sustainability education in curriculum and instruction through interdisciplinary approach, Tsogtsaikhan, Park, and Park (2023) still emphasized issues in the implementation of sustainable education in higher education that seemingly originate from the old curriculum structures where the dominant and traditional educational paradigm operates. Hence, these issues may exist because sustainability education was implemented in the framework of traditional education. They cited the following challenges in the implementation of ESD:

- Lack of universal education framework for ESD,
- Different interpretations of ESD,
- Mismatch between framework, needs, and actual students' competencies and awareness of implementation

of ESD, and

- Misconnections pedagogy and sustainability competencies.

Critical Thinking as Foundation of Sustainability Education

Critical thinking is an important aim of education. As asserted by Kotzee (2020), it is the foundational aim of education along with rational thinking. Moreover, Baehr (2019) emphasized that critical thinking is a fundamental skill that needs to be developed by any individual regardless of one's discipline or profession. He cited that this skill entails the ability to break down and evaluate information, develop and properly communicate arguments, and make informed decisions and proposed solutions based on evidence. Though this entailment may vary from one discipline to another, central to critical thinking is the quality of the thoughts and ideas one produces in the context of the discipline where it is operated. For example, Moore (2013) defines critical thinking in seven frames coming from inputs of different disciplines. It has been defined as a form of judgement, a skeptical view of knowledge, a form or originality, a careful and sensitive reading of text, a form of rationalization, a way of adopting an ethical but activist stance, and a form of self-reflexivity. This is consistent with how Willingham (2008) described thinking being a form of reasoning, making decisions and evaluations, and solving problems. However, for Willingham (2009), there are more criteria to consider when defining practice as a form of critical thinking and not just merely thinking. It should have the qualities of effectiveness or avoiding pitfalls, novelty or being creative, and self-direction or being self-prompted. Thus, critical thinking may lead to productively making decisions, solving problems, and synthesizing in terms of sustainability issues because it is novel, reflexive, and purposive.

In the aim to further concretize, several literatures have also attempted to explore what commonalities are constituted in critical thinking despite different contexts. Common to these literature and studies is the importance of prior knowledge or schema to enable critical thinking. For Almedia and Franco (2011), as well as Ossa, Rivas, and Saiz (2023), knowledge base along with motivation and cognitive operations, such as argument analysis, verbal reasoning, decision making, and problem solving, are the three main aspects of critical thinking. Parallel to this are the components of critical thinking according to Facione (2015), which includes core thinking skills like interpretation, analysis, inference, and self-regulation. They insist on the critical spirit or disposition of being inquisitive, truth-seeking, open-minded, analytical, and systematic. Willingham (2009) also adds to this discussion the importance of baseline knowledge acquired and stored in the long-term memory as a form of factual and procedural awareness and how it is used to synthesize new information. This is then directed towards making decisions and problem-solving by combining the schema with the insights derived from the environment presented.

Critical thinking is a key competence towards sustainable development. While being defined based on discipline (Christenbury & Kelly, 1983; Thonney & Montgomery, 2019), UNESCO (2017) defined critical thinking in the lens of sustainable development as "the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse" (p. 10). Consistent with Bateson (1972) and Sterling (2004, as cited in Culala & De Leon, 2019), critical thinking is purposeful and

metacognitive (Dwyer, Hogan, & Stewart, 2014) and describes the quality of making inquiries, evaluations, reflections, decisions, and solving problems.

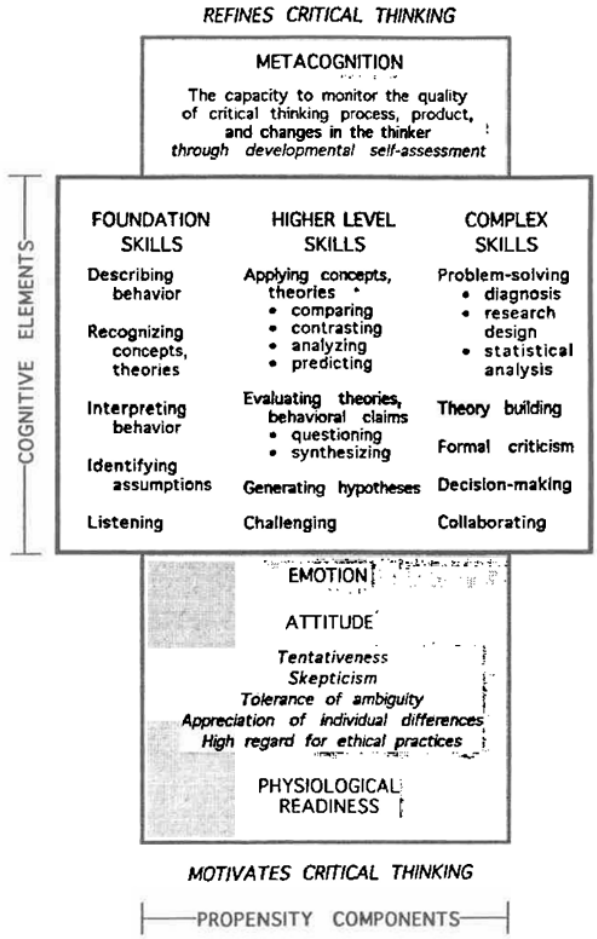

Figure 1. Refines of Critical Thinking (Wales & Nardi, 1984; Halonen, 1995; Davies & Barnett,2015).

Moving forward, perhaps one can better observe the link of critical thinking to sustainability education in the critical thinking model presented by Wales and Nardi (1984), later adapted by Halonen (1995) and presented by Davies and Barnett (2015). Their critical thinking framework suggested that critical thinking is composed of propensity components, cognitive elements, and metacognition. Furthermore, their model specifically categorizes cognitive elements into different skill levels – foundation, higher level, and complex skills (See Figure 1). The congruency of the critical thinking components to education for the sustainable development skills cited by UNESCO (2010) and Raufflet et al. (2009) can be observed in the common focus of both in terms of developing evaluation, challenging assertions, problem solving, decision-making, reflection, and collaboration skills.

So, while critical thinking is presumed in the cited literature and studies as the foundation of sustainability education based on cited literature (Sterling & Thomas, 2006; Thomas, 2009), it can be noted that it has its own and wide set of related research and studies. But, in the context of this study, the connections between sustainability education and critical thinking can be explicitly observed on the parallelism of critical thinking components and sustainable development skills as pointed out in cited literature. Thus, critical thinking is examined in this study as a sub-component of sustainability education.

Synthesis

Sustainable development aims to improve the quality of life without compromising the same for future generations. It is a paradigm consisting of principles within a belief system as basis of practice. Its aims are rooted in the holistic and interrelated development of social, economic, and environmental dimensions of society, encompassing many aspects of social actions and resources. Furthermore, sustainable development operates in consideration of people, prosperity, partnership, planet, and peace. Its principles are universal and attempts to address people's vulnerabilities by seeking interconnection, inclusiveness, and partnerships.

In the process of attaining sustainable development, education has an integral role as it paves way for curriculum integration of desired competencies, knowledge, skills, and attitudes. Most of which aids individuals in living sustainable lives in sustainable communities. Such integration leads to sustainability education that promotes an interdisciplinary and student-centered approach in learning sustainability and its entailments. Moreover, sustainability education integrates learning of critical thinking as its foundation, which leads to one's capacity for decision making, collaboration, imagining the future, and other skills needed to achieve sustainable development. Education for Sustainable Development (ESD) is one layer of sustainability education which encompasses a multitude of aspects on integration in the curriculum and educational administration.

But while there are visible efforts to integrate sustainability education in the curriculum, related research and literature point out different challenges in its implementation. This includes limited budgets and lack of public and teacher awareness. To some, the aforementioned challenges are seemingly mechanical and may be addressed through increased financial allocation and information dissemination. But, in actuality, the integration of sustainability education seems to have paradigmatic issues mainly due to its implementation within traditional curriculum structures and an instruction-centric paradigm. As such, one may attempt to integrate sustainability education in curriculum and instruction but may just end up adding content to an overcrowded curriculum. In the process, it may just promote rote learning and fail to capture the idea of capacitating students with critical thinking skills which then impairs them to develop other sustainable development competencies.

Research Question

In light of the reviewed related literature and studies, this paper aims to examine the integration of Sustainability Education (SE) and critical thinking (CT) in General Education (GE). Specifically, this study aims to explore the research question:

1. What is the level of integration of Sustainability Education in General Education in terms of:
    - 1.1. Sustainable development key concepts and themes
    - 1.2. Sustainable development - critical thinking skills
    - 1.3. Sustainable development values and attitudes
    - 1.4. Sustainable development competencies

With all of the cited sources considered and based on this review of related literature and studies, there is

seemingly a gap in the integration of sustainability education in the curriculum. This is evident in the cited issues of unclear learning outcomes, misconnections between pedagogy and competencies, and incoherence between teaching-learning practice and beliefs. Because there is already an existing body of research identifying these gaps in practice, the study focused on examining the extent of integration of sustainability education as perceived by selected faculty members teaching General Education. Findings from the study may be used as springboard to corroborate faculty perceptions on SE integration to studies on actual practice of integration.

This study situates itself on the transformational paradigm of research and thus aims to transform new understanding into theory, research, and practice of integrating sustainable development into the curriculum. Specifically, this study hopes to contribute to the achievement of the following:

- Student outcomes: Through utilizing the findings of the study in developing curriculum and instructional designs, students may be led to greater opportunities to learn and demonstrate different sustainable development competencies which can assist them in progressing on their personal and professional lives within sustainable communities.
- Teaching-learning practice: Teachers can apply the findings of the study in instructional designing towards better student achievement of target sustainable development competencies.
- Educational policy: School administrators will be informed by the findings of the study in developing curriculum policy frameworks and guidelines that will serve as basis for academic development and support services, such as teacher training and student interventions, targeting teaching and learning for sustainable development.
- Curriculum reconceptualization: Curriculum theorists and education researchers may gain new insights in understanding curriculum and sustainability as the study contributes to the existing body of knowledge on curriculum reconceptualization and sustainability education.

Method

Descriptive quantitative research design was employed in the study. As shown in Figure 2, the study examined the extent of sustainability education integration in the curriculum in terms of sustainable development key concepts and themes, critical thinking skills, and values and attitudes, which were identified based on the reviewed related literature and studies. As a disclaimer, this study did not test effects, relationships, and differences between the variables. Instead, the descriptive statistical results were corroborated with the findings and synthesis of reviewed literature.

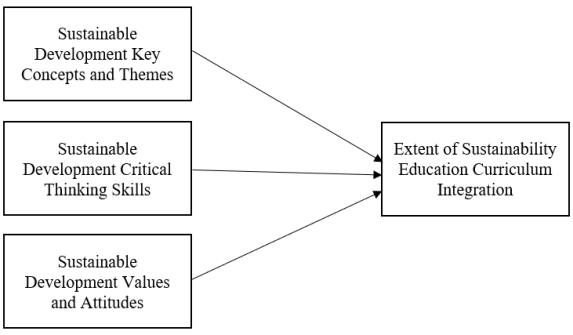

Figure 2. Theoretical Framework of the Study

Since the study focused on the integration of sustainability education in General Education courses, invitations and requests to participate in the study were sent to three colleges and universities in the University Belt area. These schools have a bachelor's degree offering because the target participants of the study were those who teach General Education courses. Additionally, selection of participating schools was based on existing initiatives, efforts, or vision to contribute to and/or integrate Sustainable Development Goals in the curriculum and have been established for 5 or more years to ensure that the school has already constructed its vision, mission, and practices. The study sites were the following:

- College 1 is a top university in the country. It offers various undergraduate and graduate degree programs which are recognized by the Commission on Higher Education (CHED) for its quality. Moreover, it is recognized locally and internationally by different accreditation and ranking systems. It also has different initiatives for sustainability as evident on its inclusion to an international ranking system of higher education for Sustainable Development Goals. It currently serves around 43,000 students.
- College 2 is a technological college which specializes in offering engineering and information technology degree programs. It has been active for more than 80 years and is recognized by CHED as an autonomous university. It currently serves around 3,000 students and focuses on innovations and nation-building as evident on its inclusion to an international ranking system which emphasizes higher education impacts to society.
- College 3 is a higher education institution who specializes in offering criminal justice education. It has been certified and accredited by different local accrediting and government agencies. Currently, efficiency and going green are parts of its key initiatives along with academic excellence. It currently caters for around 6,000 students.

In terms of the participants of the study, a purposive sampling was implemented. The universe of this study consists of faculty members employed in the three colleges for the academic year 2023-2024. Additionally, they should be (1) teaching GE courses; (2) may be a full-time faculty or a department chair; and (3) have been teaching in the college for at least three years. This population was chosen because the survey method required established beliefs and perception on one's practice on integrating sustainability education. Other differences between the nature of participating colleges/universities (e.g. private or state status; geographic location) and of participants (e.g. degree; employment type) were not included as variables for the study. These are elements that are contextually not relevant in the study in reference to its objective and research question. Moreover, other factors that may influence faculty's integration of sustainability education were not included in the data to be processed. However, these variables may be explored in future studies in connection with the findings of this research.

Table 1. Sample Size Based On Population

College	Total Number of Faculty Teaching GE	Number of Faculty who Participated	Percentage of Participation
College 1	325	62	19 %
College 2	80	16	20 %
College 3	60	18	30 %

Table 1 shows the sample size of the study from the 3 study sites. A sample size of at least 15 % of the population

is acceptable for methods which only require descriptive statistics (Bujang et al., 2015; Choi & Wong, 2016; Weber & Hoo, 2018). Since the quantitative part of the study would only involve the use of weighted mean to describe the perceived level of integration of sustainability education of faculty members, the sample size of the study can provide acceptable data.

Sources and Analysis of Data

To analyze the extent of integration of sustainability education as perceived by teachers, a structured and researcher-made survey questionnaire was administered. The questionnaire measures the level of integration of sustainability education in the General Education courses based on identified sustainable development key concepts and themes, critical thinking skills, and values and attitudes, put together from cited reviewed related literature and studies. The questionnaire was composed of 4 parts. The first part of the questionnaire allowed the participants to identify the GE course they teach. The second part referred to Sustainable Development knowledge, which detailed sustainable development key themes based on the Japanese National Commission for UNESCO (n.d.) and UNESCO (2010). The third part of the questionnaire refers to the Sustainable Development - Critical Thinking Skills synthesized by the researcher, based on UNESCO (2010), Raufflet, Dupre, and Blanchard (2009), and Wales and Nardi (as cited in Halonen, 1995). On the other hand, the fourth part of the questionnaire referred to the Sustainable Development Values and Attitudes (McKeown, 2006; UNESCO, 2010). The questionnaire was validated by external reviewers to assess content and construct validity. Table 2 presents the results of the pilot testing and reliability test through Cronbach Alpha which was run to ensure the internal consistency of the survey questionnaire. Since the acceptable value for Cronbach Alpha is at least 0.70 (Peterson, 1994; Kılıç, 2016), most of the items show internal consistency.

Table 2. Internal Consistency of the Survey Questionnaire

Categories	Sub-categories	Number of items	Items' Placement	Cronbach's Alpha
Concepts and Themes	Social Concepts	13	Part 2. # 1 – 13	0.825
	Environmental Concepts	10	Part 2. # 14 – 23	0.968
	Economic Concepts	6	Part 2. # 24 – 29	0.909
	Cultural Concepts	7	Part 2. # 30 – 36	0.925
Critical Thinking Skills	Foundational Skills	5	Part 3. # 1 – 5	0.859
	Higher Level Skills	6	Part 3. # 6 – 11	0.811
	Complex Skills	6	Part 3. # 12 – 17	0.717
Values and Attitudes	Social Values	3	Part 4. # 1 – 3	1.000
	Environmental Values	6	Part 4. # 4 – 9	0.795
	Economic Values	3	Part 4. # 10 – 12	0.859
	Cultural Values	6	Part 4. # 13 – 18	0.784

Note: N = 50

Participants self-assessed the level of integration of these in their GE course using the scale in Table 3. It is important to note that this research based its descriptors of levels of integration on Fogarty's (1991) models of curriculum integration. He described the first levels of integration as one sighting at a time or one directed focus, seemingly implying a fragmented integration to the whole. This was referred to as weak integration in this study. On the other hand, the next levels of integration were described as ones that exist across several and organized curriculum units. This was referred to as moderate integration in this study. Lastly, the highest levels of curriculum

integration are those that exist within and across learners allowing them to funnel, use, and integrate curriculum units in their area of interest. Thus, this was referred to as high integration in this study.

Table 3. Level of Integration Scale

Score	Range	Level of Integration	Description
1	1.75 and below	No Integration	• No topics related to the theme are discussed in the course. • Learning of the skill/values is not facilitated in the course.
2	1.76 – 2.50	Weak Integration	• One or some topics about the theme are discussed in the course. • Learning of the skill or values is facilitated in one or some topics in the course.
3	2.51 – 3.25	Moderate Integration	• Several topics about the theme are organized, connected, and discussed in the course. • Learning of the skill or values is facilitated and is recurring in several topics in the course.
4	3.26 – 4.00	High Integration	• Most topics and activities in the course can be linked by students to the theme. • Most topics and activities in the course provide students with opportunities to learn and use the skill or values.

Data from the survey method was analyzed through weighted mean. Weighted mean was used to statistically analyze the extent of integration of sustainability education and critical thinking in teaching and learning as perceived by teachers. The succeeding formula was used to compute for the weighted mean.

$$\dot{X} = \frac{\sum wx}{w}$$

Where:

$\dot{X}$ = weighted mean

$\sum wx$ = summation of the weight for each data point multiplied by the value of each data point

w = weight for each data point

x = value of each data point

Results

Overall Level of Integration of Sustainability Education in General Education

The overall self-assessment survey results presented in Table 4 indicate a moderate to high level of integration of sustainability education in teaching and learning. The results show moderate integration of social (*M*=3.20), environmental (*M*=2.73), and cultural (*M*=2.98) concepts and themes, complex critical thinking skills (*M*=3.19), and environmental (*M*=3.19) and economic (*M*=3.11) values. This indicates that several social, environmental, and cultural concepts topics are organized, connected, and discussed in GE courses and that learning of complex critical thinking skills and environmental and economic values is facilitated and recurring in several topics of GE courses. On the other hand, overall results show high integration of foundational and higher-level critical thinking skills, and social and cultural values. This means that most topics and activities in GE courses provide students

with opportunities to learn and use foundational and higher-level critical thinking skills, and social and cultural values.

Table 4. Overall Level of Sustainability Education Integration in Colleges

Sustainability Education	College 1		College 2		College 3		Overall	
	Mean	Verbal Interpretation	Mean	Verbal Interpretation	Mean	Verbal Interpretation	Mean	Verbal Interpretation
Concepts and Themes								
Social	3.20	Moderate	2.78	Moderate	3.48	High	3.2	Moderate
Environmental	2.64	Moderate	2.26	Weak	3.34	High	2.73	Moderate
Economic	2.82	Moderate	2.08	Weak	3.32	High	2.82	Moderate
Cultural	3.00	Moderate	2.42	Weak	3.35	High	2.98	Moderate
Critical Thinking Skills								
Foundational	3.45	High	3.26	High	3.31	High	3.4	High
Higher Level	3.50	High	3.04	Moderate	3.33	High	3.4	High
Complex	3.22	Moderate	2.90	Moderate	3.31	High	3.19	Moderate
Values and Attitudes								
Social	3.31	High	2.97	Moderate	3.44	High	3.29	High
Environmental	3.23	Moderate	2.77	Moderate	3.39	High	3.19	Moderate
Economic	3.14	Moderate	2.59	Moderate	3.37	High	3.11	Moderate
Cultural	3.34	High	2.95	Moderate	3.41	High	3.3	High

Noticeably while College 1 and 3 have moderate and high integration of sustainable development concepts and themes respectively, College 2 has weak integration in terms of environmental (M=2.26), economic (M=2.08), and cultural (M=2.42) concepts and moderate integration in terms of social concepts (M=2.78). This indicates that one or only a few environmental, economic, and cultural concepts are discussed in GE for College 2. On the other hand, moderate to high integration of critical thinking skills and sustainable development values and attitudes, can be observed between colleges.

Table 5 shows that most GE courses have moderate to high integration of sustainable development concepts, critical thinking skills, and values and attitudes. However, it can be observed that the course Ethics has weak integration of environmental (M=2.19) and economic (M=2.21) concepts while Mathematics in the Modern World and Understanding the Self have weak integration of environmental, economic, and cultural concepts. Moreover, Understanding the Self has weak integration of economic values (M=2.47) while Mathematics in the Modern World has weak integration of all sustainable development values and attitudes.

Table 5. Overall Level of Sustainability Education Integration in GE Courses

Sustainability Education	Art App		Ethics		MMW		Purp Comm		RPH		STS		TCW		Rizal		UTS	
	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI
Concepts and Themes																		
Social	3.54	High	3.17	Moderate	2.65	Moderate	3.33	High	3.42	High	3.26	High	3.60	High	3.71	High	2.94	Moderate
Environmental	2.63	Moderate	2.19	Weak	2.44	Weak	2.75	Moderate	2.55	Moderate	3.57	High	3.32	High	2.75	Moderate	1.76	Weak
Economic	3.22	Moderate	2.21	Weak	2.33	Weak	2.86	Moderate	2.94	Moderate	3.46	High	3.53	High	3.17	Moderate	1.88	Weak
Cultural	3.79	High	2.95	Moderate	2.10	Weak	3.33	High	3.48	High	2.97	Moderate	3.55	High	3.93	High	2.45	Weak
Critical Thinking Skills																		
Foundational	3.89	High	3.54	High	2.67	Moderate	3.41	High	3.61	High	3.24	Moderate	3.94	High	3.83	High	3.64	High
Higher Level	3.97	High	3.65	High	3.02	Moderate	3.42	High	3.47	High	3.22	Moderate	3.83	High	3.92	High	3.24	Moderate
Complex	3.97	High	3.27	High	2.87	Moderate	3.26	High	3.44	High	3.08	Moderate	3.72	High	3.71	High	2.71	Moderate
Values and Attitudes																		
Social	3.94	High	3.58	High	2.31	Weak	3.51	High	3.44	High	3.10	Moderate	3.72	High	3.67	High	3.58	High
Environmental	3.81	High	3.48	High	2.27	Weak	3.10	Moderate	3.33	High	3.43	High	3.83	High	3.75	High	2.89	Moderate
Economic	3.78	High	3.08	Moderate	2.38	Weak	3.23	Moderate	3.33	High	3.32	High	3.72	High	3.83	High	2.47	Weak
Cultural	3.97	High	3.52	High	2.43	Weak	3.38	High	3.33	High	3.33	High	3.75	High	4.00	High	3.18	Moderate

Note: WM – Weighted Mean; VI – Verbal Interpretation; Art App - Art Appreciation; MMW - Mathematics in the Modern World; Purp Comm - Purposive Communication; RPH - Readings in Philippine History; STS - Science, Technology, and Society; TCW - The Contemporary World; Rizal - The Life and Works of Rizal; UTS - Understanding the Self

Level of Integration of Sustainable Development Key Concepts and Themes in General Education

Overall results in Table 6 show that most sustainable development concepts and themes have moderate to high integration in GE courses. Notably, citizenship (*M*=3.34), globalization (*M*=3.41), human rights (*M*=3.28), inclusion (*M*=3.38), international understanding (*M*=3.36), and welfare, health, and wellbeing (*M*=3.36) have the highest level of integration. However, it can be observed as well that the topic of HIV and reproductive health (*M*=2.49), and of desertification (*M*=2.36) have an overall weak integration in GE. When grouped according to colleges, it can be noted that College 2 mostly focused on moderately integrating social concepts and themes (*M*=2.78) while weak integration can be observed on most environmental (*M*=2.26), economic (*M*=2.08), and cultural (*M*=2.42) concepts. When grouped according to GE courses as shown in Table 7, it can be observed that each GE course has its own focus in terms of sustainable development concepts. However, it is notable that Science, Technology, and Society has moderate to high integration in all identified sustainable development concepts and themes.

Table 6. Level of Sustainable Development Key Concepts and Themes Integration in Colleges

Sustainable Development Concepts and Themes	College 1		College 2		College 3		Overall	
	WM	VI	WM	VI	WM	VI	WM	VI
Social								
Building communities	3.12	Moderate	2.77	Moderate	3.50	High	3.14	Moderate
Citizenship	3.41	High	2.69	Moderate	3.61	High	3.34	High
Gender equity	3.20	Moderate	3.00	Moderate	3.44	High	3.22	Moderate
Globalization	3.42	High	3.15	Moderate	3.56	High	3.41	High
Good governance	3.20	Moderate	2.54	Moderate	3.50	High	3.17	Moderate
HIV and AIDS and reproductive health	2.41	Weak	2.08	Weak	3.06	Moderate	2.49	Weak
Human rights	3.31	High	2.77	Moderate	3.56	High	3.28	High
Inclusion	3.36	High	3.38	High	3.44	High	3.38	High
International understanding	3.44	High	2.85	Moderate	3.44	High	3.36	High
Leadership and organization	3.15	Moderate	2.77	Moderate	3.61	High	3.19	Moderate
Peace, conflict, and security	3.05	Moderate	2.62	Moderate	3.50	High	3.08	Moderate
Social discrimination	3.20	Moderate	2.54	Moderate	3.50	High	3.17	Moderate
Welfare, health, and wellbeing	3.39	High	2.92	Moderate	3.56	High	3.36	High
Composite Mean	3.20	Moderate	2.78	Moderate	3.48	High	3.20	Moderate
Environmental								
Biodiversity	2.81	Moderate	2.62	Moderate	3.50	High	2.92	Moderate
Climate change	2.92	Moderate	2.54	Moderate	3.44	High	2.97	Moderate
Deforestation	2.68	Moderate	2.31	Weak	3.39	High	2.77	Moderate
Desertification	2.22	Weak	2.00	Weak	3.06	Moderate	2.36	Weak
Disaster risk reduction	2.69	Moderate	2.08	Weak	3.33	High	2.73	Moderate
Energy	2.37	Weak	2.15	Weak	3.33	High	2.53	Moderate
Fresh water	2.42	Weak	2.23	Weak	3.39	High	2.59	Moderate
Natural disasters	2.71	Moderate	2.00	Weak	3.28	High	2.72	Moderate
Natural resource conservation	2.81	Moderate	2.46	Weak	3.33	High	2.87	Moderate
Pollution	2.76	Moderate	2.23	Weak	3.39	High	2.81	Moderate
Composite Mean	2.64	Moderate	2.26	Weak	3.34	High	2.73	Moderate
Economic								
Migration	2.66	Moderate	1.92	Weak	3.28	High	2.68	Moderate
Overconsumption	2.75	Moderate	2.08	Weak	3.33	High	2.77	Moderate
Poverty and equity	3.20	Moderate	2.46	Weak	3.28	High	3.11	Moderate
Rural development	2.71	Moderate	2.00	Weak	3.22	Moderate	2.71	Moderate
Sustainable production and consumption	2.76	Moderate	1.92	Weak	3.39	High	2.77	Moderate
Urbanization	2.86	Moderate	2.08	Weak	3.44	High	2.87	Moderate
Composite Mean	2.82	Moderate	2.08	Weak	3.32	High	2.82	Moderate
Cultural								
Cultural critique	3.12	Moderate	2.46	Weak	3.39	High	3.08	Moderate
Cultural heritage	3.00	Moderate	2.46	Weak	3.33	High	2.99	Moderate
Cultural preservation	2.98	Moderate	2.31	Weak	3.33	High	2.96	Moderate
Cultural renewal	2.93	Moderate	2.31	Weak	3.50	High	2.96	Moderate
Cultural values	3.15	Moderate	2.54	Moderate	3.28	High	3.09	Moderate
Indigenous knowledge	2.73	Moderate	2.31	Weak	3.28	High	2.78	Moderate
Religion and belief systems	3.07	Moderate	2.54	Moderate	3.33	High	3.04	Moderate
Composite Mean	3.00	Moderate	2.42	Weak	3.35	High	2.98	Moderate

Table 7. Level of Sustainable Development Key Concepts and Themes Integration in GE Courses

Sustainable Development	Art App		Ethics		MMW		Purp Comm		RPH		STS		TCW		Rizal		UTS	
Concepts and Themes	Mean	VI	Mean	VI	Mean	VI	Mean	VI	Mean	VI	Mean	VI	Mean	VI	Mean	VI	Mean	VI
Social																		
Building communities	3.50	High	2.75	Moderate	2.57	Moderate	3.15	Moderate	3.50	High	3.48	High	3.50	High	4.00	High	2.67	Moderate
Citizenship	3.67	High	3.13	Moderate	2.71	Moderate	3.31	High	3.83	High	3.48	High	4.00	High	4.00	High	3.08	Moderate
Gender equity	3.83	High	3.50	High	2.57	Moderate	3.46	High	3.00	Moderate	2.86	Moderate	3.67	High	3.75	High	3.58	High
Globalization	3.83	High	3.00	Moderate	3.14	Moderate	3.69	High	3.33	High	3.67	High	4.00	High	3.75	High	2.67	Moderate
Good governance	2.83	Moderate	3.50	High	2.79	Moderate	3.15	Moderate	3.83	High	3.24	Moderate	3.67	High	4.00	High	2.58	Moderate
HIV and AIDS and reproductive health	2.67	Moderate	1.63	No	2.21	Weak	2.23	Weak	2.33	Weak	2.86	Moderate	3.00	Moderate	2.00	Weak	2.92	Moderate
Human rights	3.67	High	3.88	High	2.43	Weak	3.54	High	3.67	High	3.14	Moderate	3.50	High	4.00	High	3.08	Moderate
Inclusion	3.83	High	3.88	High	2.57	Moderate	3.62	High	3.50	High	3.29	High	3.67	High	3.50	High	3.42	High
International understanding	3.83	High	3.25	Moderate	2.93	Moderate	3.69	High	3.50	High	3.52	High	4.00	High	4.00	High	2.42	Weak
Leadership and organization	3.17	Moderate	2.88	Moderate	2.79	Moderate	3.38	High	3.50	High	3.33	High	3.33	High	4.00	High	2.92	Moderate
Peace, conflict, and security	3.50	High	3.38	High	2.50	Weak	3.15	Moderate	3.33	High	3.10	Moderate	3.50	High	4.00	High	2.58	Moderate
Social discrimination	3.83	High	3.50	High	2.43	Weak	3.54	High	3.67	High	2.95	Moderate	3.50	High	3.75	High	2.83	Moderate
Welfare, health, and wellbeing	3.83	High	3.00	Moderate	2.86	Moderate	3.38	High	3.50	High	3.52	High	3.50	High	3.50	High	3.42	High
Composite Mean	3.54	High	3.17	Moderate	2.65	Moderate	3.33	High	3.42	High	3.26	High	3.60	High	3.71	High	2.94	Moderate
Environmental																		
Biodiversity	2.83	Moderate	2.75	Moderate	2.71	Moderate	3.15	Moderate	2.67	Moderate	3.67	High	3.17	Moderate	2.25	Weak	2.00	Weak
Climate change	2.50	Weak	2.88	Moderate	2.57	Moderate	3.31	High	2.33	Weak	3.71	High	3.67	High	3.25	Moderate	1.92	Weak
Deforestation	2.50	Weak	2.63	Moderate	2.36	Weak	2.62	Moderate	2.67	Moderate	3.71	High	3.17	Moderate	3.25	Moderate	1.67	No
Desertification	2.17	Weak	1.50	No	2.07	Weak	2.15	Weak	2.17	Weak	3.29	High	3.00	Moderate	2.50	Weak	1.67	No
Disaster risk reduction	2.67	Moderate	1.88	Weak	2.64	Moderate	2.69	Moderate	2.67	Moderate	3.43	High	3.33	High	2.75	Moderate	2.00	Weak
Energy	2.50	Weak	1.50	No	2.43	Weak	2.62	Moderate	2.50	Weak	3.33	High	3.17	Moderate	2.50	Weak	1.58	No
Fresh water	2.50	Weak	1.63	No	2.21	Weak	2.85	Moderate	2.50	Weak	3.48	High	3.17	Moderate	2.75	Moderate	1.58	No
Natural disasters	2.67	Moderate	2.13	Weak	2.50	Weak	2.69	Moderate	2.67	Moderate	3.52	High	3.33	High	2.75	Moderate	1.75	No
Natural resource conservation	3.17	Moderate	2.63	Moderate	2.43	Weak	2.69	Moderate	2.83	Moderate	3.76	High	3.67	High	2.75	Moderate	1.67	No
Pollution	2.83	Moderate	2.38	Weak	2.50	Weak	2.69	Moderate	2.50	Weak	3.76	High	3.50	High	2.75	Moderate	1.75	No
Composite Mean	2.63	Moderate	2.19	Weak	2.44	Weak	2.75	Moderate	2.55	Moderate	3.57	High	3.32	High	2.75	Moderate	1.76	Weak
Economic																		
Migration	3.17	Moderate	1.63	No	2.21	Weak	2.38	Weak	3.00	Moderate	3.43	High	3.83	High	3.50	High	1.67	No
Overconsumption	3.00	Moderate	2.25	Weak	2.29	Weak	2.77	Moderate	2.67	Moderate	3.48	High	3.67	High	2.75	Moderate	1.92	Weak
Poverty and equity	3.50	High	3.13	Moderate	2.57	Moderate	3.46	High	3.33	High	3.33	High	3.33	High	3.00	Moderate	2.58	Moderate
Rural development	3.00	Moderate	2.13	Weak	2.21	Weak	2.77	Moderate	3.00	Moderate	3.33	High	3.33	High	3.50	High	1.67	No
Sustainable production and consumption	3.33	High	2.13	Weak	2.29	Weak	2.85	Moderate	2.83	Moderate	3.57	High	3.33	High	3.00	Moderate	1.58	No
Urbanization	3.33	High	2.00	Weak	2.43	Weak	2.92	Moderate	2.83	Moderate	3.62	High	3.67	High	3.25	Moderate	1.83	Weak
Composite Mean	3.22	Moderate	2.21	Weak	2.33	Weak	2.86	Moderate	2.94	Moderate	3.46	High	3.53	High	3.17	Moderate	1.88	Weak
Cultural																		
Cultural critique	3.67	High	3.63	High	2.14	Weak	3.46	High	3.50	High	3.05	Moderate	3.50	High	4.00	High	2.42	Weak
Cultural heritage	3.83	High	2.75	Moderate	2.07	Weak	3.31	High	3.83	High	3.00	Moderate	3.50	High	4.00	High	2.42	Weak
Cultural preservation	3.83	High	2.50	Weak	2.07	Weak	3.46	High	3.83	High	3.00	Moderate	3.50	High	3.75	High	2.25	Weak
Cultural renewal	3.83	High	2.88	Moderate	2.29	Weak	3.31	High	3.33	High	2.95	Moderate	3.67	High	3.75	High	2.17	Weak
Cultural values	3.83	High	3.38	High	2.07	Weak	3.38	High	3.67	High	3.00	Moderate	3.67	High	4.00	High	2.67	Moderate
Indigenous knowledge	3.67	High	2.13	Weak	2.00	Weak	3.46	High	3.00	Moderate	2.81	Moderate	3.17	Moderate	4.00	High	2.17	Weak
Religion and belief systems	3.83	High	3.38	High	2.07	Weak	2.92	Moderate	3.17	Moderate	2.95	Moderate	3.83	High	4.00	High	3.08	Moderate
Composite Mean	3.79	High	2.95	Moderate	2.10	Weak	3.33	High	3.48	High	2.97	Moderate	3.55	High	3.93	High	2.45	Weak

Level of Integration of Sustainable Development Critical Thinking Skills in General Education

Table 8 shows the overall results of critical thinking integration in colleges based on the self-assessment survey. Similar to the overall trend of the survey, results show moderate to high integration of different critical thinking components and skills. However, when viewed for each GE course as shown in Table 9, it can be observed that there is a weak integration of the skill of synthesizing theories and claims (*M*=2.50) in Mathematics in the Modern World. Moreover, weak integration of students' ability to build theory can also be observed in Mathematics in the Modern World (*M*=2.50), Science, Technology, and Society (*M*=2.48), and Understanding the Self (*M*=2.17).

Table 8. Level of Critical Thinking Skill Integration in Colleges

Critical Thinking Skills	College 1		College 2		College 3		Overall	
	M	VI	M	VI	M	VI	M	VI
Foundational Skill								
Students can describe behavior	3.19	Moderate	3.08	Moderate	3.44	High	3.22	Moderate
Students can recognize concepts and theories	3.53	High	3.23	Moderate	3.28	High	3.43	High
Students can listen	3.64	High	3.46	High	3.22	Moderate	3.53	High
Composite Mean	3.45	High	3.26	High	3.31	High	3.40	High
Higher Level Skill								
Students can apply theories	3.59	High	3.38	High	3.61	High	3.57	High
Students can compare, contrast, analyze, or predict using theories and concepts	3.59	High	3.23	Moderate	3.44	High	3.51	High
Students can question theories and claims	3.56	High	2.77	Moderate	3.28	High	3.39	High
Students can synthesize theories and claims	3.31	High	2.77	Moderate	3.11	Moderate	3.19	Moderate
Students can generate hypothesis	3.32	High	3.08	Moderate	3.28	High	3.28	High
Students can challenge ideas	3.61	High	3.00	Moderate	3.28	High	3.46	High
Composite Mean	3.50	High	3.04	Moderate	3.33	High	3.40	High
Complex Skill								
Students can diagnose problems	3.32	High	3.15	Moderate	3.28	High	3.29	High
Students can design or propose solutions	3.36	High	3.23	Moderate	3.33	High	3.33	High
Students can analyze data	3.25	Moderate	2.62	Moderate	3.28	High	3.17	Moderate
Students can build theory	2.66	Moderate	2.69	Moderate	3.11	Moderate	2.76	Moderate
Students can do formal criticism	3.22	Moderate	2.69	Moderate	3.44	High	3.19	Moderate
Students can do decision-making	3.53	High	3.00	Moderate	3.44	High	3.43	High
Composite Mean	3.22	Moderate	2.90	Moderate	3.31	High	3.19	Moderate

Note: M – Weighted Mean; VI – Verbal Interpretation.

Table 9. Level of Critical Thinking Skill Integration in GE Courses

Critical Thinking Skills	Art App		Ethics		MMW		Purp Comm		RPH		STS		TCW		Rizal		UTS	
	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI	M	VI
Foundational Skill																		
Students can describe behavior	3.67	High	3.50	High	2.21	Weak	3.08	Moderate	3.67	High	3.05	Moderate	3.83	High	4.00	High	3.67	High
Students can recognize…	4.00	High	3.63	High	2.57	Moderate	3.62	High	3.50	High	3.29	High	4.00	High	3.75	High	3.67	High
Students can listen	4.00	High	3.50	High	3.21	Moderate	3.54	High	3.67	High	3.38	High	4.00	High	3.75	High	3.58	High
Composite Mean	3.89	High	3.54	High	2.67	Moderate	3.41	High	3.61	High	3.24	Moderate	3.94	High	3.83	High	3.64	High
Higher Level Skill																		
Students can apply theories	4.00	High	3.50	High	3.21	Moderate	3.77	High	3.67	High	3.48	High	4.00	High	3.75	High	3.42	High
Students can compare……	4.00	High	3.75	High	3.07	Moderate	3.46	High	3.67	High	3.48	High	4.00	High	3.75	High	3.33	High
Students can question theories and claims	4.00	High	3.63	High	3.07	Moderate	3.31	High	3.67	High	3.19	Moderate	3.83	High	4.00	High	3.17	Moderate
Students can synthesize….	4.00	High	3.63	High	2.50	Weak	3.31	High	3.17	Moderate	2.90	Moderate	3.50	High	4.00	High	3.25	Moderate
Students can generate hypothesis	3.83	High	3.75	High	3.00	Moderate	3.15	Moderate	3.17	Moderate	3.14	Moderate	3.67	High	4.00	High	3.00	Moderate
Students can challenge ideas	4.00	High	3.63	High	3.29	High	3.54	High	3.50	High	3.14	Moderate	4.00	High	4.00	High	3.25	Moderate
Composite Mean	3.97	High	3.65	High	3.02	Moderate	3.42	High	3.47	High	3.22	Moderate	3.83	High	3.92	High	3.24	Moderate
Complex Skill																		
Students can diagnose problems	4.00	High	3.50	High	2.79	Moderate	3.31	High	3.17	Moderate	3.29	High	4.00	High	4.00	High	2.83	Moderate
Students can design or propose….	4.00	High	3.50	High	2.79	Moderate	3.62	High	3.67	High	3.33	High	4.00	High	3.75	High	2.58	Moderate
Students can analyze data	4.00	High	3.13	Moderate	3.14	Moderate	3.31	High	3.67	High	2.76	Moderate	3.50	High	3.75	High	2.75	Moderate
Students can build theory	3.83	High	3.25	Moderate	2.50	Weak	2.62	Moderate	2.83	Moderate	2.48	Weak	3.50	High	3.50	High	2.17	Weak
Students can do formal criticism	4.00	High	3.00	Moderate	2.93	Moderate	3.00	Moderate	3.67	High	3.29	High	3.50	High	3.50	High	2.75	Moderate
Students can do decision-making	4.00	High	3.25	Moderate	3.07	Moderate	3.69	High	3.67	High	3.33	High	3.83	High	3.75	High	3.17	Moderate
Composite Mean	3.97	High	3.27	High	2.87	Moderate	3.26	High	3.44	High	3.08	Moderate	3.72	High	3.71	High	2.71	Moderate

Note: WM – Weighted Mean; VI – Verbal Interpretation; Art App - Art Appreciation; MMW - Mathematics in the Modern World; Purp Comm - Purposive Communication; RPH - Readings in Philippine History; STS - Science, Technology, and Society; TCW - The Contemporary World; Rizal - The Life and Works of Rizal; UTS - Understanding the Self

Level of Integration of Sustainable Development Values and Attitudes in General Education

Table 10 and 11 show the level of integration of sustainable development values and attitudes based on the self-assessment survey on GE faculty. Based on these results, there is an overall moderate to high integration of identified values and attitudes in GE courses. When grouped based on colleges, College 2 has a weak integration on the environmental values of precautionary principle (M=2.38) and on the economic values of equitable distribution and sharing of wealth and resources (M=2.46). When grouped based on GE course, it is notable that Mathematics in the Modern World was only able to moderately integrate one values which is respect for the Earth and life in all its diversity (M=2.57). All of the other sustainable development values and attitudes have weak integration in the course which means that learning of these is only facilitated in one or few topics in the course.

Table 10. Level of Sustainable Development Values Integration in Colleges

Values and Attitude	College 1		College 2		College 3		Overall	
	Mean	Verbal Interpretation	Mean	Verbal Interpretation	Mean	Verbal Interpretation	Mean	Verbal Interpretation
Social								
Non-discrimination, inclusion, equity and social justice	3.42	High	3.15	Moderate	3.56	High	3.41	High
Participation in decision-making and access to justice	3.25	Moderate	2.92	Moderate	3.33	High	3.22	Moderate
Affirmation of gender and other forms of equity and inclusivity	3.25	Moderate	2.85	Moderate	3.44	High	3.23	Moderate
Composite Mean	3.31	High	2.97	Moderate	3.44	High	3.29	High
Environmental								
Protection of ecological integrity and care for the community of life	3.14	Moderate	2.69	Moderate	3.33	High	3.11	Moderate
Ethical actions needed to restore damaged ecosystems	3.05	Moderate	2.77	Moderate	3.44	High	3.09	Moderate
Prevention of harm	3.19	Moderate	2.69	Moderate	3.44	High	3.17	Moderate
Precautionary principle	3.12	Moderate	2.38	Weak	3.44	High	3.08	Moderate
Respect and care for life and the community of life	3.49	High	3.08	Moderate	3.33	High	3.40	High
Respect for future generations	3.39	High	3.00	Moderate	3.33	High	3.32	High
Composite Mean	3.23	Moderate	2.77	Moderate	3.39	High	3.19	Moderate
Economic								
Eradication of poverty as an ethical, social, and environmental imperative	3.15	Moderate	2.54	Moderate	3.39	High	3.11	Moderate
More equitable distribution and sharing of wealth and resources	3.15	Moderate	2.46	Weak	3.33	High	3.09	Moderate
Safeguarding of the Earth's regenerative capacities, human rights and community well-being in production and consumption patterns	3.12	Moderate	2.77	Moderate	3.39	High	3.12	Moderate
Composite Mean	3.14	Moderate	2.59	Moderate	3.37	High	3.11	Moderate
Cultural								
Respect for the Earth and life in all its diversity	3.22	Moderate	2.77	Moderate	3.39	High	3.19	Moderate
Care for the community of life	3.34	High	2.54	Moderate	3.50	High	3.26	High
Care for others and their well-being	3.46	High	3.15	Moderate	3.39	High	3.40	High
Principles of equity and respect for others	3.36	High	3.15	Moderate	3.39	High	3.33	High
Human dignity, bodily health, and spiritual well-being	3.44	High	3.08	Moderate	3.44	High	3.39	High
Tolerance, non-violence, and peace	3.22	Moderate	3.00	Moderate	3.33	High	3.21	Moderate
Composite Mean	3.34	High	2.95	Moderate	3.41	High	3.30	High

Table 11. Level of Sustainable Development Values Integration in GE Courses

Values and Attitude	Art App		Ethics		MMW		Purp Comm		RPH		STS		TCW		Rizal		UTS	
	WM	VI	WM	VI	WM	VI	WM	VI	WM	VI	WM	VI	WM	VI	WM	VI	WM	VI
Social																		
Non-discrimination, inclusion, equity…	4.00	High	3.75	High	2.36	Weak	3.77	High	3.50	High	3.19	Moderate	3.83	High	3.75	High	3.75	High
Participation in decision-making…	3.83	High	3.50	High	2.50	Weak	3.15	Moderate	3.50	High	3.19	Moderate	3.50	High	3.50	High	3.33	High
Affirmation of gender and other forms…	4.00	High	3.50	High	2.07	Weak	3.62	High	3.33	High	2.90	Moderate	3.83	High	3.75	High	3.67	High
Composite Mean	3.94	High	3.58	High	2.31	Weak	3.51	High	3.44	High	3.10	Moderate	3.72	High	3.67	High	3.58	High
Environmental																		
Protection of ecological integrity…	3.50	High	3.13	Moderate	2.21	Weak	3.08	Moderate	3.17	Moderate	3.62	High	3.83	High	3.75	High	2.50	Weak
Ethical actions needed to restore….	3.67	High	3.75	High	2.07	Weak	2.92	Moderate	3.33	High	3.52	High	3.83	High	3.75	High	2.25	Weak
Prevention of harm	3.83	High	3.38	High	2.21	Weak	3.00	Moderate	3.17	Moderate	3.43	High	3.67	High	3.75	High	3.08	Moderate
Precautionary principle	3.83	High	3.00	Moderate	2.29	Weak	2.92	Moderate	3.33	High	3.24	Moderate	3.67	High	3.75	High	2.92	Moderate
Respect and care for life and the …	4.00	High	4.00	High	2.36	Weak	3.38	High	3.33	High	3.52	High	4.00	High	3.75	High	3.33	High
Respect for future generations	4.00	High	3.63	High	2.50	Weak	3.31	High	3.67	High	3.24	Moderate	4.00	High	3.75	High	3.25	Moderate
Composite Mean	3.81	High	3.48	High	2.27	Weak	3.10	Moderate	3.33	High	3.43	High	3.83	High	3.75	High	2.89	Moderate
Economic																		
Eradication of poverty as an ethical..	3.83	High	3.13	Moderate	2.29	Weak	3.31	High	3.50	High	3.19	Moderate	3.67	High	3.75	High	2.67	Moderate
More equitable distribution and…	3.83	High	3.25	Moderate	2.50	Weak	3.15	Moderate	3.50	High	3.14	Moderate	3.67	High	3.75	High	2.42	Weak
Safeguarding of the Earth's regenerative...	3.67	High	2.88	Moderate	2.36	Weak	3.23	Moderate	3.00	Moderate	3.62	High	3.83	High	4.00	High	2.33	Weak
Composite Mean	3.78	High	3.08	Moderate	2.38	Weak	3.23	Moderate	3.33	High	3.32	High	3.72	High	3.83	High	2.47	Weak
Cultural																		
Respect for the Earth and life in all its…	3.83	High	3.00	Moderate	2.57	Moderate	3.08	Moderate	3.17	Moderate	3.57	High	3.83	High	4.00	High	2.58	Moderate
Care for the community of life	4.00	High	3.00	Moderate	2.43	Weak	3.46	High	3.33	High	3.52	High	3.50	High	4.00	High	2.92	Moderate
Care for others and their well-being	4.00	High	3.75	High	2.43	Weak	3.38	High	3.33	High	3.52	High	3.83	High	4.00	High	3.42	High
Principles of equity and respect for others	4.00	High	3.75	High	2.50	Weak	3.54	High	3.17	Moderate	3.14	Moderate	3.83	High	4.00	High	3.42	High
Human dignity, bodily health, and spiritual well-being	4.00	High	4.00	High	2.36	Weak	3.54	High	3.50	High	3.24	Moderate	3.67	High	4.00	High	3.58	High
Tolerance, non-violence, and peace	4.00	High	3.63	High	2.29	Weak	3.31	High	3.50	High	3.00	Moderate	3.83	High	4.00	High	3.17	Moderate
Composite Mean	3.97	High	3.52	High	2.43	Weak	3.38	High	3.33	High	3.33	High	3.75	High	4.00	High	3.18	Moderate

Discussion

In general, the self-assessment results indicate moderate to high integration of sustainable development concepts, values, attitude, and critical thinking skills in General Education. The integration of specific sustainability concepts, critical thinking skills, and values varies from high to weak level for individual courses and colleges. This is seemingly the same general observations in some higher education institutions where the level of integration varies widely from holistic to incremental integration (Menon & Suresh, 2020; Dmochowski et al., 2016; Argento, 2020). Noticeably, some courses and colleges have weak integration of environmental and economic concepts along with the critical thinking skill of building theory and synthesis. This is related to the findings of Sidiropoulos (2014) and Thürer et al. (2017) where disciplinary differences, such as focus on technical aspects, are pivotal determiner of the level of integration of sustainability content.

While each GE course may have focused on particular aspects of sustainability in terms of concepts, skills, values and attitude, sustainability education interrelates the social, environmental, economic, and cultural domains and thus should progress together and all be given emphasis. Integration of multiple dimensions of sustainability allows a holistic approach in students' understanding of interconnected and multifaceted aspects of sustainability issues (Parry & Metzger, 2023; Zorba, 2023; Sharia & Sitchinava, 2023) which then promotes comprehensive problem-solving and decision-making skills. Consistent with UNESCO's (2012) description of sustainable development as convergence of development with social, environmental, economic, and cultural dimensions, Commission on Higher Education Mem. Ord. No. 20 (2013) specifies that GE courses are supposed to be interdisciplinary and go beyond the orientation of specific disciplines. Thus, the weak integration of main sustainable development concepts and critical thinking skills in the course Ethics, Mathematics in the Modern World, and Understanding the Self is a point of improvement when relatively compared to other GE courses which were able to moderately and highly integrate all main sustainable development concepts, critical thinking skills, values and attitude. The same argument can be made in the case of College 2, which moderately integrates social concepts but weakly integrates environmental, economic, and cultural themes.

Additionally, there is an observed weak to high level of integration on selected sustainable development concepts and themes. When viewed for each sustainable development key concepts and themes, citizenship, globalization, human rights, inclusion, international understanding, and welfare, health and wellbeing have the overall highest level of integration while HIV and reproductive health and desertification have an overall weak integration in GE. While it can be understandable that not all key concepts can be integrated given the time constraints and congested course curriculum, it is seemingly an imperative to at least integrate the critical thinking skill sets needed for students to practice sound decision-making and problem-solving. As emphasized by Weimer (2002), content is the vehicle to demonstrate skills, and it is what students critically think about (Centre for Higher Education Research, Policy and Practice, 2019) during teaching-learning activities (TLAs) and assessment tasks (ATs). Thus, while students may not be able to cover all sustainable development concepts, they should be able to practice all critical thinking skill sets using whatever content allowed given the constraints. By doing so, students may be able to progress on their own in understanding other sustainability issues not covered by GE courses or the curriculum as a whole.

While there is an observed moderate to high integration of different critical thinking components and skills in the overall results, the case of Mathematics in the Modern World is notable as it indicates weak integration of the skill of synthesizing theories and claims. Moreover, the results also show weak integration of Mathematics in the Modern World of the skill of building theory along with the courses Science, Technology, and Society and Understanding the Self. Consequently, students' ability to synthesize and build theories and claims are crucial in decision making for sustainability as the skill of integrating and synthesizing knowledge is a prerequisite to develop solutions (Jonassen, 2011) and make informed decisions (van Merriënboer & Kirschner, 2024). Moreover, these skills are seemingly expectations from courses allied to formal, natural, and behavioral sciences. Thus, weak integration of these skills in the aforementioned courses seemingly indicates another point of improvement. As mentioned previously in this discussion, it is understandable not to cover all key concepts due to curriculum constraints on content but at least the critical thinking skills sets should be integrated as these are foundations of sustainability education (Sterling & Thomas, 2006) which allow students to initiate learning on their own and practice decision-making and problem-solving.

In terms of sustainable development values and attitudes, it is again notable how Mathematics in the Modern World has weak integration in almost all of the identified values and attitudes. Seemingly, the traditional structure of Mathematics leaves little space for sustainability to be integrated into the course curriculum. As cited by Scartascini, Curiel, and Melchor (2017), disciplinal approaches take an atomistic manner of teaching-learning which makes it difficult for inter- and transdisciplinary themes to be integrated. While weak and moderate integration depends on the frequency of topics which facilitate learning of concepts, skills, and values, high integration provides opportunities for students to find connection to sustainable development concepts and values and apply the skills in the discipline being studied and of their area of interest (Fogarty, 1991). Thus, structuring the context of the learning outcomes, teaching-learning activities, and assessment tasks, so as these will be flexible enough to provide opportunities for students to connect sustainability issues to disciplinal or transdisciplinal content and apply critical thinking skills in a defined context reflecting sustainable issues, may allow integration of sustainability education in seemingly disciplinal courses like Mathematics.

Conclusion and Recommendations

The overall results of the self-assessment survey imply moderate to high integration of most of the sustainable development concepts, critical thinking skills, values, and attitudes in General Education. However when viewed independently for each course, the integration starts to vary from high to weak level of integration. This is particularly observed in the course Ethics, Mathematics in the Modern World, and Understanding the Self where some major sustainable development concepts and critical thinking skills have weak integration. Thus, higher integration and interrelations of social, environmental, economic, and cultural dimensions within the course are seemingly needed. Moreover, emphasis on students' ability to synthesize and build theories and claims need higher integration as these are crucial in problem-solving and decision-making process concerning sustainability issues. High integration provides opportunities for students to connect concepts and values and apply the skills in the discipline being studied.

In light of the findings of the study, the following recommendations are provided:

- Faculty training on interdisciplinary teaching and learner centered pedagogy may be done to increase interrelations of social, environmental, economic, and cultural dimensions of sustainable development within a course, as well as integration of the skill of building and synthesizing theories in seemingly highly disciplinal courses. Since sustainability education promotes interdisciplinarity (Moore, 2005) and operates within a learner centered paradigm (Barr & Tagg. 1995, as cited in Whetten, 2021), capacitating teachers to shift to learner centered and interdisciplinary teaching will provide flexibility for course content to integrate sustainability education and focus on complex critical thinking skills such as theory building.
- Further studies may be done to confirm and corroborate the results of this study. An analysis on curriculum alignment of course components to sustainability education and held teaching-learning beliefs of faculty members may be done to examine how consistent the course learning outcomes, teaching activities, assessment tasks, and teaching paradigm, to sustainability education. These will make sense of the survey results as while curriculum integration requires organizing teaching and learning to selected units of study (Wall & Leckie, 2017), curriculum alignment involves consistency between desired outcomes and course content (Yilmaz & Oner Sunkur, 2021). Moreover since sustainability education operates in a learner-centered paradigm (Tsogtsaikhan, Park, & Park, 2023), it will be worth examining how teachers' belief system influence their curriculum integration and alignment to sustainable development.

Author(s)' Statements on Ethics and Conflict of Interest

***Ethics Statement*:** In this study, all rules stated to be followed within the scope of "UST Graduate School Review Ethics Committee" were followed. Ethical review board name: UST Graduate School Review Ethics Committee. Date of ethics review decision: July 30, 2024. Ethics assessment document issue number: GS2024-056.

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An Evaluation of the 2024 Geography Curriculum Learning Outcomes in Türkiye Based on the Revised Bloom's Taxonomy

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Abstract

This study aimed to analyze the learning outcomes in the Geography Curriculum developed under "the Century of Türkiye Education Model" introduced in 2024, using the Revised Bloom's Taxonomy as a framework The research was conducted using a case study design. The data were obtained from the website of the Board of Education and Discipline of the Ministry of National Education. A total of 76 learning outcomes from the geography curriculum were examined. The data were analyzed using descriptive analysis. The results showed that the learning outcomes in the curriculum predominantly focus on the conceptual knowledge level within the knowledge dimension. In the cognitive process dimension, the learning outcomes are largely focused on the evaluation level, while the learning outcomes at the creation level are notably limited. This finding indicates that although the curriculum provides opportunities to support analytical and critical thinking skills, it falls short in fostering creative thinking processes. Based on these findings, it is recommended that increasing the number of learning outcomes at the creation level could enhance students' creative problem-solving, innovative thinking, and ability to produce original works.

Keywords: Geography education, Geography curriculum, Revised Bloom's taxonomy, Learning outcomes, Cognitive process, Türkiye.

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Introduction

In education systems, learning outcomes serve as a fundamental roadmap, defining not only the knowledge and skills students are expected to acquire but also the levels at which these acquisitions should be achieved. Therefore, a comprehensive analysis of learning outcomes is crucial, not only for evaluating and enhancşng the effectiveness of curricula but also for conducting a needs analysis for further revisions (Allan, 1996; Eisner, 1979; Karabağ & Şahin, 2007; Kırkeser, 2021; King & Evans, 1991; Prøitz, 2010; Şahin, 2019; Yiğit Özüdoğru, 2024). In this context, Revised Bloom's Taxonomy (RBT) provides a robust framework for systematically evaluating learning outcomes (Airasian & Miranda, 2002; Anderson, 2002; Bennett, 2001; Krathwohl, 2002). This taxonomy helps analyze both the types of knowledge students are expected to acquire and the ways in which they process this knowledge. Previous studies in the national literature have revealed that learning outcomes of earlier curricula (such as the 2005 and 2018 curricula for social studies, science, history, Turkish, physics, chemistry, biology, and mathematics) generally focused on lower-order cognitive processes and fell short in addressing higher-order processes (Avcı et al., 2021; Büyükalan-Filiz & Yıldırım, 2019; Çerçi, 2018; Çolak & Demircioğlu, 2010; Eke, 2018; Erol, 2021; Güldüren & Cangüven, 2020; Kuzu et al., 2019; Zorluoğlu et al., 2017). Similarly, studies examining the learning outcomes of geography curricula (Gülersoy, 2007; İlhan & Gülersoy, 2019a; 2019b; Kaya & Aladağ, 2023; Sözcü & Aydınözü, 2019) have reported comparable results, underscoring the need for efforts to enhance the effectiveness of the curricula. In this context, the present study aims to analyze the learning outcomes in the 2024 Geography Curriculum (GC), implemented by the Ministry of National Education (MoNE) starting in the 2024–2025 academic year, through the lens of RBT. To this end, the study seeks to answer the following research question: *What is the distribution of the learning outcomes in the 2024 GC across grades (9th, 10th, 11th, and 12th) in terms of the knowledge and cognitive process dimensions of the taxonomy?* By evaluating the extent to which the 2024 GC addresses students' cognitive and knowledge-based needs, this study aims to propose recommendations for improving the quality of education. As the first study to examine the learning outcomes of the 2024 GC, this study is expected to make significant contributions to literature and educational policies, providing valuable insights for future curriculum revision processes.

The 2024 Geography Curriculum: Learning Outcomes and Components

The Century of Türkiye Education Model (CTEM) is a holistic framework composed of the fundamental approach of the curriculum, the student profile, the Virtue-Value-Action Framework, and the skills framework (MoNE, 2024b, p. 4). The GC is structured based on this model. Learning outcomes in the curricula are defined as knowledge, skills, attitudes, or competencies that students are expected to acquire by the end of a course (MoNE, 2024b, p. 5). According to CTEM, learning outcomes are derived from subject-specific skills or conceptual skills associated with the content knowledge of the unit (MoNE, 2024b, p. 5). The scope of the learning outcomes is provided under the heading "Content Framework". The relationship of learning outcomes with other curriculum components is presented in the section titled "Learning-Teaching Experiences" (MoNE 2024b, p. 6). These components include tendencies, social-emotional learning skills, values, literacy skills, and interdisciplinary relations. Additionally, interdisciplinary relations are included in relation to the content of the learning outcomes.

The key component "interdisciplinary relations," refers to the interaction and cooperation between different disciplines, i.e., subjects. The aim of interdisciplinary relations is to enhance students' ability to make connections across subjects, develop multiple perspectives, and solve complex problems (MoNE, 2024a, p. 59). Within this context, the curriculum establishes connections among different disciplines that students have encountered, may encounter in the future, or that align with their grade levels. According to CTEM, interdisciplinary relations are not directly associated with learning outcomes (MoNE, 2024a, p. 59). Instead, the curriculum expects teachers to establish interdisciplinary relations that are suitable for the content of each unit. Subject-specific skills encompass conceptual skills and/or integrated skills specific to each discipline, including the process components of these skills (MoNE, 2024a, p. 24). Conceptual skills refer to basic skills acquired and observed without requiring a complex process, as well as integrated and higher-order thinking skills that are products of mental activities used to transform abstract ideas and complex processes into actions (MoNE, 2024a, p. 14). The content framework provides a basis for the acquisition of skills and combines with skills to form learning outcomes by answering the question "What should the student know?". Within this context, the content framework refers to generalizations, principles, key concepts, and symbols that are significant to a specific discipline (MoNE, 2024a, p. 49). A new element introduced in the 2024 GC is dispositions, which refer to the mental patterns that explain how individuals use their skills when necessary, in line with elements such as intention, sensitivity, willingness, and evaluation (MoNE, 2024a, p. 20).

Social-emotional learning skills represent individuals' abilities to manage the processes of understanding and learning through sensory perceptions during social interactions. These skills are recognized as a set of competencies designed to support students' success in school and out-of-school life (MoNE, 2024a, p. 51). Literacy skills refer to the ability to understand, evaluate, interpret, and, when necessary, recreate information, messages, and texts of various types (Sever, 2022). In the 2024 GC, literacy skills are addressed implicitly rather than being explicitly emphasized in the learning outcomes. Literacy types identified within the framework of the curricula are introduced through a holistic spiral model starting from early childhood education. The 2024 GC learning outcomes are structured based on these components, and they are developed by integrating the body of knowledge of each unit with the relevant subject-specific skills or conceptual skills (MoNE, 2024b, p. 5).

The learning outcomes in the curriculum are designed using a process-based approach, aiming to evaluate students' holistic development and progress qualitatively and quantitatively throughout the learning process (MoNE, 2024a, p. 49). The 2024 GC includes a total of 76 learning outcomes: 19 outcomes in the 9th grade, 18 outcomes in the 10th grade, 19 outcomes in the 11th grade, and 20 outcomes in the 12th grade (based on a 4-hour program in the 11th and 12th grades) (MoNE, 2024b). The numerical codes assigned to the learning outcomes indicate the unit number corresponding to each grade level (Figure 1).

The learning outcomes are defined with clear and measurable process components, specifying what students are expected to achieve or perform during a particular learning process. In this context, analyzing the learning outcomes within a structured framework is considered essential for effectively planning and implementing teaching processes. Against this background, this study aims to analyze the 2024 GC learning outcomes to support teachers in planning the teaching-learning process more effectively, selecting appropriate instructional methods

aligned with the learning outcomes, and conducting assessment and evaluation processes.

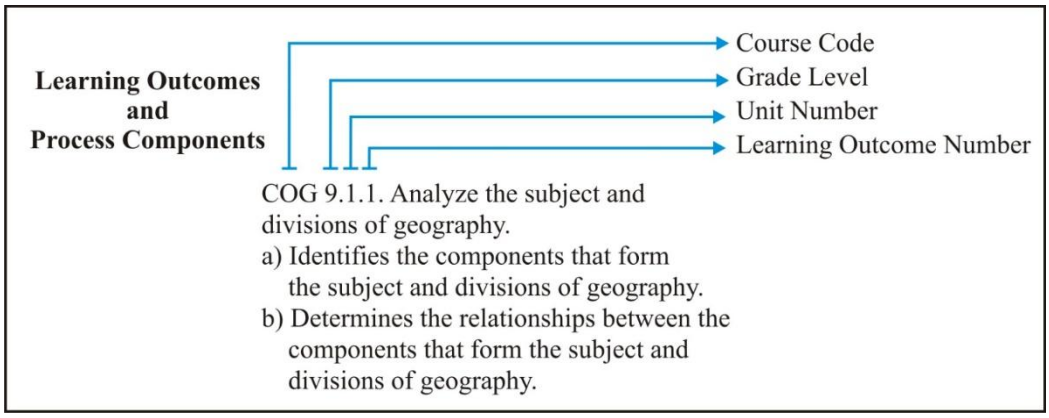

Figure 1: Geography Learning Outcomes

Revised Bloom's Taxonomy

Bloom's Taxonomy, which classifies educational objectives within the cognitive domain, was developed by Benjamin S. Bloom in 1956 and has provided an essential framework for organizing learning in the cognitive domain (Arı, 2011; 2013; Bloom, 1956; Bümen, 2006). In 1995, Lorin W. Anderson, a former student of Bloom, assembled a working group to adapt the cognitive domain taxonomy to address the needs of 21st-century students and teachers. This group included experts from diverse fields, such as cognitive psychologists (e.g., Mayer, Pintrich, and Wittrock), curriculum and instruction specialists (e.g., Anderson, Cruikshank, and Raths), and assessment and evaluation experts (e.g., Airasian and Krathwohl) (Özdemir et al., 2015). The result of this collaboration was the Revised Bloom's Taxonomy (RBT), which classifies learning objectives into two interrelated dimensions: the knowledge dimension and the cognitive process dimension. These dimensions are not independent of each other; any cognitive process inherently requires the application of a category within the knowledge dimension (Anderson et al., 2001; Krathwohl, 2002).

The knowledge dimension involves the elements necessary for acquiring knowledge or solving problems within a discipline. It represents the types of content students need to acquire during the learning process, essentially answering the question "What does the student know?" (Demirel, 2014). This dimension is used to make learning objectives more specific and determine how different types of knowledge contribute to the educational process. The knowledge dimension consists of four main categories: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. Factual knowledge includes the fundamental terminology and specific details within discipline. Conceptual knowledge refers to understanding the relationships between core elements and how these relationships operate within a broader framework. The subcategories of conceptual knowledge include knowledge of classifications and categories, principles and generalizations, and theories, models, and structures. Procedural knowledge pertains to knowing how to perform a task and understanding methods and procedures, and it includes knowledge of discipline-specific techniques and methods, as well as the criteria for determining when to apply appropriate procedures. Metacognitive knowledge involves an individual's awareness of their own cognitive processes and cognitive processes in general. This type of knowledge includes

subcategories such as strategic knowledge, knowledge about cognitive tasks, and self-knowledge (Anderson et al., 2001; Bümen, 2006; Krathwohl, 2002).

The cognitive process dimension focuses on how learning occurs, addressing the question "How do students think?" (Demirel, 2014). This dimension is used to understand how students acquire knowledge and analyze how they process it. The cognitive process dimension consists of six main categories: remembering, understanding, applying, analyzing, evaluating, and creating. Remembering refers to retrieving relevant knowledge from long-term memory. Understanding involves the process of determining and explaining the meaning of messages. The sub-processes such as interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining fall under the understanding category. Applying refers to using a learned procedure in a specific situation. Analyzing involves breaking down a phenomenon, event, or concept into its components and identifying the relationships among those parts. This process includes sub-processes such as differentiating, organizing, and attributing. Evaluating involves making judgments based on criteria and standards and includes sub-processes such as checking and critiquing. Creating refers to generating a new product or integrating elements into a cohesive structure. The sub-processes of this dimension include planning and producing (Anderson et al., 2001; Bümen, 2006; Krathwohl, 2002). These categories are organized hierarchically, progressing from simple to complex and concrete to abstract (Anderson et al., 2001). The first three categories, i.e., remembering, understanding, and applying are considered lower-order cognitive processes, while the latter three, i.e., analyzing, evaluating, and creating are regarded as higher-order cognitive processes (Crowe et al., 2008).

RBT has enabled a broader perspective in analyzing learning outcomes, driving a significant transformation in education (Köğce et al., 2009). This approach has been proven to be a powerful tool for defining learning outcomes more clearly and precisely, enriching learning experiences, and enhancing the effectiveness of assessment processes (Anderson, 2002; Airasian & Miranda, 2002; Bennett, 2001; Krathwohl, 2002). Numerous studies have utilized RBT to analyze learning objectives across various disciplines (Avcı et al., 2021; Büyükalan-Filiz & Yıldırım, 2019; Çerçi, 2018; Çolak & Demircioğlu, 2010; Eke, 2018; Güldüren & Cangüven, 2020). Additionally, the literature includes research that examines the 2018 GC using the RBT framework (İlhan & Gülersoy, 2019a; 2019b; Sözcü & Aydınözü, 2019). The analysis of the 2024 GC learning outcomes is expected to contribute to the literature on earlier curriculum analyses and provide an opportunity to evaluate the continuity of learning objectives. Furthermore, a comparative analysis of GCs from different years within the RBT framework will offer insights into how curriculum updates have been reflected in instructional goals.

Method

The research was conducted using a case study design, one of the qualitative research methods, and the data were obtained from the website of the Board of Education and Discipline of MoNE. The dataset consisted of 76 learning outcomes included in the 2024 GC published by the Board of Education and Discipline. Descriptive analysis was used to analyze the data. In this process, the learning outcomes and curriculum components of the 2024 GC were examined in detail (Appendix 1). Each learning outcome was analyzed by placing it into the two-dimensional matrix structure of RBT, which includes the knowledge and cognitive process dimensions. During the analysis,

the level of each learning outcome was determined based on the intersection of the categories in the knowledge dimension (factual, conceptual, procedural, and metacognitive knowledge) and the cognitive process dimension (remembering, understanding, applying, analyzing, evaluating, and creating). Validity and reliability are critical in ensuring trustworthiness and accuracy of findings in qualitative research (Guba & Lincoln, 1994). To ensure reliability, several measures were taken during the research process. The researcher listed all learning outcomes and curriculum components in an Excel file and conducted simultaneous analyses to maintain consistency. During the preliminary analysis, the 9th-grade learning outcomes were shared with a geography education expert who had participated in the curriculum preparation committee. Two researchers independently analyzed the learning outcomes, and their results were later compared and evaluated. Subsequently, the findings were presented to two faculty members specializing in RBT for further review. A form prepared by the researcher was used to collect expert feedback, categorizing the results as *"acceptable," "unacceptable,"* or *"requires revision."* The level of agreement between the experts was calculated using the formula proposed by Miles and Huberman (1994) [Reliability = Agreement / (Agreement + Disagreement) x 100]. The reliability score was calculated as 148 / (148 + 4) x 100 = 97%, indicating a high level of reliability. The four points of disagreement were reviewed, and consensus was reached on all of them. Following the second round of expert feedback, adjustments were made to certain classifications: the 9th-grade learning outcomes initially categorized at the evaluation level were reassigned to the analysis level, and the 11th-grade learning outcomes initially classified under procedural knowledge were reassigned to conceptual knowledge.

Results

The results obtained from the analysis of the 9th-grade GC learning outcomes according to RBT are presented in Table 1.

Table 1. Distribution of 9th-Grade Learning Outcomes According to RBT

The Knowledge Dimension	**The Cognitive Process Dimension**						
	Remember	Understand	Apply	Analyze	Evaluate	Create	**Total (%)**
Factual Knowledge	-	-	-	-	-	-	-
Conceptual Knowledge	9.1.3, 9.6.2	9.2.2, 9.3.4	-	9.1.1, 9.1.2 9.2.3, 9.3.1 9.3.2, 9.6.1	9.4.1, 9.4.3 9.4.4, 9.5.1 9.6.3, 9.7.1	-	**15 (78.95)**
Procedural Knowledge	-	-	9.2.1, 9.3.3	9.4.2	-	-	**4 (21.05)**
Metacognitive Knowledge	-	-	-	-	-	-	-
Total (%)	**2 (10.53)**	**2 (10.53)**	**2 (10.53)**	**7 (36.84)**	**6 (31.58)**	**-**	**19 (100)**

Table 1 shows that the 9th-grade geography learning outcomes are primarily concentrated at the conceptual knowledge level (78.95%, n = 15) within the knowledge dimension, whereas procedural knowledge (21.05%, n = 4) is represented to a lesser extent. In the cognitive process dimension, the outcomes are mainly distributed across

the analyzing (36.84%, n = 7) and evaluating (31.58%, n = 6) levels. In contrast, remembering, understanding, and applying levels are equally represented (10.53%, n = 2). These results suggest that conceptual knowledge and the analyzing level are emphasized in the 9th-grade learning outcomes. The results obtained from the analysis of the 10th-grade GC learning outcomes according to RBT are presented in Table 2.

Table 2. Distribution of 10th-Grade Learning Outcomes According to RBT

The Knowledge Dimension	**The Cognitive Process Dimension**						
	Remember	Understand	Apply	Analyze	Evaluate	Create	**Total (%)**
Factual Knowledge	-	10.2.1, 10.7.1.	-	-	-	-	**2 (11.1)**
Conceptual Knowledge	-	10.1.1, 10.4.2 10.5.1, 10.5.2	-	10.3.1, 10.3.3 10.6.2.	10.3.5, 10.4.1	10.6.4	**10 (52.63)**
Procedural Knowledge	-	-	10.2.2,10.3.4 10.5.3		10.6.1.	-	**4 (22.22)**
Metacognitive Knowledge	-	-	-	--		10.3.2,10.6.3	**2(11.1)**
Total (%)	**-**	**6 (33.33)**	**3 (16.67)**	**3 (16.67)**	**3(16.67)**	**3(16.67)**	**18(100)**

Table 2 presents that the 10th-grade geography learning outcomes are predominantly concentrated at the conceptual knowledge level (52.63%, n = 10) within the knowledge dimension, while procedural knowledge (22.22%, n = 4) and factual knowledge (11.11%, n = 2) are represented to a lesser extent. In the cognitive process dimension, the learning outcomes are mainly distributed at the understanding level (33.33%, n = 6), while the other levels (applying, analyzing, and creating) are equally represented (16.67%, n = 3). These results suggest that conceptual knowledge and the understanding process are prioritized in the 10th-grade learning outcomes. The results obtained from the analysis of the 11th-grade GC learning outcomes according to RBT are presented in Table 3.

Table 3. Distribution of 11th-Grade Learning Outcomes According to RBT

The Knowledge Dimension	**The Cognitive Process Dimension**						
	Remember	Understand	Apply	Analyze	Evaluate	Create	**Total (%)**
Factual Knowledge	-	-	-	-	-	-	-
Conceptual Knowledge	-	11.3.1, 11.5.4 11.7.2, 11.7.3 11.7.5	-	11.4.1	11.3.2, 11.4.2 11.5.1, 11.5.2 11.5.3, 11.5.5, 11.6.3, 11.7.1	-	**14 (73.68)**
Procedural Knowledge	-	11.2.1	-	-	11.6.2	11.7.4	**3 (15.79)**
Metacognitive Knowledge	-	-	-	-	-	11.6.1, 11.1.1	**2 (10.53)**
Total (%)	**-**	**6 (31.58)**	**-**	**1 (5.26)**	**9 (47.37)**	**3 (15.79)**	**19 (100)**

As seen in Table 3, within the knowledge dimension, the 11th-grade geography learning outcomes are largely focused on the conceptual knowledge level (73.68%, n = 14), while procedural knowledge accounts for 15.79% (n = 3). In the cognitive process dimension, a significant proportion of the learning outcomes, 47.37% (n = 9), are concentrated at the evaluating level, while the creating (15.79%, n=3) and analyzing (5.26%, n=1) levels are less represented. These results highlight that conceptual knowledge and the evaluating level are the main focus in the 11th-grade geography learning outcomes. The results obtained from the analysis of the 12th-grade GC learning outcomes according to RBT are presented in Table 4.

Table 4. Distribution of 12th-Grade Learning Outcomes According to RBT

	The Cognitive Process Dimension						
The Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create	**Total (%)**
Factual Knowledge	-	-	-	-	-	-	-
Conceptual Knowledge	-	12.3.3,12.5.1 12.6.2,12.6.3 12.7.2	-	12.5.2, 12.7.3, 12.7.3,12.7.4	12.1.1,12.3.2 12.4.1,12.5.3 12.6.1,12.6.4, 12.7.1		**16(84.21)**
Procedural Knowledge	-	-	12.2.1.	-	-	-	**1 (5.26)**
Metacognitive Knowledge	-	-	-	-	-	12.3.1,12.6.5 12.6.6	**3(15.79)**
Total (%)	**-**	**5(26.32)**	**1 (5.26)**	**4 (21.05)**	**7 (36.84)**	**3 (15.79)**	**20 (100)**

As seen in Table 4, within the knowledge dimension, the 12th-grade geography learning outcomes are mainly concentrated at the conceptual knowledge level (84.21%, n = 16), while procedural knowledge is represented to a minimal extent (5.26%, n = 1). In the cognitive process dimension, the outcomes are predominantly distributed across the evaluating (36.84%, n = 7) and understanding (26.32%, n = 5) levels. The analyzing level represents 21.05% (n=4), while the applying level (5.26%, n = 1) and the creating level (15.79%, n = 3) are represented at lower percentages. These results suggest that conceptual understanding and evaluating are the main focus in the 12th-grade geography learning outcomes.

Discussion

This study aimed to evaluate the learning outcomes of the 2024 GC (9th, 10th, 11th, and 12th grades) using RBT as a framework. The findings provided insights into the distribution of the curriculum learning outcomes across the knowledge and cognitive process dimensions. The analysis results showed that the learning outcomes at all four grade levels are predominantly concentrated at the conceptual knowledge level (72.37%). The conceptual knowledge level was found to be 78.95% for the 9th grade, 52.63% for the 10th grade, 73.68% for the 11th grade, and 84.21% for the 12th grade. The dominance of conceptual knowledge at each grade level in the 2024 GCC indicates that the curriculum aims to equip students with the fundamental building blocks of geography discipline. This approach can be considered an important indicator for students to develop a deep understanding of geography

discipline, grasp the relationships between fundamental concepts, and interpret this knowledge holistically. Similarly, studies analyzing the learning outcomes of the 2018 GC within the framework of RBT (İlhan & Gülersoy, 2019a; 2019b) also highlighted the prevalence of conceptual knowledge in the curriculum. These findings suggest that this focus on conceptual knowledge in the 2018 and 2024 GC learning outcomes reflects the continuity of an approach that centers on conceptual knowledge in geography education.

In the learning outcomes, procedural knowledge follows the knowledge dimension, but the proportion of learning outcomes at the procedural knowledge level within the total learning outcomes is relatively low (15.79%). By grade, the proportion of procedural knowledge was 21.05% in the 9th grade, 22.22% in the 10th grade, 15.79% in the 11th grade, and only 5.26% in the 12th grade. This limited focus on procedural knowledge may weaken the application-oriented aspects of geography education, potentially negatively affecting students' ability to understand, analyze, and generate solutions for geographical events. Another finding is that skills such as identifying cause-and-effect relationships of events, adapting specific methods to different situations, and understanding the practical aspects of the discipline seem to be not adequately supported in geography education. Moreover, the low representation of learning outcomes at the procedural knowledge level in the curriculum may limit students' ability to relate their theoretical knowledge of geographical events to practice and could present the risk of not fully developing the analytical thinking processes required by the discipline. Prior studies have emphasized that theoretical knowledge alone is insufficient for developing geographical skills (Arıkan & Baysan, 2024; Karakuş, 2009; Öcal, 2013; Önal & Güngördü, 2008; Seremet, 2024; Sezer, 2011).

It is believed that more learning outcomes aimed at developing procedural knowledge should be incorporated into the program. A notable observation is the absence of learning outcomes at the factual knowledge level, except for the 10th grade. Similar results were found in studies analyzing the learning outcomes of the 2018 GC according to the knowledge dimension (İlhan & Gülersoy, 2019a; Sözcü & Aydınözü, 2019). As mentioned in the literature review, the absence of factual knowledge concepts in the updated 2024 GC learning outcomes may be due to the approach adopted by the curriculum. In the 2024 GC, the main generalizations, principles, key concepts, and symbols related to the discipline (such as place names, and historical events) are provided in connection with the content framework (MoNE, 2024a, p. 74). This means that the sub-heading of key concepts in the curriculum includes geographical terms related to the discipline that students will learn in the unit. However, the lack of explicit articulation of this relationship in the 2024 GC and the absence of these concepts in the learning outcome statements make the evaluation in this study more complex. The results of this study show that in future revisions, the relationships between the learning outcomes and curriculum components should be explicitly written in the curriculum. On the other hand, it is believed that the preparation of curricula according to the principles of vertical coherence has led to the lower representation of concepts at the factual knowledge level in the learning outcomes. In the Turkish education system, geographical terms are typically taught to students through various subjects in primary and secondary schools (e.g., Life Science, Social Studies, and Turkish). Therefore, the low representation of factual knowledge terminology, reflecting the basic knowledge level, in the high school GC is a natural outcome. However, research has shown that high school students often lack sufficient knowledge of geographical concepts (Aladağ, 2016; Geçit, 2010; Kırkeser & Demiralp, 2019; Kızılçaoğlu, 2009; Turan, 2002). Therefore, learning outcomes at the factual knowledge level are essential for supporting conceptual knowledge and providing

students with a knowledge-based foundation (Bümen, 2006). The teaching process should be designed with this in mind, and the planning should be aligned with students' readiness levels.

Another notable finding is the absence of learning outcomes at the metacognitive knowledge level in the 2024 GC learning outcomes. As mentioned earlier, metacognitive knowledge is considered critical for students to develop their ability to plan, monitor, and evaluate their learning processes (Anderson, 2002). Learning outcomes based on metacognitive knowledge allow students to become aware of their own thinking processes, develop problem-solving strategies, and more effectively guide their learning. In this sense, the lack of learning outcomes at the metacognitive knowledge level in the GC may limit students' ability to develop deep learning and autonomous thinking skills (Cangüven & Avcı, 2022; Kaya & Aladağ, 2023; Yolcu, 2019; Zorluoğlu et al., 2017). The broader inclusion of learning outcomes based on metacognitive knowledge, especially at the high school level, is crucial for helping students cope with complex geographical problems and enhance their critical thinking skills. However, creating learning outcomes at this level is challenging. One of the main reasons for this difficulty is that metacognitive knowledge-based learning outcomes often rely on strategic knowledge and self-knowledge, making assessment and evaluation challenging. Due to this challenge, national exams in Türkiye predominantly focus on questions based on conceptual knowledge in the field of geography (Şanlı, 2021). Similarly, the curriculum prioritizes content aimed at equipping students with conceptual knowledge of geographical information. Another challenge is that the articulation of cognitive needs that vary according to context and situations requires both pedagogical knowledge and abstract thinking skills, which makes this process quite complex for curriculum developers. In this context, it is considered crucial for curriculum developers to make necessary revisions to the curriculum by collaborating more with geography educators and establishing long-term, comprehensive joint working environments.

According to the analysis results, in the cognitive process dimension, the 2024 GC learning outcomes across all four grade levels are predominantly concentrated at the evaluating level (34.21%). Considering the sub-dimensions of the evaluating level in RBT (e.g., judgment, evidence-based evaluation), these learning outcomes focus on developing students' analytical thinking and critical evaluation skills. As mentioned in the literature review, the low representation of learning outcomes at the remembering level in the 2024 GC further supports this argument, as it indicates that the curriculum prioritizes deeper thinking and analytical processes rather than rote memorization based on factual knowledge. In this context, it can be stated that the suggestions from previous studies on the GC (İlhan & Gülersoy, 2019a; 2019b; Sözcü & Aydınözü, 2019) have been taken into account in the revised program. Indeed, these studies identified that the learning outcomes of the 2018 curriculum were predominantly at the understanding level in terms of cognitive processes. The low representation of learning outcomes at the creating level in the 2024 GC, however, limits the development of students' higher-order thinking skills. Prior studies have highlighted that curricula often have significant gaps in fostering creative thinking (Çolak & Demircioğlu, 2010; Güldüren & Cangüven, 2020; Kuzu et al., 2019; Zorluoğlu et al., 2017). These gaps suggest that teaching processes limit the potential for developing students' creative thinking skills and that these skills are not sufficiently supported within the education system. Considering that high school education represents a pivotal stage in the transition to higher education, students' potential for transforming knowledge, generating innovative ideas, and developing original projects must be more strongly supported through revised curricula. In addition,

increasing the learning outcomes at the creating level in curricula is crucial for fostering skills such as analysis, synthesis, evaluation, innovative thinking, and problem-solving. In this regard, future adjustments are expected to contribute to students' acquisition of 21st-century skills. The inclusion of "differentiation and enrichment" elements in the 2024 GC learning and teaching experiences is intended to offer an inclusive educational environment by considering students' abilities, interests, and profiles. The goal is to offer students opportunities to engage in original cognitive processes through project and performance tasks (MoNE, 2024a, 13). These components added to the curriculum are believed to support students' creative thinking skills. However, the lack of clear expression of learning outcomes related to creative thinking in the context of cognitive processes in the 2024 GC complicates the evaluation process in this study. Despite being included in the learning outcomes, the connections made with inter-curriculum components (such as social-emotional learning skills and literacy skills) suggest that the goal of developing higher-order thinking skills in students is a complex process for both practitioners and researchers. These findings suggest that curricula need to be redesigned considering these challenges and should be supported with concrete examples and tools to guide practitioners.

There are also differences in the distribution of the 2024 GC learning outcomes by grade level in the cognitive process dimension. For the 9th grade, 36.84% of the learning outcomes are concentrated at the analyzing level. In contrast, the learning outcomes at the understanding, remembering, and applying levels are limited to 10.53%, with no learning outcomes included at the creating level for this grade. This distribution indicates that analytical thinking skills are prioritized in the 9th grade. In the 10th-grade learning outcomes, the understanding level (33.33%) emerges as the most highly represented cognitive process. These learning outcomes predominantly support students in deepening their comprehension and enhancing their ability to assign meaning to knowledge. Additionally, the 10th-grade learning outcomes show an equal distribution across the applying, analyzing, evaluating, and creating levels (16.67%), highlighting an emphasis on developing students' problem-solving and analytical thinking skills. In the 11th grade, the concentration of learning outcomes at the evaluating (47.37%) and creating (15.79%) levels reflects an approach that aims to encourage students to engage with knowledge more deeply and evaluate it from a critical perspective. For the 12th grade, the representation of learning outcomes at the evaluating (36.84%) and creating (15.79%) levels continues this trend of prioritizing the development of higher-order thinking skills. These proportions indicate an approach that supports students in critically engaging with knowledge, deepening their evaluation processes, and generating creative solutions. However, the differences in the 2024 GC learning outcomes across grades in the cognitive process dimension are believed to stem from the diversity of topics in each grade, as well as the variety of skills (such as conceptual skills, subject-specific skills, and tendencies) associated with these learning outcomes. This suggests that each grade is designed with a specific learning objective in mind, and therefore, the learning outcomes are aligned with different cognitive processes unique to each grade.

Conclusion and Recommendations

The results of the research revealed that the learning outcomes are predominantly concentrated at the conceptual knowledge level in the knowledge dimension and at the evaluating level in the cognitive process dimension. The prominence of conceptual knowledge suggests that the 2024 GC aims to equip students with the fundamental

concepts of geography discipline and the relationships between them. The emphasis on the evaluating level in the cognitive process dimension presents a significant opportunity for students to develop their analytical thinking and critical judgment skills. However, it is expected that increasing the learning outcomes that promote creative thinking processes in the curriculum will support students in developing innovative problem-solving and creative thinking skills. It is believed that these improvements in learning outcomes will be beneficial for both students and teachers in the effective implementation of the curriculum. This study did not examine components such as subject-specific skills, conceptual skills, and other elements in the unit design (teaching practices, content framework, etc.) associated with the creation of the 2024 GC learning outcomes. Future research may consider conducting more detailed and comprehensive analyses to examine these associations. Additionally, it is important to increase in-service training opportunities for teachers to effectively help students achieve the learning outcomes outlined in the curriculum.

Limitations

In this study, the 2024 GC learning outcomes were analyzed from the perspective of RBT. Only the learning outcome statements included in the 2024 GC were considered in the study. The reason is that learning outcomes are frequently preferred as a criterion for evaluating the educational effectiveness of curricula (Anderson, 2002; Brady, 1997; Burke, 1995; Bümen, 2006; Capper & Jamison, 1993; Prøitz, 2010). However, the common text of CTEM states that the learning outcomes of the 2024 GC are aligned with the curriculum components (such as subject-specific skills, conceptual skills, tendencies, and content framework) during their preparation. However, the theoretical foundations and specific associations between these components and the learning outcomes are not elaborated in detail within the CTEM text or the curriculum document. Within this framework, the researcher comprehensively examined the curriculum components to view the educational objectives holistically in the analysis of learning outcomes according to RBT. However, an analysis based on associations was not conducted in the study. The scope of the research was limited to the 2024 GC learning outcome statements.

Author(s)' Statements on Ethics and Conflict of Interest

***Ethics Statement*:** In this study, all rules stated to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were not taken. This study does not involve qualitative or quantitative data collection methods that require ethics committee approval, such as surveys, interviews, focus groups, observations, experiments, or similar techniques. Therefore, obtaining approval from an ethics committee does not apply to this research.

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Appendix 1. Analysis Process

<table>
<tr><td colspan="2">GCC Learning Outcomes and Process Components
COG.9.3.3. Ability to create tables, graphs, figures, and/or diagrams using climate data from places with different climate types in Türkiye and around the world.

a) Determines the purpose of the table, graph, figure, and/or diagram to be created using climate data from places with different climate types in Türkiye and around the world.
b) Identifies the tools and equipment required for creating the table, graph, figure, and/or diagram based on the type of climate data from places with different climate types in Türkiye and around the world.
c) Collects climate data from places with different climate types in Türkiye and around the world.
ç) Classifies the climate data from places with different climate types in Türkiye and around the world.
d) Visualizes the climate data from places with different climate types in Türkiye and around the world in the form of tables, graphs, figures, and/or diagrams.
e) Uses the table, graph, figure, and/or diagram visualized with the climate data from places with different climate types in Türkiye and around the world for its intended purpose. (MoNE, 2024b)</td></tr>
<tr><td rowspan="8">Program Components</td><td>Unit 3: Natural Systems and Processes</td></tr>
<tr><td>SUBJECT-SPECIFIC SKILLS: Table, graph, figure, and/or diagram</td></tr>
<tr><td>CONCEPTUAL SKILLS: Analysis, observation-based prediction</td></tr>
<tr><td>DISPOSITIONS: Pursuit of truth</td></tr>
<tr><td>INTER-CURRICULUM COMPONENTS
Social-Emotional Learning: Self-regulation skills
Values: Diligence
Literacy Skills: Data literacy</td></tr>
<tr><td>INTERDISCIPLINARY RELATIONS: Climate, environment and innovative solutions, astronomy and space sciences, physics</td></tr>
<tr><td>INTER-SKILL RELATIONS: Critical thinking, working with data and data-driven decision-making, scientific observation-based prediction, scientific data-driven prediction, scientific inference, perceiving time and chronological thinking, evidence-based inquiry and research, mapping.</td></tr>
<tr><td>CONTENT FRAMEWORK
Weather Events and Their Effects on Daily Life
Components and Variables of the Climate System
Climate Types
Changes in the Climate System
Key Concepts:
Extreme weather events, atmosphere, pressure, biodiversity, biosphere, maritime influence, rotation and revolution, ecosystem, axial tilt, geoid, sunshine duration, folk calendar, hydrosphere, climate, climate system, continentality, urban heat island, cryosphere, global climate change, lithosphere, season, humidity, ocean currents, wind, temperature, topographic factors, precipitation.</td></tr>
<tr><td>LEARNING-TEACHING EXPERIENCES
Basic Assumptions: It is assumed that students can distinguish between weather events and climate, are knowledgeable about the factors affecting weather and climate, and are aware of the importance of climate in the interaction between humans and the environment.

Learning-Teaching Practices:

To examine the climate types in Türkiye and around the world, tables, graphs, figures, and/or diagrams to be created are identified. A checklist outlining the steps for setting goals and managing the process of creating geographic representations can be provided to students. The necessary geographic representations (such as climate maps, tables, graphs, etc.) are identified to compare temperature and precipitation data across different climate types. In this regard, climate data is collected from places with different climate characteristics in Türkiye and around the world. The collected climate data is classified according to its purpose and the intended inferences and is made ready for use. Based on the organized climate data, temperature and precipitation graphs for the respective regions are created and visualized. Using the created visuals, the climate types observed in different regions of Türkiye and the world are examined. In this regard, digital globes can also be utilized to draw inferences. Checklists for the study are reviewed, and feedback regarding the results of the review can be provided to the students.</td></tr>
</table>

RBT Analysis

Analysis of Learning Outcomes According to RBT Dimensions

Knowledge Dimension: Procedural Knowledge

The analysis of climate data included in the learning outcome and its transformation into tables or graphs requires knowledge of the software and tools used for data processing, as well as the selection of types of graphs (bar, line, pie charts), which involves procedural knowledge. Therefore, the learning outcome in the knowledge dimension is at the procedural knowledge level.

Cognitive Process Dimension: Application

The learning outcome involves the ability to prepare tables, graphs, figures, and/or diagrams, requiring students to create a representational tool using climate data. Because students are expected to follow a given procedure or method to produce the outcome, the learning outcome is at the applying level in the cognitive process dimension.

The Cognitive Process Dimension

The Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge			**X**			
Procedural Knowledge						
Metacognitive Knowledge						