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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.

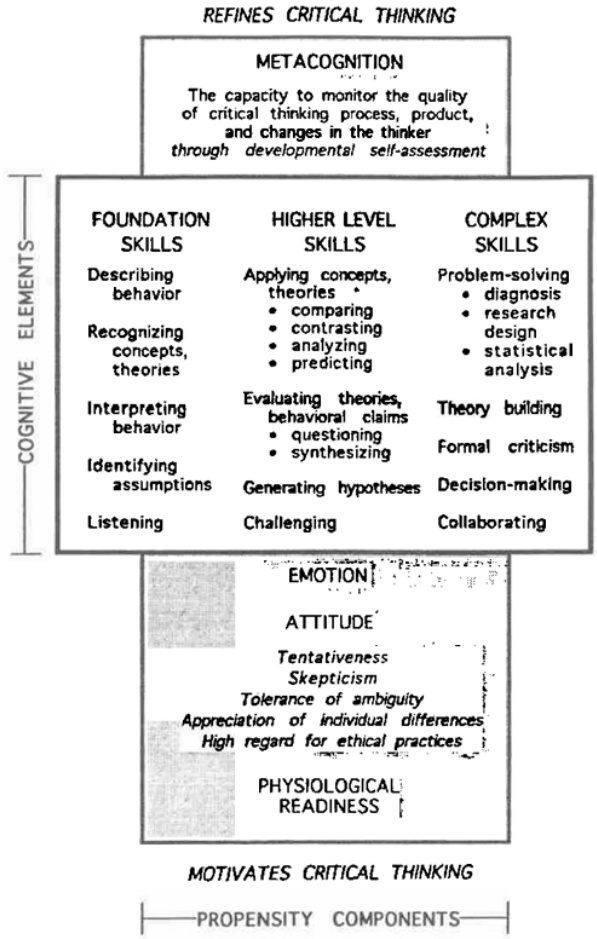

Figure 1. Refines of Critical Thinking (Wales & Nardi, 1984; Halonen, 1995; Davies & Barnett,2015).

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.

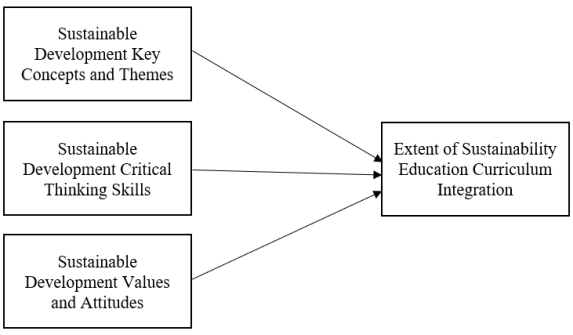

Figure 2. Theoretical Framework of the Study

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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