THE USE OF VALUE-LADEN NATIONAL SOCIO-SCIENTIFIC ISSUES IN TEACHING THE INTERPLAY OF SCIENCE AND TECHNOLOGY: BASIS FOR A PROPOSED TEACHERS' GUIDE

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This study aimed to develop a Culturally and Socio-Emotionally Responsive Social Science Curriculum Model for Senior High School. The research examined the academic performance of Senior High School students, assessed the level of Social and Emotional Learning competencies, evaluated the quality of Social Science curriculum and the level of cultural responsiveness the current curriculum, and explored how these elements shape the teaching and learning of Social Science. A mixed-methods approach with an explanatory sequential design was employed. Quantitative data were gathered from 302 SHS students through stratified random sampling and 18 Social Science teachers through total enumeration. Additionally, eight teachers and eight students who had completed core Social Science subjects participated in qualitative focus group discussions. Results revealed that students exhibited high academic performance in Social Science and demonstrated a very high level of SEL competencies with a mean of 3.42. Teachers rated both the quality Social Science curriculum with a mean of 3.71 and the level of cultural responsiveness with a mean of 3.58 as very high. Thematic analysis produced 11 themes from students' SEL experiences and 16 themes from teachers' perspectives on cultural responsiveness.

Keywords: Social Science, Social and Emotional Learning, Cultural Responsiveness, Curriculum Model

Introduction

The rapid advancement of science and technology in the 21st century has significantly transformed economies, cultures, governance, and daily life. As societies confront both the benefits and ethical challenges of innovations such as artificial intelligence, genetic engineering, climate change, and data surveillance, education systems must evolve to prepare students for informed and responsible participation in these complex domains. In Philippine higher education, the General Education Curriculum (GEC 7) course, Science, Technology, and Society (STS), provides a strategic platform for fostering scientific literacy, ethical reasoning, and civic engagement. Anchored on CHED Memorandum Order (CMO) No. 20, series of 2013, which mandates the inclusion of topics on environmental awareness and societal impacts, this study focuses on the midterm unit titled "The Interplay of Science and Technology and Its Impact on Society.

While San Pablo Colleges (SPC) encourages the analysis of how science and technology interact with social, political, and cultural forces, instruction often lacks localized and contextualized examples. This study addresses that gap by evaluating a model for integrating national socio-scientific issues (NSSI) that is content-rich and values-driven, emphasizing critical thinking, ethical reflection, and national awareness. Grounded in the Socio-Scientific Issues (SSI) Framework introduced by Sadler (2004), the study posits that engaging students in controversial and ethically laden scientific topics promotes personal, cognitive, and moral development, ultimately leading to functional scientific literacy.

Specifically, this study sought to determine: (1) the demographic profile of the respondents in terms of age, sex, and academic program; (2) the perceived level of effectiveness of using NSSI in teaching the STS midterm unit in terms of attainment of learning outcomes, class participation, and enjoyment in class; (3) the perceived extent of integration of core institutional values, namely Love of God (Virtus), Love of Fatherland (Patria), and Love of Learning (Scientia); (4) whether significant differences exist in students' perceptions when grouped according to profile variables; (5) whether a significant relationship exists between perceived effectiveness and the extent of values integration; (6) whether a significant relationship exists between perceived effectiveness and students' midterm grades; and

(7) what Teachers' Guide on the Use of NSSI can be proposed based on the findings.

Method

This study utilized a descriptive-correlational research design to examine how integrating national socio-scientific issues (SSI) into Science, Technology, and Society (STS) education relates to student engagement, academic performance, and institutional values at San Pablo Colleges. Employing complete enumeration across six GEC 7 sections taught by the researcher, the study targeted all 190 enrolled students and achieved an 83.16% retrieval rate with 158 completed responses. Data were gathered using a researcher-made 4-point Likert scale questionnaire covering demographic profiles, perceived effectiveness of SSI integration (learning outcomes, class participation, and enjoyment), and institutional values integration (Love of God, Love of Fatherland, and Love of Learning), alongside student midterm grades. The instrument underwent content validation by three experts in science education, research, and values education, and demonstrated high internal consistency during pilot testing with a Cronbach's alpha of 0.91.

Following formal institutional approval and clear explanations of voluntary participation and ethical safeguards, the validated surveys were administered in person during scheduled class sessions and stored securely to protect confidentiality. Quantitative data were then analyzed using descriptive statistics—including frequency, percentage, mean, and standard deviation—to summarize participant demographics and perceptions. To evaluate variable relationships and group differences at the 0.05 level of significance, inferential statistical tests were conducted, specifically Pearson's correlation coefficient (r), independent samples t-tests, and one-way ANOVA.

Results and Discussion

Profile of the Respondents

The demographic profile of the 158 respondents revealed a predominantly young student population, with 139 respondents (88%) aged 19–21 years old, and 19 respondents (12%) aged 22 and above. In terms of sex,

99 students (63%) were female and 59 (37%) were male, reflecting national trends in Philippine tertiary education where female students outnumber males in allied health, education, and humanities (Philippine Statistics Authority [PSA], 2021). The respondents represented six academic programs: Radiologic Technology (24.05%), Nursing (22.15%), Hospitality Management (18.99%), Information Technology (15.82%), Business Administration (12.66%), and Education (6.33%), underscoring the interdisciplinary nature of the GEC 7 course (Zeidler et al., 2016).

Perceived Level of Effectiveness of NSSI Integration

The students' perceptions of the effectiveness of NSSI integration across three dimensions yielded consistently high ratings:

- Attainment of Learning Outcomes: Obtained a composite mean of 3.16 (High). The highest-rated indicators were gaining a deeper understanding of ethical concerns related to science and technology ($M = 3.20$) and making the subject matter more relevant and meaningful ($M = 3.19$). This affirms that SSIs bridge classroom instruction and real-world application (Zeidler & Keefer, 2017; Sadler, 2024).
- Class Participation: Obtained a composite mean of 3.09 (High). The highest-rated indicators pointed to the teacher's approach encouraging open discussion and critical debate ($M = 3.14$) and improved student collaboration ($M = 3.13$). This supports Zeidler and Nichols (2019) regarding dialogic teaching and cooperative learning in SSI-based classrooms.
- Enjoyment in Class: Obtained a composite mean of 3.19 (High). The highest-rated indicator was "The lessons felt more relatable because they discussed relevant social issues" ($M = 3.28$, Strongly Agree), demonstrating the motivational power of contextualized science education (Evagorou & Puig Mauriz, 2020; Lee et al., 2021).

Perceived Extent of Values Integration

Students perceived a "Great Extent" of integration across all three institutional values:

- Love of God (Virtus): Composite mean of 3.19. The highest-rated indicator was increased awareness of how scientific developments should be used for the common good ($M = 3.26$, Strongly Agree).
- Love of Fatherland (Patria): Composite mean of 3.17. The highest-rated indicator was gaining awareness of how public policies shape scientific progress in the Philippines ($M = 3.24$).
- Love of Learning (Scientia): Composite mean of 3.44. The highest-rated indicator was the development of critical and analytical thinking skills ($M = 3.52$, Strongly Agree).

These findings confirm that SSI-based instruction successfully embeds spiritual reflection, national consciousness, and intellectual curiosity into general education (Atienza & Reyes, 2018; Balita & Soriano, 2021).

Differences in Perceptions Across Demographic Variables

Independent samples t-tests and one-way ANOVA revealed no statistically significant differences in perceived effectiveness or values integration when students were grouped according to age ($p = 0.393$ for effectiveness; $p = 0.423$ for values), sex ($p = 0.657$ for effectiveness; $p = 0.958$ for values), or academic program ($p = 0.239$ for effectiveness; $p = 0.229$ for values). These results demonstrate that the pedagogical strategy is inclusive, equitable, and universally effective across diverse demographic groups (Dawson & Venville, 2010; Sadler, 2011).

Relationships Between Effectiveness, Values Integration, and Midterm Grades

- Perceived Effectiveness and Values Integration: Pearson correlation analysis revealed a very strong positive correlation ($r = 0.95, p = 0.000$), indicating that instructional strategies rooted in real-world ethical issues significantly enhance both cognitive and moral learning outcomes (Zeidler & Sadler, 2021).
- Perceived Effectiveness and Midterm Grades: A strong positive correlation ($r = 0.81, p = 0.000$) was found between perceived effectiveness and students' midterm academic performance, confirming that contextualized and engaging instruction

positively impacts content mastery and academic success (Osborne et al., 2023; Sadler, 2024).

Conclusion

The integration of National Socio-Scientific Issues into the GEC 7 midterm unit proved highly effective in fostering learning outcomes, active participation, and class enjoyment while successfully embedding institutional values (Virtus, Patria, and Scientia). The approach demonstrated universal applicability across student demographics and exhibited strong positive correlations with both values internalization and academic achievement. These findings substantiate the validity of the proposed Teachers' Guide as a practical instructional model for values-oriented and contextualized science education.

Recommendation

It is recommended that San Pablo Colleges and similar higher education institutions formally institutionalize the use of NSSI in STS and other general education science courses. Faculty members should be provided with professional development workshops focusing on SSI pedagogy, ethical facilitation, and contextual curriculum design. Furthermore, assessment practices should incorporate reflective journals, debates, and performance tasks to continuously measure both cognitive growth and moral reasoning. Future researchers may explore the long-term impact of NSSI-based instruction on students' civic behavior and science communication competencies.

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