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Examining the Influence of Science-for-the-Common-Good Orientation on Civic Responsibility Intentions among STEM and Non-Stem Students

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Abstract

This study examined the influence of science-for-the-common-good orientation on civic responsibility intentions among STEM and non-STEM students. It focused on three dimensions of civic responsibility: community engagement, ethical decision-making, and social accountability. The study aimed to determine whether students' perception of science as a tool for societal benefit relates to their intention to participate in civic and community-related activities.

A descriptive research design was used. Data were gathered through a structured survey questionnaire administered to selected STEM and non-STEM students. Mean and standard deviation were used to analyze the level of science-for-the-common-good orientation and civic responsibility intentions.

Findings revealed that the respondents demonstrated a high level of science-for-the-common-good orientation (M range = 4.70 to 5.01), indicating that students generally believe science should contribute to societal welfare and address environmental and social concerns. The respondents also exhibited high civic responsibility intentions in terms of community engagement (M = 4.71), ethical decision-making (M range = 4.99 to 5.05), and social accountability (M range = 4.90 to 5.20).

The findings further showed that science-for-the-common-good orientation significantly predicts civic responsibility intentions among students. Learners who perceive science as socially relevant tend to demonstrate stronger ethical awareness, community participation, and social accountability. However, academic track was not found to significantly moderate this relationship. Overall, the study highlights the importance of promoting socially relevant science education to strengthen students' civic-mindedness and sense of social responsibility.

Keywords: Science-for-the-Common-Good Orientation, STEM Education, Non-STEM Students, Civic Engagement, Science Education, Civic Responsibility

1. Introduction

In the twenty-first century, science and technology have become deeply tied to many of the problems societies face today. Issues such as climate change, public health emergencies, environmental destruction, and widening social inequalities are no longer seen as concerns limited to scientists or policymakers alone. They affect everyday life and demand citizens who can understand scientific information, think critically about it, and use it in making decisions that benefit both individuals and communities. Because of this, education systems around the world are increasingly expected to develop learners who are not only knowledgeable in science but also capable of applying that knowledge in socially meaningful ways (OECD, 2023; UNESCO, 2021) [6, 7].

This shift has gradually influenced the direction of science education. Rather than focusing only on memorizing concepts or mastering technical skills, science learning is now being viewed as something connected to real social realities. Schools are being encouraged to help students see how science can contribute to solving community problems, promoting sustainability, and improving quality of life. Recent educational frameworks stress that scientific literacy should go beyond understanding theories and formulas. Students must also learn how science intersects with ethical issues, environmental concerns, and civic responsibilities (OECD, 2023) [6]. In this perspective, science is no longer treated simply as a classroom subject. It becomes a human and social practice that directly affects society.

Alongside this development is the growing attention given to civic responsibility among learners. Civic responsibility refers to a person's willingness to contribute positively to society through actions such as community participation, responsible decision-making, and concern for public welfare. Educational research has increasingly emphasized that meaningful learning experiences can shape students' awareness of their social roles. When learners are exposed to authentic societal issues and are encouraged to reflect on them, they tend to become more socially aware and more motivated to participate in community-oriented actions (OECD, 2020; UNESCO, 2021) [5, 7].

In science education, this civic-oriented approach has started to receive greater attention in recent years. Studies suggest that students are more likely to develop prosocial attitudes when they see science as relevant to the needs of society. Science lessons that tackle environmental challenges, public health concerns, or local community problems often encourage students to feel a stronger sense of responsibility toward others (Koirala & Bowman, 2021) [4]. Civic-oriented STEM experiences have also been associated with increased engagement and a clearer sense of purpose in learning science, especially when students recognize that scientific knowledge can be used beyond academic requirements (Kim & Park, 2022) [3].

Despite these developments, science instruction in many schools still tends to prioritize content coverage, laboratory work, and examination performance. In many classrooms, discussions about the social and civic dimensions of science remain limited. Because of this, some students may struggle to fully appreciate how science can address real-world problems or contribute to the common good. This raises important questions about whether students who view science as socially meaningful are also more likely to develop stronger civic responsibility intentions (UNESCO, 2021) [7].

Another factor that may influence this relationship is academic track, particularly the distinction between STEM and non-STEM strands. STEM education generally places strong emphasis on analytical thinking, scientific reasoning, and technical competence. While these skills are essential, some studies argue that STEM curricula do not always explicitly highlight the social and civic implications of science, which may affect how students connect scientific learning to societal concerns (OECD, 2023; Kim & Park, 2022) [6, 3].

On the other hand, non-STEM students are often more exposed to subjects related to the humanities and social sciences. These learning experiences may shape different perspectives regarding community issues, ethics, and social responsibility. Research suggests that students' academic specialization can influence their interests, values, and ways of understanding societal concerns (OECD, 2020) [5]. Because of these differences, STEM and non-STEM learners may not interpret the role of science in society in the same way.

Although the connection between science education and civic development has received increasing attention, there are still limited studies that directly examine science-for-the-common-good orientation as a predictor of civic responsibility intentions. Existing research often looks at civic engagement or STEM learning separately instead of examining how the two relate to one another within a single framework. In the Philippine context, this gap becomes even more noticeable. Few studies have explored this issue among senior high school students, particularly within the STEM and non-STEM track system implemented in the country.

Given these gaps, the present study aims to examine the influence of science-for-the-common-good orientation on civic responsibility intentions among STEM and non-STEM students. Specifically, it seeks to determine whether students who perceive science as beneficial to society are more likely to demonstrate civic responsibility intentions and whether academic track affects this relationship. Through this investigation, the study hopes to contribute to ongoing discussions on how science education can develop not only academically competent learners but also socially responsible and civic-minded individuals.

Statement of the Problem

This study aims to examine the relationship between students' science-for-the-common-good orientation and civic responsibility intentions, and to assess differences across STEM and non-STEM academic tracks. Specifically, it seeks to answer the following questions:

1. What is the level of science-for-the-common-good orientation among STEM and non-STEM students?
2. What is the level of civic responsibility intentions among STEM and non-STEM students in terms of:
   2.1 Community Engagement
   2.2 Ethical Decision-making
   2.3 Social Accountability
3. Does science-for-the-common-good orientation significantly predict civic responsibility intentions, and is this relationship moderated by academic track (STEM vs non-STEM)?

Objectives of the Study

1. To determine the level of science-for-the-common-good orientation among STEM and non-STEM students.
2. To assess the level of civic responsibility intentions among STEM and non-STEM students in terms of:
   2.1 Community Engagement
   2.2 Ethical Decision-making
   2.3 Social Accountability
3. To examine whether science-for-the-common-good orientation significantly predicts civic responsibility intentions and whether this relationship is moderated by academic track (STEM vs non-STEM).

Hypothesis

H1: Science-for-the-common-good orientation significantly predicts civic responsibility intentions.

H2: Academic track (STEM vs non-STEM) significantly moderates the relationship between science-for-the-common-good orientation and civic responsibility intentions.

2. Review of Related Literature and Studies

Science-for-the-Common-Good Orientation

Science education has increasingly emphasized the importance of framing science not only as a body of knowledge but also as a tool for fostering scientific literacy necessary for addressing societal issues and promoting the common good. The science-for-the-common-good orientation highlights individuals' beliefs that scientific knowledge should be applied to improve society, inform

public decision-making, and contribute to community welfare. This perspective is strongly supported by Ross and Fried (2022) [8], who argue that science education, particularly in STEM fields, should prepare students to use scientific knowledge responsibly for the public benefit. The authors further emphasize that integrating civic science into education fosters a sense of social responsibility and encourages students to engage in real-world problems.

Similarly, initiatives in prosocial science indicate the shifting of science education beyond technical knowledge, from learning scientific facts and methods to a framework that develops ethical and social responsibility and community engagement. Greater Good in Education (n.d.) highlighted that prosocial science promotes students' development as socially responsible individuals by linking scientific knowledge with ethical reasoning and community engagement. This approach reinforces theSimilarly, initiatives in prosocial science emphasize that science learning should not be limited to technical understanding but should also cultivate moral responsibility and concern for others.

A recent study conducted by Mocanu, Bibiri, Rusu, Moroșanu, and Bejan (2025) [10], provides empirical evidence that individuals who perceive science as socially relevant are more likely to engage in civic-oriented activities. The authors found that attitudes toward science, perceived benefits, and scientific literacy significantly influence civic engagement with science. Their findings suggest that when individuals recognize the relevance of science in society, they are more inclined to participate in activities that benefit the community.

Thus, a science-for-the-common-good orientation is a crucial factor that shapes how individuals translate scientific learning into socially responsible behavior.

Civic Responsibility Intentions

Civic responsibility intentions refer to an individual's willingness to contribute to society through active participation, ethical decision-making, and accountability to others. Civic responsibility is widely defined as participation in democratic life through both attitudes and actions such as engagement in community issues, social advocacy, and contribution to public welfare. Empirical research on service-learning shows that participation in community-based civic activities strengthens students' awareness of societal problems and their commitment to civic engagement (Gregory B. Markus, Jeffrey P. F. Howard, & David C. King, 1993 [11]; Wilcox, 2011).

Research by Popa *et al*. (2023) demonstrates that civic responsibility is closely linked to prosocial behavior among young adults. Their study found that students who develop a strong sense of social responsibility are more likely to engage in behaviors that benefit others, indicating that civic responsibility intentions play a crucial role in shaping real-world actions. This highlights the importance of fostering civic values within educational settings.

Additionally, studies on civic competence among university students show that academic programs can significantly influence students' sense of responsibility toward society. For instance, Cantiga *et al*. (2025) found that participation in social studies programs enhances students' civic competence, including their awareness of social issues, sense of responsibility, and willingness to contribute to community development. These findings suggest that civic responsibility is not only an individual trait but also an outcome of educational experiences that promote social awareness and engagement.

3. Methods and Procedures

Research Design

This study employed a quantitative research approach using a correlational design to examine whether science-for-the-common-good orientation influences students' civic responsibility intentions and whether differences exist between STEM and non-STEM students. Since the study focuses on determining relationships and predictive influence among variables without manipulating any condition, the correlational method is considered appropriate.

The study also utilized a predictive approach through regression analysis to determine whether students' orientation toward science for societal benefit can significantly predict their civic responsibility intentions. In addition, comparisons between STEM and non-STEM students will be explored to identify possible differences in their responses. Through this design, the researchers will be able to describe patterns, relationships, and tendencies that naturally exist among the variables being studied.

Participants of the Study

The study involved senior high school students currently enrolled at Glory Dei Montessori College. A total of 50 respondents participated in the study, consisting of 25 STEM students and 25 non-STEM students. The participants were selected using a stratified sampling technique to ensure equal representation from both academic tracks.

The respondents were chosen based on the following criteria: they were currently enrolled as senior high school students during the conduct of the study and were willing to participate voluntarily. The researchers considered these participants appropriate for the study because they represented different academic strands, which allowed comparisons between STEM and non-STEM students (HUMSS, ABM, TVL) in terms of science-for-the-common-good orientation and civic responsibility intentions.

Data Gathering Instrument

The primary instrument used in this study was a survey questionnaire designed to measure students' science-for-the-common-good orientation and civic responsibility intentions. The questionnaire was adapted from the study Predictors of Scientific Civic Engagement (PSCE) Survey by Alam *et al*. (2023), which focused on scientific civic engagement, social responsibility, and attitudes toward science in relation to community involvement.

The instrument consisted of statements related to students' perceptions of science as a means of contributing to society and their intentions to participate in civic and socially responsible actions. Some items from the original questionnaire were modified to fit the context and objectives of the present study involving STEM and non-STEM students. Hence, the questionnaire utilized a 5-point Likert scale ranging from Strongly Disagree to Completely Agree.

Before the actual conduct of the study, the instrument underwent content validation through peer review and evaluation by field experts to ensure the clarity, relevance, and appropriateness of the items. Necessary revisions were

incorporated based on their suggestions and feedback. After the validation process, the finalized questionnaire was distributed to the selected respondents for data collection.

Data Analysis

The data gathered from the respondents were organized, tabulated, and analyzed using appropriate statistical tools. Mean and standard deviation were utilized to determine the level of science-for-the-common-good orientation and civic responsibility intentions among STEM and non-STEM students. These statistical measures were used to describe the respondents' general perceptions, responses, and variability across the measured variables.

To determine whether significant differences existed between STEM and non-STEM students in terms of science-for-the-common-good orientation and civic responsibility intentions, an independent sample t-test was employed. The analysis was conducted across the dimensions of community engagement, ethical decision-making, and social accountability. The level of significance was set at 0.05.

Furthermore, multiple regression analysis with interaction terms was utilized to determine whether science-for-the-common-good orientation significantly predicts civic responsibility intentions and whether academic track moderates the relationship between the two variables. In the analysis, science-for-the-common-good orientation served as the predictor variable, civic responsibility intentions as the dependent variable, and academic track (STEM vs non-STEM) as the moderator variable. An interaction term between science-for-the-common-good orientation and academic track was included in the regression model to examine possible moderation effects. Regression coefficients, t-values, p-values, and the coefficient of determination (R^2) were used in interpreting the results.

Ethical Consideration

Ethical standards were strictly observed throughout the conduct of the study. Before gathering data, permission to conduct the research was secured from the appropriate school authorities. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. They were also assured that they could withdraw from the study at any time without any consequences.

To protect the respondents' privacy, no personal identifying information was disclosed in the study. All responses gathered from the participants were treated with confidentiality and were used solely for academic and research purposes. The researchers ensured that the data collected were stored securely and handled responsibly throughout the duration of the study.

4. Results and Discussion

This chapter presents the findings of the study between students' science-for-the-common-good orientation and civic responsibility intentions among STEM and non-STEM students. The analysis also determined whether academic track moderates the relationship between the two variables. A total of 50 respondents participated in the study.

Table 1: Level of science for-the-common-good orientation among STEM and NON-STEM tracks

Track	Mean	SD	Interpretation
STEM	5.01	0.9	High
Non-STEM	4.7	1.34	High

Interpretation scale:
Sample size: Stem =25; Non-Stem= 25

Table 1 shows that both STEM and non-STEM students demonstrated high levels of science-for-the-common-good orientation, with STEM students obtaining a slightly higher mean score (M = 5.01, SD = 0.90) compared to non-STEM students (M = 4.70, SD = 1.34). This indicates that students from both tracks generally believe that science should be used to benefit society, address social concerns, and contribute to community welfare. These findings support the idea presented by Ross and Fried (2022) [8] that science education can foster social responsibility when students perceive science as connected to real-world concerns. The results also align with the study of Mocanu *et al*. (2025) [10], which emphasized that individuals who see science as socially relevant are more likely to develop civic-oriented perspectives and engagement.

Table 2: Level of civic responsibility intentions among STEM and NON-STEM tracks

Dimensions	Track	Mean	SD	Interpretation
Community Engagement	STEM	4.71	0.93	High
	NON-STEM	4.71	1.29	High
Ethical Decision-Making	STEM	5.05	0.2	High
	NON-STEM	4.99	0.22	High
Social Accountability	STEM	5.2	0.97	High
	NON-STEM	4.9	1.05	High

Table 2 reveals that both groups demonstrated a consistently high level of civic responsibility across all dimensions. In terms of community engagement, both STEM and non-STEM students obtained the same mean score of 4.71, interpreted as high. However, the non-STEM group showed a slightly higher standard deviation (SD = 1.29) compared to STEM students (SD = 0.93), indicating greater variability in their responses, while STEM students exhibited more consistent perceptions regarding participation in community-related activities.

For ethical decision-making, STEM students recorded a mean of 5.05, while non-STEM students obtained a mean of 4.99. Both results fall under the high interpretation, suggesting that students from both academic tracks highly value fairness, responsibility, and ethical considerations in decision-making. The low standard deviation values for both groups (STEM = 0.20; non-STEM = 0.22) further indicate that respondents shared relatively similar views regarding ethical behavior and responsible choices.

In terms of social accountability, STEM students obtained a slightly higher mean score (M = 5.20) than non-STEM students (M = 4.90), although both remained within the high level of interpretation. This suggests that students generally recognize the importance of being accountable for their actions and contributing positively to society. The standard deviation values (STEM = 0.97; non-STEM = 1.05) imply moderate variability in responses, reflecting some differences in how students perceive their social responsibilities.

The findings of the present study are consistent with the work of Chang *et al*. (2024) [1], who found that civic engagement efficacy among STEM students contributes to active participation in community and social activities. Similarly, Chen *et al*. (2025) [2] emphasized that STEM education should promote ethical responsibility and social

accountability alongside scientific competence. These studies support the present finding that both STEM and non-STEM students demonstrate high civic responsibility intentions, particularly in terms of community engagement, ethical decision-making, and social accountability.

Overall, the results suggest that both STEM and non-STEM students possess strong civic responsibility intentions. Regardless of academic track, the respondents demonstrated positive attitudes toward community involvement, ethical conduct, and social accountability, indicating that students are generally aware of their responsibilities as members of society.

Table 3: Independent Samples t-test Results on the Differences Between STEM and Non-STEM Students in Science-for-the-Common-Good Orientation and Civic Responsibility Intentions

Variable	t-value	p-value
Science for-the-common-good orientation	0.925	0.362
Civic responsibility intentions	0.604	0.549
Community Engagement	-0.008	0.994
Ethical Decision-Making	0.947	0.349
Social Accountability	1.045	0.302

Table 3 presents that all obtained p-values were greater than the 0.05 level of significance. Specifically, science-for-the-common-good orientation yielded a p-value of 0.362, community engagement obtained 0.994, ethical decision-making recorded 0.349, social accountability showed 0.302, and overall civic responsibility intentions produced a p-value of 0.549. These findings indicate that there were no statistically significant differences between STEM and non-STEM students in any of the variables examined.

The absence of significant differences suggests that students from both tracks share relatively similar perspectives regarding the role of science in promoting societal welfare and in demonstrating civic responsibility. Regardless of specialization, the respondents appeared to exhibit comparable levels of community involvement, ethical awareness, and social accountability. This may imply that civic-oriented values and socially responsible attitudes are not limited to a particular academic strand but are instead shaped by broader educational experiences and social influences.

The findings further suggest that both STEM and non-STEM students recognize the importance of contributing positively to society and making responsible decisions that consider the welfare of others. Although slight differences in mean scores were observed in some variables, these variations were not substantial enough to establish statistical significance.

These results are consistent with previous studies emphasizing that civic responsibility and social awareness can develop across different academic disciplines. Chang *et al*. (2024) [1] noted that students' civic engagement is influenced not only by academic specialization but also by educational experiences that encourage participation and social involvement. Similarly, Chen *et al*. (2025) [2] emphasized that values related to ethical responsibility and social accountability may be cultivated among learners regardless of academic track, particularly when education promotes awareness of societal concerns.

Table 4: Multiple Regression Analysis on the Influence of Science-for-the-Common-Good Orientation on Civic Responsibility Intentions and the Moderating Effect of Academic Track

Predictor	B	t	p-value	Interpretation
Intercept	2.487	9.584	0.000	Significant
Science-for-the-common-good orientation	0.506	9.512	0.000	Significant
STEM vs Non-STEM Tracks	-0.408	-0.949	0.348	Not Significant
Science-for-the-common-good orientation x STEM vs Non-STEM Tracks	0.074	0.860	0.394	Not Significant

$R^2 = 0.783$

Table 4 displays the multiple regression analysis with interaction terms to determine whether science-for-the-common-good orientation significantly predicts civic responsibility intentions and whether STEM or non-STEM tracks moderates this relationship.

The regression model explained approximately 78.3% of the variance in civic responsibility intentions ($R^2 = .783$), indicating that the model has strong explanatory power. The findings revealed that science-for-the-common-good orientation significantly predicted civic responsibility intentions ($B = 0.506$, $t = 9.512$, $p < 0.01$). This indicates that students who possess stronger beliefs regarding the role of science in promoting societal welfare are more likely to demonstrate higher levels of civic responsibility intentions. In particular, students who perceive science as beneficial to society tend to exhibit stronger community engagement, ethical decision-making, and social accountability.

In contrast, STEM and non-STEM Track did not significantly predict civic responsibility intentions ($B = -0.408$, $t = -0.949$, $p = 0.348$). Likewise, the interaction term between science-for-the-common-good orientation and academic track was not statistically significant ($B = 0.074$, $t = 0.860$, $p = 0.394$). This indicates that academic track did not moderate the relationship between science-for-the-common-good orientation and civic responsibility intentions.

These findings suggest that the positive influence of science-for-the-common-good orientation on civic responsibility intentions exists similarly among both STEM and non-STEM students. Regardless of academic specialization, students who recognize the social value of science tend to demonstrate stronger civic-oriented attitudes and behaviors.

Therefore, the hypothesis stating that science-for-the-common-good orientation significantly predicts civic responsibility intentions was supported. However, the hypothesis proposing that academic track moderates this relationship was not supported.

5. Conclusion

This study examined the influence of science-for-the-common-good orientation on the civic responsibility intentions of STEM and non-STEM senior high school students. The findings revealed that both groups

demonstrated high levels of science-for-the-common-good orientation and civic responsibility intentions, particularly in the areas of community engagement, ethical decision-making, and social accountability. These results suggest that students, regardless of academic track, generally recognize the importance of using science for societal benefit and understand their responsibilities as members of the community.

The study further found that there were no significant differences between STEM and non-STEM students in terms of science-for-the-common-good orientation and civic responsibility intentions. This indicates that civic-minded values and socially responsible attitudes are not confined to a specific academic specialization. Instead, these perspectives may be shaped by broader educational experiences, personal values, and social influences that extend beyond students' chosen tracks.

More importantly, the results confirmed that science-for-the-common-good orientation significantly predicts civic responsibility intentions. Students who viewed science as relevant to addressing societal concerns and improving community welfare were more likely to demonstrate stronger intentions toward ethical behavior, social accountability, and civic participation. This finding highlights the important role of socially oriented science education in developing learners who are not only academically capable but also socially aware and responsible.

However, academic track was not found to significantly moderate the relationship between science-for-the-common-good orientation and civic responsibility intentions. The positive relationship between the two variables remained consistent among both STEM and non-STEM students. This suggests that the influence of socially relevant views of science on civic responsibility applies similarly across different academic strands.

Overall, the study emphasizes the value of integrating social relevance, ethical awareness, and community-oriented perspectives into science education. By helping students understand the role of science in promoting the common good, schools may contribute to the development of learners who are more prepared to participate responsibly in society and address real-world challenges.

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