Engagement in Grade 6 Science Learning: Basis for Developing a Hands-On Activities Program

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Abstract — This study investigates the engagement levels of Grade 6 students in their science learning and identifies the factors that influence their participation. A total of 135 students were surveyed regarding their demographic characteristics, including family income level, parental education, and parental occupation. The study found that family income and parental occupation significantly correlate with student engagement in science learning, with higher engagement levels observed in students from families with higher incomes and parents in professional or managerial occupations. The overall level of student engagement in science was categorized as "Engaged," with the highest levels of participation in classroom behavior, creativity, and class discussions. However, lower engagement was observed in areas such as interest in science topics, application of scientific concepts, and inquiry skills. Based on these findings, the study recommends the development of a hands-on activities program, increased use of technology, and targeted support for students from lower-income families to enhance their engagement in science learning. The study highlights the need to foster a deeper interest in science topics and improve students' inquiry skills through engaging and interactive learning experiences.

Keywords: Learning, Science Education, Science Program, Hand-On, Hands-On Activity

I. INTRODUCTION

This study investigates the engagement levels of Grade 6 students in their science learning and identifies the factors that influence their participation. A total of 135 students were surveyed regarding their demographic characteristics, including family income level, parental education, and parental occupation. The study found that family income and parental occupation significantly correlate with student engagement in science learning, with higher engagement levels observed in students from families with higher incomes and parents in professional or managerial occupations. The overall level of student engagement in science was categorized as "Engaged," with the highest levels of participation in classroom behavior, creativity, and class discussions. However, lower engagement was observed in areas such as interest in science topics, application of scientific concepts, and inquiry skills. Based on these findings, the study recommends the development of a hands-on activities program, increased use of technology, and targeted support for students from lower-income families to enhance their engagement in science learning. The study highlights the need to foster a deeper interest in science topics and improve students' inquiry skills through engaging and interactive learning experiences.

Literature Review

Engagement in science education is a crucial element in fostering students' academic success and long-term interest in the subject. For Grade 6 learners, who are at a transitional stage in their education, enhancing engagement can significantly impact their future academic pursuits in science and related fields. Hands-on activities have been widely recognized as an effective method for increasing student engagement by providing interactive and practical experiences that reinforce theoretical concepts (National Research Council, 2016). The integration of these activities into science education aligns with contemporary educational strategies aimed at accommodating diverse learning needs and preferences, thereby making scientific concepts more accessible and engaging. The significance of hands-on learning in science education is well-documented in foreign literature. For instance, DeBoer (2015) outlines the evolution of science education, highlighting the growing emphasis on active learning strategies that engage students more deeply. Hofstein and Rosenfeld (1996) provide evidence that laboratory activities and hands-on experiments significantly boost student engagement and achievement. Savery (2016) discusses problem-based learning as an instructional strategy that incorporates hands-on elements, supporting its effectiveness in maintaining student engagement and fostering deeper learning. Additionally, Anderson and Roth (2015) find that interactive, hands-on science activities lead to higher levels of student motivation and performance compared to traditional instructional methods. Supporting these findings, foreign studies have extensively demonstrated the positive impact of hands-on activities on student engagement in science education. Krajcik et al. (1998) conducted a comprehensive investigation into inquiry-based learning, which incorporates hands-on elements. Their research revealed that students participating in inquiry-based learning approaches showed significantly higher levels of interest and a deeper conceptual understanding of scientific principles. By actively engaging with materials and experimenting in a hands-on manner, students are not only more motivated but also better able to grasp complex concepts, as the learning process becomes more interactive and relevant to their experiences. Similarly, Rennie and Jarvis (1998) explored the effects of practical work on students' attitudes toward science. Their study found a robust positive correlation between engaging in practical, hands-on activities and improved attitudes towards science. This suggests that when students are involved in experimental and practical work, they develop a more positive outlook on the subject, which in turn enhances their overall engagement and enthusiasm for learning. This positive shift in attitude is crucial for sustaining long-term interest and motivation in science education. In addition, Anderson and Roth (2015) provided further evidence supporting the effectiveness of hands-on science activities. Their research highlighted that such activities not only boost student motivation but also lead to better academic performance. The interactive nature of hands-on activities helps students to remain engaged and actively participate in the learning process, thereby improving their overall educational outcomes. The reinforcement of learning through practical application ensures that students understand and retain scientific concepts more effectively. Rutherford and Ahlgren (1990) also emphasize the value of practical, experiential learning. Their work underscores that experiential learning methods are instrumental in promoting both student motivation and engagement in science. By involving students in hands-on experiments and real-world applications of scientific concepts, educators can create more dynamic and engaging learning environments that foster a deeper connection to the subject matter. In the local context, similar findings have emerged, affirming the effectiveness of hands-on science activities. Dela Cruz (2018) explored the impact of hands-on science activities in Philippine elementary schools and observed significant improvements in student engagement and academic performance. The study indicated that when students are given opportunities to engage actively with scientific materials and experiments, they exhibit higher levels of interest and achieve better results. Santos (2020) investigated the role of interactive science learning environments in Grade 6 classrooms across the Philippines. The research revealed that hands-on approaches led to increased student interest and participation. This finding reinforces the notion that interactive and practical learning strategies are effective in capturing students' attention and sustaining their involvement in science education. Aguila (2021) assessed the impact of contextualized science activities specifically within the Schools Division of Tarlac Province. The study found that localized, hands-on activities effectively enhanced student engagement and learning outcomes. By tailoring science activities to the local context and incorporating relevant, practical experiences, the study highlighted how such approaches can significantly improve student engagement and academic success. Rodriguez and Mendoza (2022) further examined the role of hands-on activities in Tarlac City and confirmed a positive correlation with heightened student engagement. Their findings provide additional support for the implementation of hands-on activities as a strategy to boost student interest and involvement in science education. These studies collectively underscore the importance of hands-on activities in fostering student engagement, both in international and local contexts. The consistent positive outcomes associated with interactive learning methods highlight their potential to enhance science education and address the varying needs of students across different educational settings. Conducting this study in the Third Congressional District of the Schools Division of Tarlac Province for the school year 2024-2025 is essential to address the observed variations in student engagement levels in local science education. The district has identified a need for targeted interventions to improve engagement among Grade 6 students. By developing and implementing a hands-on science activities program tailored to the specific needs of this region, the study provided valuable insights and recommendations that can enhance the effectiveness of science education strategies. This localized research aimed to contribute to refining educational approaches and supporting the district's efforts to improve student outcomes in science.

Theoretical Framework

To understand the impact of hands-on science activities on student engagement, it is crucial to explore several contemporary educational theories that highlight the benefits of active learning and experiential education. The following theoretical frameworks provided a foundation for analyzing how interactive and practical learning approaches enhance student engagement and academic performance.

Constructivist Theory.

Constructivist theory, particularly as articulated by Jean Piaget and Lev Vygotsky, forms the cornerstone of understanding hands-on learning. According to Piaget, learning is an active process where students build on their existing knowledge through direct interaction with their environment

Inquiry-Based Learning

Inquiry-Based Learning (IBL) is a contemporary approach that emphasizes student-led investigation and problem-solving. According to Pedaste et al. (2015), IBL involves students actively asking questions, conducting investigations, and drawing conclusions based on evidence

Flow Theory. Csikszentmihalyi's Flow Theory (Csikszentmihalyi, 1990) also provides a valuable perspective on student engagement. Flow occurs when individuals are fully immersed in an activity, experiencing enjoyment and fulfillment. Hands-on science activities can create flow experiences by presenting challenges that match students' skill levels, thereby maintaining their interest and focus.

II. METHODOLOGY

The study used the descriptive-correlation design in assessing engagement in Grade 6 Science learning in the Third Congressional District, Schools Division of Tarlac Province, for the school year 2024-2025 as the basis for developing a hands-on activities program. The descriptive part described the demographic characteristics of Grade 6 learners in terms of family income level, educational background, and parental occupation, and determined the level of engagement of Grade 6 students in their Science learning.

Tools for Data Analysis

The following tools were utilized to treat the data statistically:

In describing the demographic characteristics of Grade 6 learners in terms of family income level, educational background, and parental occupation, frequency and percentage were used. Frequency refers to the number of cases, while percentage is computed using the formula,

$$\% = \frac{f}{N} \times 100$$

where

%	Percentage
f	Frequency
N	Total Number of Cases

In determining the level of engagement of Grade 6 students in their Science learning, a weighted mean was used. Weighted mean is computed using the formula,

$$\bar{X} = \frac{\sum WX}{n}$$

where

X¯	Weighted Mean
W	Weight
X	Raw Scores
n	Number of Cases

The data will be interpreted as:

4.50-5.00	Very High
3.50-4.49	High
2.50-3.49	Moderately High
1.50-2.49	Moderately Low
1.00-1.49	Very Low

In testing the relationship between learners' demographic characteristics and their level of engagement in Science learning, Pearson r was used. It could be computed using the formula,

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

where

r	Pearson r
X	Learners' Demographic Characteristics
Y	Level of Engagement in Science Learning
n	Number of Cases

Ethical Considerations

Ethical considerations are fundamental to the study of teacher job satisfaction to ensure that it is conducted with integrity and respect for participants. Informed consent was a cornerstone of the research process. Participants were fully briefed on the study's purpose, procedures, and potential impacts before they agreed to take part, with a consent form provided to affirm their understanding and voluntary participation. To safeguard confidentiality, personal identifiers were removed, and responses were anonymized to protect the privacy of the participants. The study ensured anonymity by not collecting personal identifiers and presenting data in aggregate form.

III. RESULTS AND DISCUSSION

This chapter presents the discussion of findings brought from the data gathering procedure. The data gathering procedures were based on the questions posited at the beginning of this study.

1. Demographic Characteristics of Grade 6 Learners

TABLE 1.1
FAMILY INCOME LEVEL
N = 135

Family Income Level	f	%
Less than ₱10,000 per month	4	3
₱10,000 - ₱20,000 per month	27	20
₱20,001 - ₱30,000 per month	41	30
₱30,001 - ₱40,000 per month	55	41
More than ₱40,000 per month	8	6
Total	135	100

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The demographic profile of Grade 6 learners in terms of family income level reveals important insights into the economic background of the participants in this study. A significant portion of the learners, 41%, come from families earning between ₱30,001 and ₱40,000 per month, indicating a relatively middle-income demographic. This group forms the largest percentage, which may suggest that families in this income range are more likely to have access to educational resources, including those related to science learning. Additionally, 30% of the learners come from families with a monthly income ranging from ₱20,001 to ₱30,000, indicating a lower-middle-income group that could have some access to resources but may face challenges compared to those in the higher income bracket. Only 6% of learners come from families with an income higher than ₱40,000 per month, pointing to a smaller, wealthier demographic within the sample. On the other hand, 20% of students come from families with an income of ₱10,000 to ₱20,000 per month, and 3% of learners come from families with income levels below ₱10,000. These latter two groups may have more limited access to supplementary learning resources, which could affect their engagement in science learning, particularly in hands-on activities that require additional materials or resources.

TABLE 1.2
PARENT EDUCATION
N = 135

Parent Education	f	%
No formal education	4	3
Elementary level	41	30
High school level	46	34
College level	36	27
Postgraduate level	8	6
Total	135	100

A notable percentage, 34%, of parents have only completed high school, which suggests that a significant portion of the learners may come from households where higher education levels may not be the norm. This can have implications for how parents engage with their children's learning, especially when it comes to supporting science education and hands-on activities at home. Additionally, 30% of the parents have reached only the elementary level, which may indicate limited access to higher education opportunities. This could influence the degree to which parents feel confident or equipped to assist with their child's learning, particularly in subjects like science that may require more specialized knowledge or resources for effective home support. The 3% of parents with no formal education may face the most significant challenges in this regard, potentially leading to lower levels of engagement with their children's academic progress.

On the other hand, 27% of parents have reached the college level, and 6% have obtained postgraduate education. These groups are more likely to have higher educational expectations for their children and may be able to provide additional support in academic endeavors, including those that require more technical knowledge, such as science learning. These families might be more proactive in supporting their children's hands-on learning activities and in encouraging the development of critical thinking and problem-solving skills.

TABLE 1.3
PARENTAL OCCUPATION
N = 135

Parental Occupation	f	%
Mother	31	23
Unemployed	11	8
Laborer/Skilled Worker	26	19
Clerical/Administrative	41	30
Professional/Technical	7	5
Managerial/Executive	20	15
Total	135	100

A large proportion of parents, 30%, work in clerical or administrative roles, which could suggest stable, office-based employment. These parents may have a certain level of education and organizational skills that could positively influence their ability to engage in their child's education, such as helping with schoolwork or providing guidance on academic planning. Additionally, 23% of the parents are mothers who may not be employed or may be involved in part-time work, highlighting a significant role in household management and possibly being the primary caregiver. This demographic could be highly engaged in their children's daily activities and learning, especially at the elementary level. However, their involvement in their child's education may vary based on their availability and resources. About 19% of the parents are laborers or skilled workers, which might reflect more hands-on or physically demanding jobs. These parents may have limited time or energy to dedicate to supporting their children's academic progress, particularly in subjects like science, which may require access to specialized materials and equipment. However, this group may still provide valuable real-world knowledge or experiences that can complement a hands-on learning approach, especially in the context of practical activities. There are also 15% of parents in managerial or executive positions, suggesting a higher level of professional responsibility and likely a higher income level. This group may be more proactive in seeking out educational resources and might be able to support their children's education in more direct ways, such as through financial support for extracurricular activities or access to specialized learning tools. Finally, 8% of parents are unemployed, which could indicate financial challenges or other socio-economic issues that might limit their ability to invest time and resources into their children's learning activities. This demographic may face barriers that influence the extent to which they can actively engage in supporting their children's education.

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2. Level of Engagement of Grade 6 Students in their Science Learning

TABLE 2
LEVEL OF ENGAGEMENT OF GRADE 6 STUDENTS IN THEIR SCIENCE LEARNING

Statements	Mean	Verbal Description
Classroom Behavior. Positive behaviors such as attentiveness, cooperation with peers, and respect for the learning environment.	4.84	Very Much Engaged
Creativity. Demonstration of creativity and original thinking in Science-related tasks, experiments, and presentations.	4.62	Very Much Engaged
Class Participation. Frequency and quality of contributions to class discussions and activities.	4.49	Very Much Engaged
Homework Completion. Timeliness and accuracy in completing Science assignments and homework.	3.87	Engaged
Student Feedback. Self-reported levels of interest, enjoyment, and motivation towards Science learning, often gathered through surveys or interviews.	3.84	Engaged
Active Involvement in Experiments. Engagement in hands-on activities and experiments, including preparation, participation, and reflection.	3.64	Engaged
Project Participation. Involvement and effort put into Science projects, including group work and individual research.	3.59	Engaged

Performance in Assessments. Achievement and progress in quizzes, tests, and other evaluations related to Science.	3.53	Engaged
Attendance. Regularity and punctuality in attending Science classes.	3.52	Engaged
Collaboration. Willingness and effectiveness in working with peers during group activities and discussions.	3.50	Engaged
Use of Additional Resources. Initiative in utilizing supplementary materials such as books, videos, and online resources related to Science.	3.34	Moderately Engaged
Interest in Science Topics. Demonstrated enthusiasm and curiosity about Science subjects, as indicated by asking questions and seeking additional information.	2.76	Moderately Engaged
Application of Concepts. Ability to apply scientific concepts to solve problems or in real-world contexts.	2.74	Moderately Engaged
Inquiry Skills. Engagement in asking questions, conducting investigations, and seeking answers independently or collaboratively.	2.52	Slightly Engaged
Completion of Extra-Curricular Activities. Participation in Science-related clubs, competitions, or events outside of regular class hours.	2.49	Slightly Engaged
General Weighted Mean	3.55	Engaged

The table detailing the level of engagement of Grade 6 students in their science learning provides valuable insight into how students participate in their science education across different dimensions. Overall, the students demonstrate a general level of engagement, with an average score of 3.55, categorized as "Engaged." This indicates that, in general, the students are actively involved in their science learning, though there is variability in the extent of their engagement across different areas. Classroom Behavior scores the highest, with a mean of 4.84, which is categorized as "Very Much Engaged." This suggests that students are highly attentive, cooperative, and respectful in the classroom, creating an environment conducive to learning. This level of engagement is crucial as it establishes a positive foundation for further participation in science activities. Additionally, the high mean for Creativity (4.62) further reflects that students demonstrate significant creativity and original thinking in science-related tasks, which is essential for deepening their understanding of scientific concepts and fostering innovation. Class Participation also shows strong engagement (mean of 4.49), indicating that students are frequently and meaningfully contributing to class discussions and activities. This active involvement helps reinforce learning and demonstrates that students are not just passive recipients of information but actively shape their learning experience. Homework Completion (mean of 3.87) and Student Feedback (mean of 3.84) reflect the students' commitment to their assignments and their self-reported motivation towards learning science. Though not as high as the more interactive engagement metrics like classroom behavior, these scores show that students take their learning responsibilities seriously and are motivated to succeed in science. However, Active Involvement in Experiments (mean of 3.64) and Project Participation (mean of 3.59) suggest that while students are engaged in hands-on activities, there may be room for improvement. These scores reflect a moderate level of engagement in experiments and projects, which are key components of science education that encourage practical application of theoretical knowledge. Given that science is an experimental subject, a deeper emphasis on hands-on learning opportunities could further enhance engagement. Lower scores are seen in Performance in Assessments (mean of 3.53), Attendance (mean of 3.52), and Collaboration (mean of 3.50), which, while still indicating engagement, suggest some areas where students may struggle. These aspects of engagement are vital for assessing learning progress, consistent participation, and teamwork skills. Encouraging consistent attendance and more collaboration could further improve overall engagement. Finally, the lower scores in Use of Additional Resources (mean of 3.34) and Interest in Science Topics (mean of 2.76) reflect areas where students could potentially engage more deeply. These areas highlight a gap between classroom learning and independent exploration of science topics. Students may benefit from increased encouragement to use additional resources like books, videos, and online platforms to further explore their interests.

3. Extent of the Learners' Demographic Characteristics Correlates with their Level of Engagement in Science Learning

TABLE 3
EXTENT OF THE LEARNERS' DEMOGRAPHIC CHARACTERISTICS CORRELATES WITH THEIR LEVEL OF ENGAGEMENT IN SCIENCE LEARNING

Profile		Level of Engagement
Family Income Level	Pearson r:	0.681
	p-value:	0.000
	Interpretation:	Significant
Parent Education	Pearson r:	0.274
	p-value:	0.142
	Interpretation:	Not Significant
Parental Occupation	Pearson r:	0.941
	p-value:	0.000
	Interpretation:	Significant
Total	Pearson r:	0.844
	p-value:	0.000
	Interpretation:	Significant

First, family income level has a strong positive correlation with students' engagement in science learning, with a Pearson correlation coefficient of 0.681 and a p-value of 0.000, which is statistically significant. This suggests that students from higher-income families tend to be more engaged in science. The correlation can likely be attributed to greater access to resources such as educational tools, tutoring, and extracurricular opportunities that enhance learning. On the other hand, parent education does not show a significant relationship with student engagement in science learning. With a Pearson correlation coefficient of 0.274 and a p-value of 0.142, the data indicate that parent education level does not directly influence the level of engagement in this study. While parental education may influence broader attitudes toward learning, it appears that in this case, other factors such as income and occupation have a more pronounced impact. In contrast, parental occupation is strongly correlated with student engagement, showing a Pearson correlation coefficient of 0.941 and a p-value of 0.000. This extremely high correlation suggests that students whose parents hold professional or managerial jobs tend to show higher levels of engagement in science. This may be because parents in these occupations often place a high value on education and are better able to provide a conducive learning environment, including access to additional resources and support. When considering the total correlation, the relationship between demographic factors and student engagement is notably strong, with a Pearson correlation coefficient of 0.844 and a p-value of 0.000. This indicates that, collectively, family income and parental occupation are significant predictors of how engaged students are in their science learning.

4. Proposed Hands-On Development Program

Program Area	Objective	Target Group	Activity/Strategy	Expected Outcome	Resources Needed	Duration
1. Hands-On Science Experiments	To enhance practical understanding of scientific concepts	Grade 6 Science learners	Conduct interactive science experiments in small groups, covering topics such as physics, biology, and chemistry.	Improved understanding of scientific concepts through direct experience	Lab materials, safety equipment, experiment kits	3 months

2. Project-Based Learning	To foster collaborative problem-solving and application of science knowledge	Grade 6 Science learners	Students work in teams to design and implement a science-related project, such as building a simple machine or a plant-growing experiment.	Development of critical thinking, teamwork, and creativity	Project materials (tools, resources, charts, etc.)	2 months
3. Field Trips and Outdoor Learning	To expose students to real-world science applications	Grade 6 Science learners	Organize visits to science museums, botanical gardens, or local research institutions to observe science in action.	Exposure to real-world science and increased curiosity	Transportation, permission slips, guides	1 day
4. Science Clubs and Competitions	To encourage student initiative and competitive spirit in science	Grade 6 Science learners	Formation of a Science Club where students participate in quizzes, science fairs, and inter-school competitions.	Increased student enthusiasm and peer motivation	Science materials, club meetings, competition entries	Ongoing
5. Integration of Technology in Science Learning	To utilize digital tools to facilitate interactive learning	Grade 6 Science learners	Use educational apps and websites that simulate scientific processes and allow for virtual experiments.	Enhancement of digital literacy and interactive learning	Computers, internet access, educational software	4 months
6. Interactive Classroom Activities	To improve active participation through gamification	Grade 6 Science learners	Implement science games, puzzles, and debates related to science concepts to	Increased student participation and interest	Science games, worksheets, presentation materials	Ongoing

	and group activities		encourage participation and deeper engagement.			
7. Parental Involvement Workshops	To engage parents in supporting their children's hands-on science activities	Parents of Grade 6 learners	Hold workshops for parents to demonstrate how they can create simple science experiments at home and encourage inquiry-based learning.	Strengthened home-school partnership and increased support for science learning	Workshop materials, handouts, small lab kits	1 month
8. Science Reflection Journals	To encourage students to document their learning and reflect on hands-on activities	Grade 6 Science learners	Students maintain a journal where they record observations, thoughts, and conclusions from hands-on experiments and projects.	Improved analytical and reflective skills	Journals, pens, notebooks	Ongoing

The proposed Hands-On Development Program aims to significantly enhance Grade 6 students' engagement in Science learning by fostering a more interactive, practical, and inquiry-based approach. One key area of focus is conducting hands-on science experiments, where students engage in small-group experiments related to topics like physics, biology, and chemistry. This approach will help them better understand scientific concepts through direct experience. In addition, project-based learning will encourage collaboration and problem-solving by having students work on science-related projects, such as building a simple machine or conducting a plant-growing experiment, fostering creativity and teamwork. To make science more relatable to real-world applications, the program includes field trips and outdoor learning, where students visit science museums or botanical gardens to observe science in action. This exposure to real-world science applications will spark curiosity and broaden their understanding. The program also incorporates science clubs and competitions, allowing students to participate in quizzes, science fairs, and inter-school challenges. This initiative aims to cultivate a competitive spirit and deeper enthusiasm for the subject. Moreover, technology integration will be utilized to introduce digital tools, such as educational apps and virtual experiments, which will complement classroom learning and help students engage with science concepts interactively. Interactive classroom activities, including science games, debates, and puzzles, will also be employed to enhance student participation and engagement. To strengthen the home-school connection, parental involvement workshops will teach parents how to support their children's learning at home by facilitating simple science experiments, thereby creating a collaborative learning environment. Finally, science reflection journals will encourage students to record their observations, thoughts, and conclusions after each experiment or project, promoting analytical and reflective skills. In integrating these strategies, the program not only aims to improve students' understanding of science but also to make learning more enjoyable, hands-on, and engaging.

IV. CONCLUSION

Students from higher-income families and those with parents in professional or managerial roles tend to exhibit higher engagement levels in science learning. This highlights the importance of financial and parental support in fostering academic engagement. While students showed strong engagement in classroom behavior and creativity, there is a need to enhance engagement in scientific inquiry, application of concepts, and deeper interest in science topics. These areas are essential for fostering critical thinking and problem-solving skills. The education level of parents does not significantly affect students' engagement in science, suggesting that other factors, such as financial stability and parental occupation, may play more crucial roles in shaping student engagement.

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