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Teaching Quality and Democratic Behavior as Predictors of Students Engagement in Learning Science

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A B S T R A C T

To teach students effectively, they must be engaged. This study investigated the combined significant influence of teaching quality and democratic behavior on students' engagement in learning science. The study employed a non-experimental quantitative design using a descriptive-predictive technique. It utilized a total of 117 respondents from one of the private schools in Davao City who answered the adapted survey questionnaire. Using Mean, Pearson r, and Multiple Linear Regression the following findings were made: the level of teaching quality, teacher's democratic behavior, and student engagement were high; teaching quality and student's engagement have a significant relationship; teacher's democratic behavior and student's engagement have a significant relationship. Results implied that the indicators are oftentimes observed and significantly influenced students' engagement. Furthermore, both teaching quality and democratic behavior have a combined significant influence on student's scientific engagement. In conclusion, both variables have impact students' engagement in learning science. Thus, it is recommended that the two be utilized by the teachers to improve students' engagement in science education.

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INTRODUCTION

Science education presents obstacles around the world. The National Survey of Student Engagement or NSSE in 2017 reported that student engagement in universities in the United States and Canada affects learning gains (Zilvinskis, Rocconi, & McCormick, 2021). Learning engagement is easily disturbed and a primary motivator of learning and academic performance (Bond, 2020). Additionally, the teacher's variations in educational philosophies, teaching styles, and resource availability add to the challenge of addressing global student engagement (Azuka, 2020). The recent result of the Program for International Student Assessment or PISA in 2022 reveals that 76 percent of students (15 years old) are having difficulty in science, indicating a significant gap in their understanding and competency in science topics (Orbeta, Melad, & Potestad, 2021). Due to restricted access to current teaching methods and insufficient opportunities for collaborative discussions, students may fail to engage in science learning (Espinosa & Laureano, 2015). Likewise, students lose interest in science education when they need help investigating, testing, and relating abstract ideas to practical applications such as hands-on elements (Delfino, 2019).

In the Philippines, teachers who foster a democratic environment in the classroom by allowing students to express their unique perspectives and co-create relevant scientific solutions to national challenges empower students to become active contributors to long-term development (Gonzales, 2019). The pervasive challenge of student participation, particularly in scientific-related activities such as science investigatory projects and exhibits, is a prevalent concern in the researcher's school. Few missed classes due to frustrations with learning, learning environment, learning requirements, teachers' high expectations, and behavior. Strong student-teacher ties boost engagement (Bantasan, Edig & Decano, 2022). Despite the substantial studies into the impact of teachers on student engagement, we still lack knowledge of the cumulative impact on teaching quality and teachers' democratic behavior on student engagement. Examining how science teachers influence student engagement may help develop a more comprehensive approach that fosters student's passion for learning. Furthermore, it is timely that the Philippines got low scores in the PISA result in science, increasing records of students at risk of dropping out and pursuing non-science related career courses that may result in low student engagement in science scientific education. Thus, this study may help understand the role of teachers in the continuous efforts to provide students with engaging and empowering educational experiences in science. Addressing these gaps is critical for refining educational practices and guiding policy decisions to improve scientific education quality and support long-term student engagement.

Statement of the Problem

This research determined the combined significant influence of teaching quality and democratic behavior on students' engagement in learning science. Its specific goal was to seek answers to the subsequent questions:

1. What is the level of teaching quality as perceived by senior high school students in terms of: communication skills, learning resources, tutorial function, content and evaluation, conformity with plans, global assessment; and laboratory activities?
2. What is the level of teacher's democratic behavior as perceived by the students in learning science in terms of participation, curriculum; and relations?
3. What is the level of student engagement in learning science in terms of behavioral, cognitive; and emotional?
4. Is there a significant relationship between teaching quality and engagement of the senior high school students?
5. Is there a significant relationship between teacher's democratic behavior and engagement of the senior high school students?
6. Is there a combined significant influence of teaching quality and democratic

behavior on students' engagement in learning science?

Hypotheses

The null hypotheses below were tested at a 0.05 level of significance.

$H_0$1: There is no significant relationship between teaching quality and engagement of the senior high school students.

$H_0$2: There is no significant relationship between teacher's democratic behavior and engagement of the senior high school students.

$H_0$3: There is no combined significant influence of teaching quality and democratic behavior on students' engagement in learning science.

THEORETICAL REVIEW

Teaching Quality

It is critical to understand how to generate an invitation for children to learn so that they build curiosity and interest in a subject (Chou et al., 2021). It is crucial to transform students from passive information consumers to curious learners who question the content and broaden their knowledge of a subject that helps in fostering independent learning, which is a key characteristic of successful students (Van de Grift et al., 2017). According to Cinches et al. (2017), teaching quality significantly impacts student involvement more than teacher engagement. To improve instruction quality, teachers can use effective strategies to capture students' attention and engage them in interactive classroom activities (Zheng, 2021).

Communication Skills. Communication skills are the capacity of teachers to effectively exchange and transmit knowledge with others to improve student interaction with the development of digital media and increased competition in universities and the workplace (Sinha, 2021). Thus, teachers are among the most significant players in all educational contexts that affect students' rate, quality, and communicative progress (Zheng, 2021). Students will learn more effectively When they feel free to voice their thoughts (Tas, 2018). Critical thinking is

necessary for students to become critical, active communicators as they acquire knowledge and use it to engage in class (Tuluhan & Yalcinkaya, 2018).

Learning Resources. There were written devices, data organizing and transferring tools, and multifunctional production instruments more effective at increasing student engagement than the social network, digital gaming, and online conferencing software found by Schindler et al. (2017). Incorporating digital technology into classroom discussions can enhance student engagement in behavior, emotion, and cognition (Bond et al., 2020). Additionally, the long-term professional development of teachers using expert scaffolding and educational curriculum materials, as suggested by Kleickmann et al. (2016), can enhance instructional practices and student learning. The study by Olayinka (2016), found that students with instructional materials performed better than those without.

Tutorial Function. The tutor encourages students to think independently and self-consciously through exercises, extensive reading and writing, and active involvement in critical debates that include self-immersion, self-analysis, self-correction, and mental flexibility (Podplota, 2020). Tutorials enable students to learn more effectively and improve their ability to argue effectively in a specific subject area, leading to a better understanding of the content.

Content and Evaluation. Students can increase their knowledge when science learning content is aligned with instructional techniques and curricula that meet content standards (Digal & Walag, 2019. Thus, students who take part in the assessment process feel more empowered, successful, and satisfied with exam results (Thawabieh, 2017). Furthermore, teachers' evaluation methods must be sensible and include quantitative and qualitative assessments to enhance students' learning and cognitive processes, which might produce independent learners (Sulaiman et al., 2017).

Conformity with Plans. Planning a lesson outline directs teachers methodically in a step-by-step fashion (Gutierez, 2019). Lesson plans teach students to learn independently or in groups (Monett & Weishaar, 2015). Plans allowed the teacher to give precise instructions, explain ideas logically, use examples to demonstrate ideas, offer feedback, and modify the material (Straessle, 2014). However, some teachers strictly adhere to class plans, ignoring their students' individual needs and interests (Ayra & Kösterelioğlu, 2021).

Global Assessment. Assessment is collecting, analyzing, and interpreting student data to make informed decisions and provide stakeholders with immediate feedback for improving their learning in science. It also encourages continuous learning by identifying areas where teachers can improve their classroom methods (Zeng et al., 2018). However, different teachers may interpret and assess student work differently, resulting in grading irregularities (Boring & Ottoboni, 2016). Furthermore, unconscious biases based on gender, ethnicity, or socioeconomic position may unwittingly impact teacher evaluations, undermining the fairness of the assessment process (Hornstein, 2017). Global examinations can potentially induce significant stress and anxiety levels among students, especially when they carry substantial weight or are the only factor in determining academic achievement (Von der Embse et al., 2018).

Laboratory Activities. Laboratory activities are a method that students use to learn subjects through activities including watching, experimenting, learning by doing or giving presentations in labs or special classrooms (Lau et al., 2018). The collection of data is only one aspect of the scientific method; it also improves one's reasoning and manipulating abilities (Suryawati & Osman, 2018). Creating student-centered activities, such as science experiments, allows students to embrace more profound thinking abilities, such as analysis, in the instructional procedure. They use analysis and feedback, enabling them to become problem solvers, thoughtful decision-makers, and lifelong learners (Sulaiman et al., 2017).

Teacher's Democratic Behavior

Teachers' democratic behavior involves the development of a democratic culture within the educational setting, such as equality, fairness, respect, and involvement among students in their interactions and decision-making processes (Al-Zubi, 2017). A teacher who believes in democracy should give every student an equal opportunity to create class rules, motivate them to participate in active learning, and offer various tasks while seeking feedback throughout the teaching process (Özcan, 2016). Therefore, the actions and behaviors shown by teachers in the classroom significantly influence students' involvement and perspective (Zheng, 2021). However, a study by Lauermann and Berger (2021) found that teachers' motivational views and attitudes in science did not directly favor reasoning skills, leading to higher accomplishment scores and enjoyment of the scientific fields.

Participation. Participation involves students putting in effort and perseverance to achieve desired goals (Klassen & Tze, 2014). However, the teacher's views have a more indirect relationship to student involvement, particularly the cognitive, affective, and behavioral aspects (Kengatharan, 2020). Van Uden et al. (2014) investigated the behavior of social skills teachers, which revealed insights into why people choose to become teachers, their actions, knowledge areas, and teaching quality. A teacher's persuasion assists a student in concentrating on prior successful performances and enduring outcome expectations to complete a task (Chichekian & Shore, 2016).

Curriculum. A curriculum is a structure that limits the actions of all parties involved, principally teachers and students and people who construct curricula or attempt to apply them to achieve established objectives (Young, 2014). According to Taştan et al. (2018), students in science classrooms tend to have positive attitudes, improved motivation, and achieve scientific success when their teachers demonstrate high levels of teaching quality in content and instruction. In research conducted by Masika and Jones (2016), student engagement involves peer collaboration and communication within a community of practice, emphasizing the importance of valuing individuals. Additionally, teachers can enhance academic development by spreading the lesson study process throughout the academic year and collaborating to create topic-appropriate plans for all courses (Ayra & Köstereliоğlu, 2021).

Relation. Relation refers to the relationship between students and teachers; it is essential to have strong interpersonal skills to share knowledge and learn from different perspectives (Taş, 2018). Consequently, the learning bond of both the student and the teacher acts as a bridge between the two, improving the classroom environment (Tunca, 2015). Teachers are considered more important than parents and peers in offering practical assistance and informative support (Ennis, 2014). This contrasts with traits like nurturing, intimacy, and appreciation, which are more associated with parents and peers (Klassen & Tze, 2014). Teacher dominance might impede teachers' and students' ability to take on new roles and perceive education from many angles (Bergmark & Westman, 2018). Thus, it is necessary to question the conventional career roles that strive for a more participatory classroom procedure for both teacher and student (Bovill et al., 2016).

Student Engagement

To improve the learning experience, teachers strive to enhance student engagement, which involves students doing, thinking, and feeling during the learning process, as Zepke (2018) explained. Students must have an engagement in the classroom, curriculum design, and a connection to the community (Özcan, 2016). Student engagement has three main aspects (Chong et al., 2018). The first is cognitive engagement, which centers around self-discipline, values, and learning goals (Barlow & Brown, 2020). The second emphasizes the emotional engagement of being friendly at school and getting along well with peers and teachers (Delfino, 2019). The third is behavioral engagement, which involves the specific behaviors that contribute to active participation in lessons and school activities (Chong et al., 2018).

Behavioral. Behavioral engagement defines academic, social, and extracurricular participation (Delfino, 2019). The factors included in this category consist of favorable behavior, the absence of disruptive actions, engagement in educational and learning endeavors, and active involvement in school-related activities (Mahatmya et al., 2018). Contrarily, teachers' creativity goes about their tasks to support students, plan programs, set goals in class, and ensure that students meet the standards (Shaari et al., 2014). Moreover, when students act engaged when they participate in the lessons, arrive on time, pay attention to the tasks, and work hard on them (Van Uden et al., 2014).

Cognitive. Being cognitively engaged requires commitment, which involves using cognitive processes and exerting mental effort to understand complex ideas and succeed in challenging tasks (Mahatmya et al., 2018). Cognitive engagement includes self-control, value, and learning objectives (Chong et al., 2018). Thus, it is more challenging to define and quantify as it favorably impacts students' performance, perseverance, and goal orientation (Barlow & Brown, 2020). When students can create their learning objectives, apply their self-regulation skills, recognize the value of their education and the courses and assignments, and have an academic goal, they are cognitively engaged (Van Uden et al., 2014). According to the study by Klassen and Tze

(2014), increased student cognitive engagement is essential for improving learning outcomes.

Emotional. Emotional engagement refers to how students identify themselves and the people around them. In other words, class activities are crucial in assisting students in developing their social skills (Goodman et al., 2015). If learners need help understanding a concept, they are not made to feel embarrassed or stressed out. (Zheng, 2021). Likewise, teachers must build strong relationships with their students to give them a foundation for growth, success (Martin & Rimm-Kaufman, 2015), and interest in school and studies (Wonglorsaichon et al., 2014). However, when learning experiences lack challenge, fail to attract the interest of learners, or do not give chances for active interaction, students may become discouraged and disengaged (Lou, 2019).

Theoretical / Conceptual Framework

This study is based on self-determination theory by Deci and Ryan (1985) forms the basis for student engagement. This theory suggests that psychological needs for self-sufficiency, social connection, and competence are essential for promoting positive self-motivation, personal well-being, and behavioral self-regulation. Further explain that fulfilling these fundamental psychological needs leads to positive student outcomes. The self-determination theory firmly supports the idea that people who experience more happy emotions are more autonomous and self-determined. The current study uses the self-determination theory from psychology about instruction (Niemiec & Ryan, 2009). The research found that students who feel their teachers acknowledge and appreciate their efforts and abilities are more driven to learn and excel in the classroom (Zee et al., 2013). It has been widely observed that teachers' democratic behavior plays a crucial role in students' participation, curriculum, and relationships with others. (Özcan, 2016)

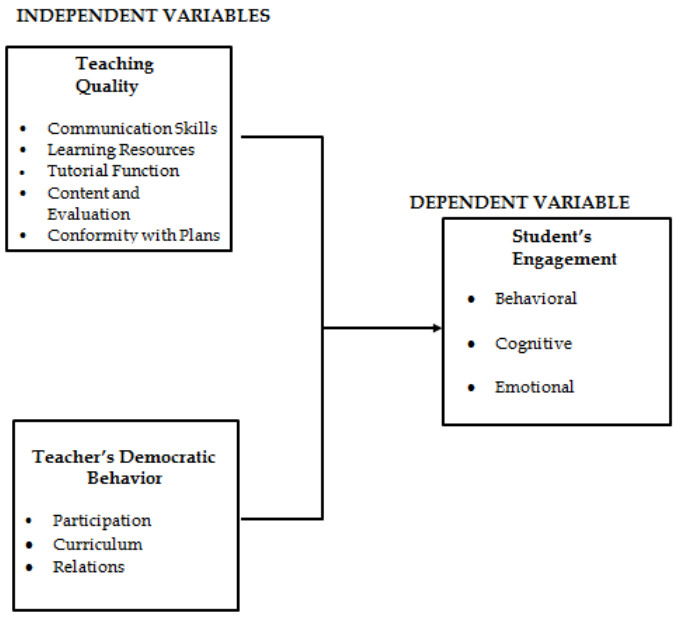

Figure 1. Conceptual Framework of the Study

METHODOLOGY

This chapter presents the design, locale, instrument, research respondents, data gathering process, ethical considerations, and data analysis.

Research Design

The research utilized a non-experimental quantitative design using a descriptive-predictive technique. This type of research attempts to analyze the relationships of the variables without trying to control them; instead, it focuses (Apuke, 2017). Furthermore, it seeks to identify links and comprehend the statistical relationships between them. Thus, this method is appropriate for the present investigation because it deals with the relationship between teaching quality and democratic behavior as determinants of students' engagement in learning science.

Research Respondent

The researcher used a total enumeration sampling method. The total enumeration sample method is a purposive method that looks at all the respondents who qualify according to the criteria (Etikan, 2016). The researcher involved 117 Grade 11 bonafide students from a private institution in Davao City, ages 15 – 17, for the 2022-2023 school year. These students have been taking science subjects. The researcher selected these students because most science subjects are available in Grade 11, and they willingly signed the assent form to participate.

Research Instruments

This study used three adapted survey questionnaires to draw information concerning the three variables. The first variable was teaching quality, including communication skills, teacher resources, tutorial function, teacher content and evaluation, conformity with plans, global assessment, and laboratory activities. The second variable was the democratic conduct of teachers, which involved participation, curriculum, and relations. Lastly, the student engagement consisting of behavioral, cognitive, and emotional indicators. The study investigated the student's engagement in science about teaching quality and democratic behaviors of science teachers.

In order to assess the quality of teaching, the researcher used a measuring tool by Fraile and Bosch-Morell in 2015. The instrument underwent pilot testing to measure its veracity using Statistical Package for Social Sciences software to determine its reliability. This survey assessed the first variable, teaching quality, through the seven indicators: communication skills (four items), learning resources (four items), tutorial function (three items), content and evaluation (five items), conformity with plans (three items), Global Assessment (three items), and laboratory activities (five items).

The researcher used the Democratic Teacher Behavior Scale (DTBS) to assess the democratic behavior of science teachers (Özcan, 2016). Each item was checked for reliability using a Cronbach alpha coefficient, which resulted in a total of 20 items with a reliability score of 0.68. Participation received 0.85, curriculum received 0.78, and the final domain relationship received 0.85. The

second variable comprises 17 items and three factors: participation (10), curriculum (6), and relations (4). According to the study findings, the scale can assess teachers' democratic conduct by creating valid and reliable measurements.

The Likert scale determines the students' perspectives on the given items. The 5-point Likert scale was assigned: one (disagree strongly), two (disagree), three (unsure), four (agree), and five (agree strongly). Moreover, this adapted survey questionnaire consisting of 65 items was examined and rated five (5) or excellent by the validators before pilot testing. The pilot test results have undergone validity and reliability. It passed the validity and reliability tests with a Cronbach's Alpha of .935

Ethical Consideration

To guarantee the ethical aspects of this research, adhere to the specific that respondents in this study are safe (Bryman & Bell, 2007). The researchers ensured the protection of respondents from harm and secured their full consent, the researcher adhered to the international mandate guiding honest research, avoiding harm, ensuring privacy and data confidentiality, and maintaining transparency and ethical conduct throughout the study, ultimately upholding the validity of the investigation. It must, therefore, adhere to the DOST-PHREB mission and the institutional HCDC-REC 9 elements, namely social value, informed consent/assent, risks, benefits, safety, privacy and confidentiality of information, justice, transparency, qualification of the researcher, adequacy of facilities, and community involvement. As established by DOST Special Order 091, it is important to safeguard the rights, well-being, and dignity of research respondents while supporting the ethical conduct of health research in the Philippines (PHREB, 2021).

Data Gathering Procedure

The researchers had done the data collection using the following stages: Asking Permission to Conduct the Study, Administration and Retrieval of Questionnaire, Gathering and Tabulation of Data.

Data Analysis

The instruments listed below analyzed the gathered responses.

Mean. This tool described the level of teaching quality, teacher's democratic behavior, and engagement in learning science.

Pearson-r. This tool examined the correlation between teaching quality and student engagement and the relationship between teacher's democratic behavior and student's engagement in learning science.

Multiple Linear Regression. This tool investigates the combined significant influence of teaching quality and teachers' democratic behavior on student engagement in learning science.

RESULTS AND DISCUSSION

Level of Teaching Quality of Science Teachers as Perceived by the Students

Table 1. Level of Teaching Quality of Science Teachers as Perceived by the Students

Indicators	Mean	Descriptive Level
Communication Skills	3.96	High
Learning Resources	3.83	High
Tutorial Function	3.80	High
Content and Evaluation	3.97	High
Conformity With Plans	3.89	High
Global Assessment	3.74	High
Laboratory Activities	3.33	Moderate
Overall	**3.79**	**High**

According to the respondents, the content and assessment have the most excellent teaching quality, with a 3.97 mean score. The high teaching quality indicates that the teacher's instructional effectiveness is notably favorable in material delivery and assessment. The score that the symbiotic relationship between content and evaluation is critical for establishing exceptional teaching quality in the academic field. Moreover, it exhibits a clear perspective of respondents involved in the educational process, as teachers proficiently provide appropriate assessments. As Irmatov (2021) mentioned, the teacher must perform high-precision assessments of each student's knowledge in a particular field or subject, including the degree to which a student has mastered a specific issue, to determine the student's strengths in scientific topics.

The second indicator next to content and evaluation is communication skills. The obtained 3.96 mean score, or a high level of perception, suggests that quality instruction, mainly according to communication skills, is oftentimes observed. The result implies that teachers with excellent communication skills are more likely to support a deeper grasp of the subject matter and, as a result, contribute to increased classroom involvement. The finding substantiates the idea that the communication techniques of teachers when instructing students are essential because they highly contribute to the extent of students' engagement (Khan et al., 2017). Teachers with efficient communication skills encourage students to articulate themselves in disputations and gain more efficiency.

The third indicator next to communication skills is conformity with plans. With a mean score of 3.89, perception is high, or the teaching quality according to the conformity of plans is oftentimes observed. It stipulates a highly positive attitude towards their teacher's conformity to plans. The result implies that teachers who consistently conform to planned instructional strategies will likely instill a sense of reliability and organization, contributing to a positive learning atmosphere. Straessle (2014) mentioned that students'

accomplishments are greatly affected when teachers make logically structured lessons.

The fourth indicator next to conformity with plans is learning resources. With the mean value of 3.83, perception is high, or teaching quality in learning resources is oftentimes observed. It implies a high regard for their teacher's learning resources. This high perception implies that students involved in the learning process value their teachers' learning resources, indicating a pleasant and enriching educational experience impacted by the quality of instructional materials. Schindler et al. (2017) mentioned that the availability of educational resources affected the students' engagement.

The fifth, the science teacher's tutorial function, reveals a 3.80 mean, that Implies a high level of perception. Teaching quality in terms of tutorial function is often observed. It suggests that students have a very favorable disposition toward the teacher's tutorial pedagogical approach. The high perception implies that the scientific teacher's ability to conduct tutorials is notable, contributing to a good learning experience. Additionally, students exhibit an excellent perspective on their level of involvement in the educational process using teachers' proficient use of pertinent learning materials. As students have a positive outlook, the teacher delivers the lessons efficiently. Podplota (2020) mentioned that the tutorial helps students uphold learning using argumentative abilities in a particular subject area that successfully ensures content mastery.

The sixth indicator next to the tutorial function is global assessment. With a mean score of 3.74, perception is high, or the teaching quality in global assessment is oftentimes observed. The score implies that the teacher's assessment procedures are successful and contribute positively to the student's learning experience. Thawabieh (2017) stated that authentic assessment will save time, facilitate learning, enhance talents, and self-learning through engaging education.

Finally, the indicator that received the lowest mean score in terms of teaching quality is laboratory activities, but it still obtained a reasonable level. It has a mean score of 3.33, or moderately observed. The teaching quality, namely utilizing laboratory activities, is noticed. The score implies teachers are less inclined to provide students with experiential learning opportunities, such as engaging in laboratory experiments. Additionally, students believed there is room for improvement and optimization in delivering laboratory activities to improve overall teaching quality. Furthermore, empirical evidence indicates that teachers use laboratory exercises with the primary objective of enhancing and actively involving students in the study of science.

Overall, the teacher's teaching quality level, as perceived by the students, got a mean score of 3.79 or high. It implies that students oftentimes observe teaching quality in their science teachers. According to Espinosa and Laureano (2015), using a hands-on approach in scientific instruction has enhanced comprehension of topics and success in science-related subjects. Furthermore, it revealed that the science teaching quality is highly significant to students' motivation and participation in scientific education.

Level of Teacher's Democratic Behaviors as Perceived by the Students

Table 2. Level of Democratic Behaviors of Teachers as Perceived by Students

Indicators	Mean	Descriptive Level
Participations	3.95	High
Curriculum	3.42	High
Relations	4.08	High
Overall	**3.82**	**High**

The table shows that among the indicators of a teacher's democratic behavior, relations got the highest mean score of 4.08 or high. It entails that science teachers' democratic behavior is often observed. Thus, teachers exhibited according to the perception level of students and their learning from one another. The data further implies that teachers make class rules with the students and are concerned about students' collaborative learning activities, guaranteeing that expression of insights is promoted. Students may feel more comfortable in class if the link has specific characteristics. Compelling and respectful communication and a desire to share and learn from one another are all characteristics that contribute to a welcoming classroom environment (Taş, 2018).

The table also shows that the second indicator of democratic behavior, which received the second-highest mean score, is participation. It has a mean value of 3.95 or high. It points out that science teachers' democratic behavior is oftentimes observed. It implies that students need to be more confident in their teacher's behavior in engaging them in the teaching and learning process. Bergmark and Westman (2018) mentioned that democratic values improve engagement, career-related learning, and student participation.

The last indicator that falls behind other indicators is curriculum, which receives 3.42. However, it ranks as the last indicator with the lowest mean score yet high. It implies that science teachers' democratic behavior is oftentimes observed. The data shows that students often observed their teacher's behavior toward positive attitudes, better motivation, and scientific performance according to their learning styles. As stated by Taştan et al. (2018), students have positive attitudes, better motivation, and scientific performance when teachers in science classrooms have high levels of teaching quality in content and teaching.

Overall, the teacher's democratic behavior in participation, curriculum, and relations is high. This indicator received an overall mean score of 3.82. Teachers encourage active student participation, collaborative decision-making, and an inclusive learning environment. This high score indicates that students recognize and value teachers' efforts to promote a democratic and participatory approach to education.

Level of Student's Engagement in Learning Science

Table 3. Level of Student's Engagement in Learning Science

Indicators	Mean	Descriptive Level
Behavioral	4.03	High
Cognitive	3.87	High
Emotional	3.97	High
Overall	**3.96**	**High**

The third statement of the problem aimed to determine the engagement level of the students in learning science according to their behavioral, cognitive, and emotional skills, as shown in Table 3. Its implications and supported studies help to understand the results better.

It is shown in the table3 above that among the three (3) indicators of the student engagement, behavioral ranks with the highest mean score of 4.03 or high. It means that senior high school oftentimes manifested to be engaged in science education. The data implies that behavioral engagement of students, including activities, is often provided by teachers to make students engaged in the learning process. As supported by Delfino (2019), behavioral engagement includes learners' participation in academic, social, and extracurricular activities.

In addition, as shown in the table, emotional engagement got the second-highest mean score, 3.97. Its descriptive level is high, meaning senior high school students' engagement in learning science is oftentimes manifested. Thus, students often incorporate several points of views into their discussions and could be more effective in collaborating with other students on projects. A student's tenacity, effort, attention, and participation are often observed in learning science. As supported by Martin and Rimm-Kaufman (2015), students show interest when they connect to the topics.

Lastly, as shown in the table, cognitive got the second-highest mean score of 3.87. Its descriptive level is high, meaning senior high school students' engagement in learning science is oftentimes manifested. It implies that students sometimes combine concepts to accomplish science-related tasks by the criteria or expectations of the science teachers. Thus, students often review notes to determine whether they understood the lesson. Klassen and Tze (2014) stated that increasing learning engagement is essential for improving learning outcomes. It lets students control their academic activity (Chong et al., 2018).

Overall, the dependent variable received an overall mean score of 3.82. It implies that students' science learning engagement level is high or oftentimes manifested in behavioral, cognitive, and emotional engagement. The high mean score implies that senior high school students have a respectable degree of cognitive engagement, demonstrating their active participation and careful approach to learning science. Thus, teachers often set expectations and use positive reinforcement to influence students' behavioral, increase cognitive engagement, and foster emotional engagement by building positive relationships and making learning science meaningful.

Significant Relationship Between Teaching Quality and Student Engagement in Learning Science

Table 4. Significant Relationship Between Teaching Quality and Student Engagement in Learning Science

	Student Engagement in Learning Science			
Teaching Quality	**r**	**p-value**	**Decision on H_{O3} at 0.05 level of confidence**	**Interpretation**
	.671	.000	Reject	Significant

Table 4 shows the significant relationship between teaching quality and student engagement in learning science. It has a p-value of .000, meaning the relationship is significant at a 0.05 significance level. Hence, rejecting the null hypothesis is the decision. Based on the .671 r value, it further implies that the two variables have a moderate to strong positive linear relationship. Thus, teaching quality correlates to the student's scientific learning engagement. It shows a correlation coefficient of r=.671, which means that the degree of relationship between the dependent and independent variables is moderate. It indicates a moderate association, which means that for every change in t teaching quality, there is also a significant and reasonable change in students' engagement in learning science. It implies that teaching quality and student engagement significantly correlate. Thus, teaching quality improves learning engagement since teaching quality has a student's engagement. Alrefaei (2015) supports that teaching quality is a significant factor in explaining teachers' actions and influencing students' engagement.

Significant Relationship Between Teacher's Democratic Behavior and Student Engagement in Science

Table 5 shows the significant relationship between teachers' democratic behavior and student's scientific learning engagement. With an overall p-value of .000, the correlation is significant using a 0.05 significance level. The two variables have a moderately high relationship. It further means a moderate correlation between teaching quality and student engagement in learning science. As a result, the null hypothesis is rejected.

Table 5. Significant Relationship Between Teacher's Democratic Behavior and Student Engagement in Learning Science

	Student Engagement in Learning Science			
Teacher's Democratic Behaviors	**r**	**p-value**	**Decision on H_{O2} at 0.05 level of confidence**	**Interpretation**
	.671	.000	Reject	Significant

The correlation relation, r=0.671, explains that for every change in the independent variable, there is an equivalent moderate change in the dependent variable. It further implies a moderate correlation, as reflected in the correlation value. Thus, this explains that the changes in the teacher's democratic behaviors would also result in reasonable development and changes in student engagement. As supported by Stavroussi et al. (2021), democratic teachers promote and value students' engagement in science lessons, allowing students to ask questions, discuss ideas, and voice their opinions about scientific concepts, resulting in improved engagement in the learning process.

Regression Analysis on the Combined Significant Influence of Teaching Quality and Democratic Behaviors on Student's Engagement in Learning Science

Table 6. Regression Analysis on the Combined Significant Influence of Teaching Quality and Democratic Behaviors on Student Engagement in Learning Science

Student Engagement in Learning Science							
	Unstandardized Coefficients		**Standardized Coefficients**				
Independent Variables	B	Std. Error	Beta	t	Sig.	Decision on H_0	Interpretation
Constant	.801	.299		2.679	.008		
Teaching Quality	.406	.116	.377	3.482	.001	Reject	Significant
Teacher's Democratic Behaviors	.425	.124	.372	3.438	.001	Reject	Significant

$R = .708$; $R^2 = .502$; F-value = 57.415; p-value = .000

Table 6 shows the combined significant influence of predictor variables, teaching quality, and democratic behaviors on students' engagement in learning science. With an overall p-value of .000, the correlation is significant using a 0.05 significance level. It shows a combined significant influence of teaching quality and teachers' democratic behavior on students' engagement in learning science. The table shows teaching quality and democratic behaviors, with a beta coefficient of .377 and .372, respectively, and a p-value of .000, indicating that both variables significantly influence student engagement.

The t-value of 3.482 for teaching quality and the T-value of 3.438 for teachers' democratic behavior are more significant against the null hypothesis because the higher the t-value, the smaller the p-value, proving to deny or reject the null hypothesis. Furthermore, the R2 value of 0.502 or 50.2 % of the variance shows that it contributed significantly to student's engagement in learning science. The regression analysis is also significant, as reflected by the F-value of 57.415 and p-value of 0.000.

Democratic classroom environments impact students' engagement and help them participate actively in the learning process, take ownership of their learning, and feel comfortable expressing their opinions (Taş, 2018). It is

anchored to Martin and Rimm-Kaufman (2015) on person-environment fit theory that an engagement of teacher-student interactions influenced by internal and external influences that the student might handle the challenges, leading to greater interest in scientific learning.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are provided based on the study's findings:

The students perceived that their level of engagement increases when their teachers improve teaching quality, particularly in global assessment and laboratory activities. Students have perceived that these important indicators helped them retain knowledge better, convey complex scientific concepts, and engage students in hands-on and science activities meaningfully. Teacher's democratic behavior is oftentimes observed in terms of participation, curriculum, and relations. Thus, students' participation in class and their assistance from teachers in creating a connection with the content and making lessons relevant to learners are considered active engagement in learning. These are crucial for enhancing instruction and preserving a smooth teaching-learning process in the classroom. The students in learning science oftentimes manifested the student's engagement. They often ask questions and actively interact with the teaching and learning process. They also make sure that they can be generalized concepts and share their varied viewpoints about the science-related lessons.

Teaching quality has a significant relationship with student engagement. It could improve the student's interests and engagement. As teachers enhance their professionalism, it would also significantly affect their performance. Thus, creating an excellent environment for students actively engaged in science depends on how well the teachers can help students succeed. It includes assisting students in learning, creating relevant content, and successfully modifying their learning.

The teacher's democratic behavior should be employed to improve students' engagement. Teachers who establish high standards for their students are more likely to succeed and promote active engagement as students become more authentic and actively engaged in science lectures. As teachers manifest a high level of democratic behavior, their student's engagement is affected.

Meanwhile, it is evident in the study that global assessment and the conduct of laboratory activities highly influenced students to raise engagement in science-related activities. These indicators improve the student's engagement significantly. It means students were given well-structured laboratory tasks and understood what and how their science teachers assessed them.

Students have recognized the relevance of the teacher's democratic behavior as it influenced their engagement. Its impact encompasses providing students with specific educational skills and fostering their self-confidence. Enhanced enthusiasm for learning and retention has improved interest in the classroom. Statistical data has proved how a teacher's democratic behavior influences student engagement and how this opens possibilities for excellent teaching-learning processes.

Lastly, it is shown from the analyzed data that teaching quality and democratic behavior influenced the student's engagement. As teachers exhibit leading quality and democratic behaviors in science classes, students become more engaged in learning. These significantly influence students' engagement with the knowledge and skills necessary to implement engaging lessons.

The research findings are used to make recommendations to various parties, bodies, and individuals participating in the study.

For the Department of Education Officials, it is recommended that they craft comprehensive professional development programs for science teachers that focus on enhancing their teaching quality, particularly in laboratory activities and handling skills, curriculum crafting, and democratic teaching. Also, to incorporate measures of teaching quality and democratic behaviors into teacher evaluation systems to ensure accountability and continuous improvement.

For School Heads, it is recommended that they may provide science school-based hands-on laboratory training programs for science teachers, regular seminars for scientific skills for 21st-century learners, scientific conferences, and professional development sessions to keep teachers up to date on innovative teaching approaches, technology, and optimal practices to improve their teaching quality considering the individual differences of students. School heads may monitor the success of introduced tactics regularly and make changes depending on feedback and outcomes for optimal reliability and continuous progress of the teachers.

For science teachers, it is recommended to employ engaging laboratory activities like lab experiments that allow students to interact directly with the science topics and expose them to real-world applications. Encourage students to interact with objects, conduct experiments, and collect data. Science teachers may foster student engagement by developing a dynamic curriculum that resonates with students, stimulates active learning and an inclusive environment, and increases overall engagement. Furthermore, science teachers may include cognitive activities such as sharing insights, in which students discuss their thoughts, question one other's ideas, and explore alternative points of view. Also, to reflect and assess their efficacy and explore opportunities for professional development to enhance their teaching competence in science and implement student-centered and inquiry-based instructional strategies that promote active student participation or engagement.

For students it is recommended that students seek opportunities to engage their interest and involvement in science through extracurricular science events like science fairs and science clubs. Students may advocate and express their perspectives on democratic classroom practices to their science teachers and school administrators. To discuss their thoughts, question one another's ideas, and explore alternative points of view. Also, they may be accountable for their learning to maintain their focus on achieving their goals and demonstrate respect for everyone. This study may help them appreciate that active involvement is vital in future endeavors. It may improve their competence and interest in science.

FURTHER STUDY

The future researchers may examine the relationship between teaching quality, democratic behaviors, and their impact on student engagement. Specifically, using R2 values from regression analysis can provide a quantitative assessment of the proportion of variance in student involvement explained by these factors. Additionally, mixed-method research techniques might offer a more detailed analysis of the issue, including multiple perspectives and interpretations of the facts. An in-depth study of this may contribute to developing a more complete understanding of democratic behaviors, excellent instruction, and student participation in the learning process.

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