Literature Review
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# Student engagements: impacts on student achievements in secondary school sciences

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## Introduction

### Overview of student engagement

Student engagement (SE) is widely recognized as a crucial factor significantly influencing student achievement. Numerous studies have focused extensively on the relationship between student engagement and student achievement in educational settings.[1,2] Understanding this relationship can help inform effective teaching and learning practices that will maximize student success. It is also crucial that teachers are aware of some of the reasons as to why students are not learning science in secondary schools, despite enormous number of reforms had been done to the education in Samoa.

The concept of student engagement represents both the time and effort students put into their studies and how effectively the institution organizes the curriculum and other learning opportunities to encourage students to participate hence leading to desired outcomes.[3] Similarly,[4] describes SE as meaningful engagement throughout the learning environment or simply a relationship between the student and the school, teachers, peers, instruction, and curriculum. When students are engaged, they do more than just attend class; they self-regulate their behavior, challenge themselves, and enjoy challenges in learning.[5] In essence, a student who is engaged in their learning generates a feeling of belonging and connectedness to their learning environment and therefore strives to gain all the learning they are given.

Although there is no specific definition of student engagement, most researchers have identified SE as having three dimensions: behavioral, emotional, and cognitive. Emotional engagement is assessed through positive and negative emotional reactions between the student and their teachers, peers, and school. Components for behavioral engagement include a broad range of behaviors at school, e.g. effort, positive conduct, involvement in (participation), and motivation for learning. Cognitive engagement identifies the learner's efforts to organize their studies based on their set goals and plans.[4,6,7]

## Aim of the study

This study aims to explore the impacts of student engagement on their achievements in secondary school science.

**The two research questions that guide this study are:**

What are the impacts of student engagement on student achievement, and

What current teaching practices encourage or promote student engagement.

## Rationale for the study and proposed outcomes

There is a growing recognition of the importance of understanding SE and the problem of disengagement. Basically, SE is often considered in the literature as a robust predictor of student learning and achievement.[4,8] However, the challenge remains that students become more disengaged as they transition through different levels of education.[5] The problem of disengagement is somewhat worrying to educators as it poses the risk of students dropping out of school and therefore not acquiring the needed learning in order to be successful. Understanding the factors affecting engagement and disengagement can provide insights into student performance, progression, and retention.[4]

This research addressed student engagement from both the teacher's and student's perspective during the implementation of their science lessons. The study proposes to:

Identify the direct impacts of student engagement on achievement in secondary school science,

Identify specific teaching and learning practices that promote learning of science in secondary schools

The outcome of this study is to implement classroom SE practices that positively impact students learning and become successful in secondary school science. The data collected in this study will help inform the decision-making of educators as to what changes are needed in terms of teaching and learning practices to ensure meaningful learning is happening in the classroom. Measuring student engagement allows institutions to restructure curriculum and lesson delivery methods to maximize student learning experiences. In addition, this study will help to identify gaps in SE that require more focus to minimize the risks of disengagement.

## Literature review

### Introduction

This section reviews international literature with a primary focus on student engagement in science education or education in general. The literature being reviewed correlates to the current study through similarities in the education level of participants being studied and in context as the majority of the institutions represented in the literature are English language learners. There is a lack of literature available from Samoa and the Pacific region, therefore most of the literature reviewed in this section is international. The first part of this review discusses the three dimensions of student engagement followed by

a review of teaching practices that enhance student engagement. A summary of this section is provided at the end.

## Student engagement

Student engagement is defined in many ways in the literature, and it is often difficult to define. Ashwin, and McVitty,[9] heighted a definition which seems more relevant to science education in Samoa secondary schools. They stated that it is the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning and being taught about a specific topic, subject or a course.[9]

**Student engagement is multidimensional, meaning that there are different types of engagement:**

**Behavioral engagement:** refers to students' academic involvement and participation in learning activities.

**Emotional engagement:** refers to the affective attitudes students have towards their school, classroom, classmates, and teachers.

**Cognitive engagement**: which is defined as students' strategic investment in learning. Some scholars see this type of engagement as a subcomponent of behavioral engagement.

## Behavioral engagement

Klem and Connell, define behavioral engagement as the "time students spent on work, the intensity of concentration and effort, the tendency to stay on task, and propensity to initiate action when given the opportunity".[5] Chen and colleagues,[10] describe this component as social-behavioral engagement where the quality of students' social interactions take place through social, interactive, constructive, and collaborative activities (e.g. collaboratively co-constructing solutions, asking questions and providing explanations). Furthermore, Chen *et al* believe that these interactive environments of engagement are more effective for student achievement than active and passive ones (e.g. underlining text sentences, copying the steps to finding a solution and listening).[10] Olivier, Archambault, Clercq & Galand,[11] refer to behavioral engagement as the observable actions of students in class, for example, participation, effort, attention, and following instructions. Suffice it to say that behavioral engagement is evident through the observation of a student's interactive involvement and efforts to stay on task during class. Examples of positive behavioral engagement include raising their hand to ask or respond to a question, working collaboratively with others, paying attention in class, participating actively in discussions, and thoroughly completing tasks even when they are difficult. On the other hand, negative behavioral engagement examples are, acting restless and being unable to sit still, annoying or interfering with peers' work, not seeming to know what's going on in class, talking too much with classmates, being withdrawn or uncommunicative and getting discouraged when encountering an obstacle.

## Emotional engagement

Emotional engagement refers to a student's emotional response or affective reactions toward their peers, teachers, institution, classroom context, and assignments.[11,12] Examples of such reactions are fatigue, boredom, happiness, excitement, enthusiasm, optimism, curiosity, and interest. Fredricks, Blumenfeld, and Paris,[13] explained emotions as a key component of student engagement, referring to it as students' affective reactions in the classroom such as happiness, interest, boredom, anxiety, frustration, and sadness. In addition, Herreid, Terry, Lemons, Armstrong, Brickman, and Ribbens,[14] showed a significant relationship among emotion, engagement, and learning gains. This means that emotional engagement has a direct impact on student achievement.

In exploring student engagement, the researcher believes it is equally important to evaluate factors influencing disengagement to understand why students exhibit negative emotional responses to learning. Research confirms that negative interactions with staff can eliminate any sense of positive interaction in a student's mind, and as a result, engagement suffers.[5,15,16] Students who are more prone to negative emotional engagement are the ones who need to be shown positive, appropriate, and enjoyable connections with staff members, peers, and institutions. The extent of academic gains a student receives is dependent upon these positive connections from their teachers, peers, school, and assignments.[14]

## Cognitive engagement

Cognitive engagement refers to the students' thoughtfulness and willingness to master difficult skills and to comprehend complex ideas.[15] Hence, we can presume that this component is activated when the student self-regulates their cognition to willingly learn the concepts based on what they believe will benefit them in the future. Explain this further in their research as the students' understanding of why they are doing what they're doing and its significance in their lives. Because of this understanding of the importance of learning and the benefit they will receive from it, the student becomes invested in their learning process. On the other hand, students who do not see the importance of learning in their lives and future goals, remove themselves from the learning mentally and even physically.

Argues that cognitive engagement is a primary factor in the way student's complete instructional-related activities.[16] In addition, when lessons are not engaging, students' minds begin to wander and fail to see the relevance of the lessons in their lives and become disconnected. Suaalii,[17] shared in his study how students felt disconnected from their chemistry lessons because they were "long, boring, tiring, confusing and too much to learn" and that there wasn't any meaningful learning.[18] From his observation, Suaalii presented that students did not necessarily have a strong conceptual knowledge of chemistry because they were only tolerating being in their chemistry class to get good marks on their Samoa School Certificate (SSC) examinations. Engagement only existed because of wanting a good grade and not for any internally motivated initiative for deep learning and achieving life goals.

The three types of SE, suggest that when students display high levels of behavioral, emotional, and cognitive engagement, they are more likely to excel academically, form a stronger sense of connection with their school, and have a more positive sense of social-emotional well-being.

## Effective teaching practices that enhance student engagement

Teaching practices as defined by the Organization for Economic Cooperation and Development (OECD) in their 2009 Teaching and Learning International Survey (TALIS), are "beliefs, practices, and attitudes important for understanding and improving educational processes". [19] In addition, Severe, Stalnaker, Hubbard, Hafen, and Bailey believe that these practices can shape students' learning environment and influence their motivation and achievement.[20] Severe, *et al*., suggested that teachers can make classrooms more active and student-centered by encouraging participation by using students' names, giving positive encouragement and approval, asking more

analytical questions over factual ones, providing enough response time, and asking students for their thoughts even involuntarily, which usually involves student talk. A lot of the literature supports a student-centered classroom as the means to increased learning in contrast to the traditional classic lecture.[20]

# Methodology

## Introduction

This section describes the methodology used in the study. It begins by exploring the methodology underpinning this study with an explanation of the sampling method used to select the student and teacher participants. This is followed by brief descriptions of the research participants. An explanation of the research tools used for data collection and the procedures that guided the process of data collection and data analyses will be discussed at the end of this section.

## Research tools & procedures

This section describes the tools and techniques that are used in this research including both quantitative and qualitative methods. The use of both research methodologies is because the study collects quantitative and qualitative data from the research participants.

## Quantitative instrumentation

This study used the Student Engagement Instrument (SEI) to measure the emotional and cognitive engagement of students with school.[21] It is a self-report five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This instrument was developed in the United States (US) and administered to various high schools within the US. It has been reported to be a valuable tool in the "early identification of students with low emotional and/or cognitive student engagement, and classrooms with collective low engagement".[22] The SEI was also administered in schools outside of the US, and Virtanen *et al*.,[22] support the use of this instrument as a reliable and valid screening instrument in cultural contexts outside the US. The SEI contains 35 items focusing on three affective (Teacher-Student Relationships, Family Support for Learning, and Peer Support at School), and three cognitive (Future Aspirations and Goals, Control and Relevance of the School Work, and Extrinsic Motivation) factors of student engagement.[22] Student participants were each given a copy of the SEI questionnaire to complete while the researcher read out each of the 35 items listed. A few items needed to be translated into the Samoan language for clarification. Each questionnaire was scored according to the scoring process provided in the SEI administration and scoring instructions.

The second tool utilized in this study was the Student Engagement Observation Checklist (SEOC) which was created based on the Student Participation Questionnaire developed by Fin, Folger, and Cox.[23] The SEOC was used to record the level of student engagement in learning and classroom behaviors using a five-point scale from 1 (never) to 5 (always).[23] This observational tool has 18 items categorized into four scales: Effort, Initiative, Disruptive, and Inattentive. The SEOC tool was used to measure the behavioral engagement of the student participants in this study because of the usefulness of the tool to measure both the positive and negative behaviors displayed by students in the classroom.

Student participants were observed using the SEOC at two different times in four weeks, once at the beginning and another at the end. The researcher sat in the back of the classroom and observed each participant's engagement during teaching instruction while making note of off-task behavior that could interfere with student engagement (e.g. playing, calling out, out of the seat, etc).

Finally, student grades (report cards), specifically their science cumulative percentages for term one was used to explore the student achievement portion of this research. This study compared the results from the SEI questionnaires, SEOC checklists, and student grades to evaluate the impacts of SE on student achievement.

## Qualitative instrumentation

This study also used a semi-structured interview methodology allowing participants to elaborate on their responses to the initial interview questions being asked.[20] This study aimed to examine the impacts of student engagement on achievement and to find out what teaching practices encourage student engagement. Therefore, interview questions were generated to explore these impacts and discover what effective teaching practices encourage engagement from the perspective of the student participants and teachers in this study. Each participant was interviewed once during this study and excerpts of these interviews are discussed in the results and discussion section. The questions asked were in English and some questions needed to be reiterated in Samoan especially the ones for the student participants. Their responses in the Samoan language were translated into English and all responses were recorded and transcribed.

## Sampling method & participants

The student participants involved in this study were chosen using a purposive sampling method under the category of stratified purposeful.[24] All student participants take Year 9 Science at a Samoan secondary school and were selected from their respective science classes. A total of six students (2 females, and 4 males) were chosen based on their engagement during the first classroom pre-observation visit, refer to Table 1 below.

**Table 1** Student participant's identification

| Student participants | Pseudonyms |
|---|---|
| Student 1 | A1 |
| Student 2 | A2 |
| Student 3 | A3 |
| Student 4 | A4 |
| Student 5 | A5 |
| Student 6 | A6 |

Three research participants were selected from students who were actively engaged, and the other three were selected from those who showed some to no engagement during the lesson. The reason for using this sampling method was to compare the relationships between the engagement levels of each participant with their academic achievement looking at their different abilities and to investigate if their engagement has a direct impact on their achievement. The teacher participants in this study are the only two science teachers at the same secondary school being studied, each teaching three of the six student participants involved, refer to Table 2.

**Table 2** Teacher participant's identification

| Student participants | Pseudonyms | Qualification | Years of teaching |
|---|---|---|---|
| Teacher 1 | Ms Toma | BSc | 10 |
| Teacher 2 | Ms Sions | BSc | 1.5 |

The research participants were chosen after gaining consent from the school administration and each participant's anonymity are

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ensured to be observed to safeguard their identities. Pseudonyms are used to identify both student and teacher participants throughout this study.

## Results & discussion

### Data results & analysis process

In this study, results from student observations from the Student Engagement Observation Checklist (SEOC) are presented using a mean average of each student participant. An overall mean average result for student engagement using the Student Engagement Instrument (SEI) is also presented together with individual results of each of the six categories of the SEI. Finally results from participants'' Term 1 Cumulative Percentages for Science are also presented. All results were compiled using spreadsheets in Excel to tally the scores and the mean function in Excel to calculate the average of each item and/or category. Excerpts of student and teacher interviews are incorporated throughout the discussions of the different measures.

### Student observation checklist

Student Observation Checklist Results (Figure 1) displays a column graph indicating four factors of student behavior: Effort, Initiative, Disruptive Behavior, and Interactive Behavior for each of the six student participants. The vertical axis shows a scale of 1 (Never) to 5 (Always). The horizontal axis displays the six student participants. The results are tallied and totaled, and then the mean is calculated by dividing the total by the number of items in each category to get the amounts displayed in (Figure 1).

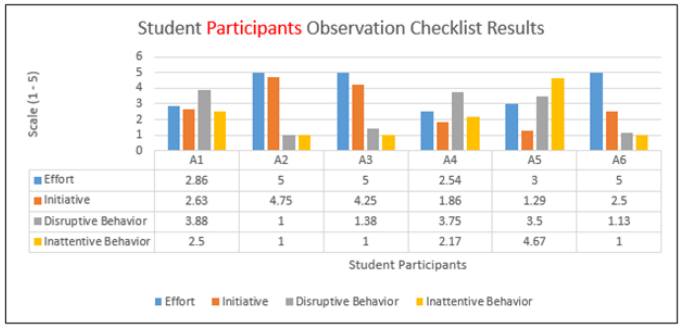


**Figure 1** Student participants engagement observation checklist results.

Half of the participants scored a 5 in the effort category, indicative of an observation of the following behavior traits during the lesson: they paid attention, worked well with peers, completed their assigned work, did their best to finish the work, and were not easily frustrated during a difficult task. The other participants scored a 3 or less which meant they showed little effort in being engaged during the lesson.

In the initiative category, 4 of the 6 participants scored 2.5 and below which is a very low score compared to effort. Although behaviors relating to effort were ranked high (Figure 2), students showed a lack of behaviors to initiate learning like raising their hands to give a response or ask a question, volunteering or contributing to a discussion, and actively participating in a discussion. Suaalii,[17] noticed this same lack of initiative in his study and concluded that Samoan students are generally too shy to ask questions because they lack confidence. Upon interviewing student and teacher participants, Suaalii, found that from the teachers' point of view, the underlying reasons emerged from three areas: school experiences of shutting down student curiosity and student talk, home and cultural experiences where students cannot talk to an adult, and religious experiences where the role of the student is to listen and obey and not question their beliefs and views. In addition, Suaalii, stated that the student participants were afraid of the teacher and fear of being stupid. In this study, student A5 shared in his interview his fear of the teacher,

**Figure 2** Student participating in discussion by raising his hand to respond to a question.

*"she yells at me when I don't turn my work in on time…one time she chased me outside…now I try to do my work because I'm afraid the teacher might yell at me again and send me to the principal's office."*

Similarly, the researcher noticed unanswered questions in students A1, A2, and A3's worksheets and proceeded to ask why they did not ask the teacher for help with their assignment. Their collective response was shrugged shoulders and blank expressions. This showed that the participants would choose to turn in an incomplete assignment rather than being mocked by their peers for not knowing the correct answers (ie: fear of being stupid) or even stem from being shy because of experiences they are accustomed to in the school, home and at church.

The two categories of disruptive and inattentive behavior (Figure 3) showed low scores for 3 participants while the other 3 showed scores ranging from 2 and above. The researcher observed that participants who scored 2 and above in these areas were mostly restless, disruptive, annoying, needed reprimanding, withdrawn, and constantly needed the teacher to guide them back on task. Students A4 and A5 both shared similar views about science as being irrelevant to their future goals and they did not like it because the language it uses is difficult for them to understand:

**Figure 3** Students shouting inactive and descriptive behaviour during the class instruction.

*"I don't like science because it's hard. The words (language) used in the assignments are difficult (faigata ia o upu e faaaoga i meaaoga) to understand. I want to be a carpenter when I finish high school and I don't think I need science to be a carpenter."*

*"I'm not interested in science…the assignments are difficult because the words (language) are difficult to understand"*

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Both A4 and A5 shared negative views about learning science because of the complexities in the language of science, thus leading to an increase in disruptive and inattentive behaviors. On the other hand, participants who scored low in these two areas shared how they enjoy learning about science:

***Student A6***: *"Science is a fun subject to learn and it's useful to me. I know some students might not like it, but I like science because I think it's important. After all, science is everywhere."*

***Student A3***: *"I love learning about science…my teacher makes learning interesting for us."*

## Student engagement instrument

The mean value of all six categories of student engagement for each student participant is given above (Figure 4). This column graph is calculated from the averages of the overall results of the Student Engagement Instrument (SEI). The SEI was mainly used to measure the emotional and cognitive engagement of student participants, as these components of engagement aren't usually easy to detect given the students' behavior. Each of the 35 items in this instrument is tallied and then converted to percentages by dividing the total by the number of items and multiplying by 100.

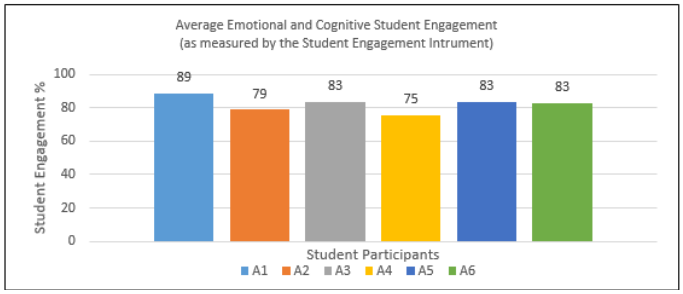


**Figure 4** Student engagement instrument—average emotional and cognitive student engagement.

The emotional and cognitive engagement levels for all six student participants ranged from the 75$^{th}$ percentile and above. In comparison, this graph (Figure 4) showed high levels of engagement even for students who scored high in disruptive and inattentive behaviors from Figure 1. For example, Student A1 scored the highest with 89% in Figure 4 and also scored 2$^{nd}$ highest in Figure 1 for disruptive and inattentive behaviors. Another example of this discrepancy is shown in Student A2's scores which are high in effort and initiative and low in disruptive and inattentive behavior. However, Student A2 has the 2$^{nd}$ lowest score in Figure 4 with 79% in emotional and cognitive engagement. The results show that the three components of SE: behavioral, emotional, and cognitive are not directly proportional and that each is an independent variable of engagement. This means that the student's behavioral engagement may or may not have any influence on the same student's emotional and/or cognitive engagement.

Figures 5.1 – 5.6 give a breakdown for each of the six categories: Teacher-Student Relationship, Peer Support at School, Family Support for Learning (Emotional Components), Control & Relevance of School Work, Future Aspirations & Goals, and Intrinsic Motivation (Cognitive Components). The scales shown on the vertical axis represent 1 (strongly disagree) to 5 (strongly agree) and the horizontal axis represents the student participants. The items were tallied according to their respective categories in Excel and the mean was calculated to give the results shown in each table.

The two categories Teacher-student relationship (Figure 5.1) with a mean of 3.8 and Peer Support at School (Figure 5.2) with a mean of 3. 6 scored the lowest. Whereas, the other four components had means between 4.2 (Figure 5. 4) and 4.8 (Figure 5.3). The results of this study clearly show that the emotional engagement of students is strongly influenced by family support of learning (Figure 5.3) and less likely by teacher-student relationship (Figure 5.1) and peer support at school (Figure 5.2).

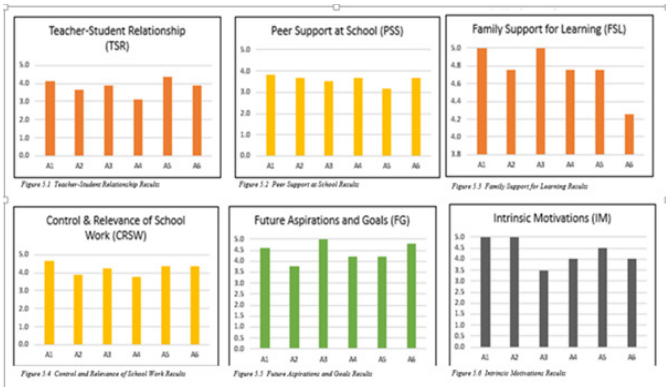


**Figure 5** Six categories of teacher-student relationship, peer support at school, family support for learning.

When asked about support from their families, all six student participants had positive things to say about their families:

***Student A1***: *"My family is always encouraging me to do well in school, especially my mother. She is the only one that helps me with my homework."*

***Student A2***: *"Every day after school, the first question my mother asks is, do I have any homework? She always makes sure I do my homework first before I do my chores or play with my friends."*

***Student A3***: *"My dad stopped me from playing netball because I was slacking in my studies. I wanted to play so I tried my best to focus on school so my dad could allow me to play netball again."*

***Student A4***: *"My mother is not very good at science but she helps me with my assignments. She wants me to try my best even if I don't like science."*

***Student A5***: *"My family encourages me to do my school work even though no one in my family knows how to do my homework. It's hard when no one can help me at home."*

***Student A6***: *"My parents help me out at home. They are very supportive and always allow me to use the internet to find help with my research."*

The results from the students' interviews show a strong support system from these students' families. Although most of them do not have family members knowledgeable in science, they are still motivated to learn because they feel a sense of emotional connection from their families supporting them in their learning.

When students were asked about their teachers and the way they teach, the students also gave positive feedback. For example, Student A4 said *"my teacher helps me with questions I don't understand and gives me second chances when I don't turn my work in on time"*. Student A6 described her teacher as someone who *"organizes the lessons in a way that is easy for me to understand. I love that she creates activities that make learning fun."* In a similar manner, Student A1 shared that his teacher gives a lot of engaging activities for them to do in groups. He said this about Miss Toma, *"my teacher involves all of us in the discussion. She picks on anybody so I want to be ready to respond when she picks me."*

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The categories (control & relevance of school work, future aspirations & goals, and intrinsic motivations) classified under the cognitive component of the SEI scored a slightly higher combined average of 4.3 to 4.1 from the emotional component. These scores are ranked in the 80% percentile showing high levels of emotional and cognitive engagement for all participants (Figure 6).

**Figure 6** (From left to right)¬ Students presenting on fungi, students describing model of fungi, students working on their activity.

### Student progress report

The data results previously discussed above reported on the different components of student engagement for each student participant. In this part of the results and discussion section, we will see the correlation between student engagement and student achievement. One of the questions for this study is to find what impacts SE has on student achievement. The researcher used the students' progress reports in comparison with results from SE to investigate these impacts. The cumulative percentages for science in the first term of the year 2024 for each student participant are displayed in Table 1. Grades are calculated based on raw marks received from in-class activities, quizzes, tests, and projects that students did for term 1 only. These raw marks are then converted into percentages to get the cumulative percentage. The last column of the table shows the corresponding letter grades.

The results in Table 3 show that Students A1, A2, A3, and A6 all received 95% cumulative percentages and higher. Students A4 and A5 both received cumulative percentages below the halfway mark of 50%. Initially, these participants were selected based on their behavioral engagement as observed by the researcher during the first observation. In particular, the researcher's notes on Student A1 during both observation visits show that Student A1 was disruptive, restless, constantly out of his seat, and bothered other students. Miss Toma was surprised when the researcher informed her about Student A1's behavior:

**Table 3** 2024 Term 1—student progress report (science cumulative %)

| Student Participants | 2024 Cumulative Percentage (%) for Term 1 | Letter Grade |
|---|---|---|
| A1 | 97.03 | A+ |
| A2 | 95.36 | A+ |
| A3 | 100 | A+ |
| A4 | 43.59 | F |
| A5 | 37 | F |
| A6 | 100 | A+ |

*"He loves to respond to class discussions…a very bright student in class. Loves getting engaged in our in-class activities."*

Miss Toma admitted that Student A1 does lose focus at times but he's mostly a bright student. Cumulative percentages for student participants from Miss Sione's science class correlated closely with their engagement levels. In addition, Miss Sione's description of each of these students given in her questionnaire responses were similar to the observation notes of the researcher. Both Miss Sione and the researcher concluded that Students A4 and A5 were less likely to have high student achievement because of their lack of engagement in all three components: behavioral, emotional, and cognitive. The literature reviewed in this study state that student engagement is a major factor for student achievement, and this is true in the case of Students A4 and A5.

## Themes

**The results discussed earlier generated two significant themes that are relevant to this study: section:**

1. factors influence student engagement—student-teacher relationship
2. teaching practices need to focus on ideas to bridge science language barriers

### Theme-1

Many Factors Influence Student Engagement and the Student-Teacher relationship is one major factor that is somehow overlooked. The results of this study show that the student participants received an emotional connection from their families more than from their teachers. Chen *et al*.,[10] believe that student engagement is positively associated with student enjoyment when teachers use productive classroom talk, thus creating space for students to think and reason. Furthermore, their study claims that literature shows implications of links between teacher-supportive behavior and student emotions, interests, and motivation. It is clear from the results of this study and supported by the available research that students feel engaged in learning when they have a sense of belonging and connection to their teachers. When student-teacher relationships are fortified, the problems hindering student talk (eg: fear of being mocked, fear of the teacher) will likely be eliminated.

### Theme-2

Teaching practices need to focus on ideas to bridge science language barriers. As seen in the excerpts from student interviews, one of the problems the participants faced was the difficulties in understanding the language of science. Similarly, Suaalii, presented these difficulties in his study when discussing misapprehensions faced by Samoan students in learning a second language and the need for code-switching when clarifying a difficult concept in the classroom. Samoan students are English language learners and therefore, require an in-depth knowledge of the language of science. Suaalii, puts it plainly that poor knowledge of the language of Science puts second language learners (in the case of this study, the Samoan students) at a disadvantage. Insomuch that they become frustrated and will resort to rote memorization because they cannot make any meaningful connections in texts.

## Conclusion

This section summarizes the aim and research questions of this study followed by an explanation of the limitations and implications for future research.

This study aimed to investigate the impacts of student engagement on student achievement in secondary school science. The key findings from the analyses contributed to identifying the impacts of student engagement (behavioral, emotional, and cognitive) on the student's achievements. The two questions that guided this study focused on finding what factors of student engagement impacted student

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achievement and discovering teaching practices that encourage student engagement thus improving student achievement. The study concludes that there is significant importance on the role of the teacher in creating a learning environment that promotes student engagement as this is also in agreement with the literature in the review. As English language learners, the student participants in this study revealed difficulties in learning the language of Science. This study believes that improvement in this area needs to be evaluated and looked at more closely by the Samoan school system.

One of the limitations of this study is the relatively small dataset as this is not a well-presented model of the entire population. Another limitation has to do with the constraints in time, where data was only collected within a limited timeframe of under two months. There is also limited research available for student engagement in the Pacific region, specifically for Samoan students. This dataset may be enhanced for future work to consider more students and more institutions at multiple levels of education. For analysis to be more effective, suggestions for more contextually fitting tools conducive to Samoan students to use for the measurement of student engagement may be explored. Other sources of data collection like video recordings, and online Zoom meetings can also be utilized for effective data collection.

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None.

## Competing interests

The authors report there are no competing interests to declare.

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