RESEARCH ARTICLE

THE MEDIATING EFFECT OF SCIENCE LEARNING ENVIRONMENT ON THE RELATIONSHIP BETWEEN STUDENT ACADEMIC MOTIVATION AND SELF-EFFICACY

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ABSTRACT

The purpose of this study was to determine the mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy of senior high school student of Baganga North District Division of Davao Oriental, Region XI, Philippines. The study utilized a quantitative, non-experimental design via correlational technique and mediation analysis.Futhermore,204 senior high students respondents were survey using universal sampling an adapted 5 point likert scale survey questionnaires. Weighted, mean, Pearson r, and multiple regression were used as statistical tools. Moreover, all of the three variables obtained a high level and revealed a significant relationship between student academic motivation and self-efficacy, there was a significant relationship between science learning environment and student academic motivation and a significant relationship between science academic motivation and self-efficacy of senior high school students, three variables. Furthermore, science learning environment has a partial mediating effect on the relationship between student academic motivation and self-efficacy of students in science. This means that the science learning environment influences the strength of the relationship between the student academic motivation and self-efficacy.

INTRODUCTION

Lacking motivation for self-efficacy in learning science could affect individual's perception in controlling their learning ability, behavior that lead to difficulties in solving issues and decreased internal beliefs on the steady cultivation and accumulation of various learning environments or activities (An, Wang,Li, Li, Yin, & Wang, 2024). Students with low efficacy is owing lack of attentiveness and desire resulting to low academic accomplishment and school performance (Hammack, Yeter, Pavlovich & Boz, 2024). Further, this claimed that when teaching efficacy does not significantly influence students behavior and the strategies they use in their classrooms does not possess robust self-efficacy toughness to faced with challenges in the classroom and ability to facilitate learning for all students decreased Luzin, Rozhnov, Tkachenko, Shoustikova, Tukhvatullina, & Batrakova, (2024). Self-efficacy is considered an important factor in students' achievement in science education (Tillotson-Chavez & Weber, 2024). Research supports the notion that self-efficacy plays a strong role in behavior indicated that science teachers' self-efficacy has a strong impact on the capabilities and it influences the students ability to develop confidence that may

benefit student progress in science (Ibragimov, Zhdanov, Volosova Knyazeva, Efimushkina, & Kochneva, 2024). Therefore, self-efficacy supports students' motivation, use of effective learning strategies, and ultimately their achievement in science classes that increased a successful and understanding science concepts, scientific questions, conducting experiments, and other critical skills Zhu, & Luo, (2024). Students academic motivation is considered as vital factor that plays a key role in students' behaviour and performance in self-efficacy effectiveness that influences students expectations and perceptions about their abilities which enables and stimulates the learners to make efforts to accomplish certain goals in a desired field of interest (Alnemare, 2020). Individuals with high self-efficacy tend to see challenges as opportunities to learn and grow, whereas those with low academic motivation perceive as threats to their self-esteem to achieve certain objectives (Yentür, 2023). Thus, Students with high academic motivation are more likely to have increased levels of academic achievement and have lower dropout rate. Moreover, self-efficacy is considered as an important psychological factor and may be closely related to students academic performance (Xiang, 2023). Research indicates that the science learning

environment plays a crucial role in students' motivation to learn science that emphasize real-world connections and student engagement can enhance motivation and self-efficay in science (Yurtseven, Atay, & Bulut, 2021). Thus, self-efficacy is crucial to science learning environment because it is applicable to practical knowledge and action by integrating students' own science experiences with science knowledge (Kim, & Alghamdi 2023). It is notable that the quality of the learning environment in science subject is related to self-efficacy that has an impacts their achievements significantly because it focuses not only how students achieve in science but significantly, how they sustained attentiveness and engagement in science learning (Ma, Zhang, Zhou, & Li, 2024). The literature pointing out students who consider they can make it are more expected to engage actively with their educations and pursue interesting tasks also, an encouraging science learning environment nurtures better self-belief among senior high students with the to teacher upkeep, peer connections, and available resources focus on creating supportive learning environments to enhance students' self-efficacy and motivation, leading to improved academic results (Agustini, Tarihoran, & Sapriati, 2023). In senior high school student of Baganga North District who took the science subject were conducted the study, there was a scarcity in the research literarture and this study aimed to fill the existing literature gap which was in the context of Baganga North district of senior high student. Hence the researcher pursued investigating the factors associated self-efficacy in learning science which was the focal point of this study. Addressing the gap can provide valuable insights into the mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy.

This study aims to determine the significance of the mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy of the senior high school students in a certain public high school in Baganga, Davao Oriental. Specifically, this research sought answers to the following objectives: First is to identify the level of science learning environment provided by teacher's terms of course content/ view of Learning, role of Instructor, role of student/peers, classroom atmosphere/activities and, evaluation procedures. Second is to ascertain the level of student academic motivation showed in terms of intrinsic motivation, self-determination, grade motivation and career motivation. Third is to assess the level of self-efficacy of senior high student in terms of perceived control items, competence items, persistence items and self-regulated learning items. Fourth is to determine the significant relationship between Science Learning Environment and Student Academic Motivation, Student Academic Motivation and Self-Efficacy, and Science Learning Environment and Self-Efficacy and, lastly, to determine the significance of the Mediating Effect of Science Learning Environment on Relationship between Student Academic Motivation and Self-efficacy in Learning Science. The hypothesis of the study was tested at 0.05 level of significance. These are the null hypothesis of the study. First, there is no significant relationship between student academic motivation and self-efficacy, student academic motivation and science learning environment, science learning environment and self-efficacy of senior high school student of Baganga North District. Second, there is no significance of the mediating effect of learning

environment on the relationship between student academic motivation and self-efficacy in learning science. This study is anchored on Bandura (1999) social cognitive theory discusses mechanisms behind self-efficacy which an individual's belief in their ability to succed in specific situations. Conferring to this understanding, it demonstrates the significant role of self-efficacy in enhancing students' academic motivation and performance that influence students' goal-setting, effort regulation, and overall academic achievement in each learning environment setting in science learning. Thus, including factors such as teacher support and task orientation, positively impacts students' learning motivation and self-regulated learning (Ariani, 2020). Students' perceived learning environment and academic motivation affects their academic self-efficacy, which turn influences their academic goals and final achievement by fostering self-efficacy and creating supportive learning environments to enhance students' academic motivation and performance (Hidajat, Hanurawan, Chusniyah, Rahmawati, and Gani, 2023). Additionally, the self-determination theory by Deci & Ryan (2012) supports the study. The theory describes the pressure caused by the condition of strengthening and any other pressure is decisive on one's actions. In this context of the study, learning environment and student academic motivation are components of ones environmental control and choices that contribute to autonomy, competence, and relatedness that can boost their self-efficacy as they succeed in their academic pursuits. As the students develop their competence in learning environment and academic motivation their abilities to achieve academic task while involving the feeling of relatedness to others will devote themselves fully to their studies in self-efficacy that engage in science. On parallel note the Achievement Goal Theory by Nicholls' (1984) strengthens the study which focuses on how individuals' goals influence their motivation and performance. This theory emphasizes the importance of classroom goal structures in shaping students' motivation and achievement which learning environments emphasizing mastery and skill improvement by postering a positive academic motivation patterns in demonstrating ability and competition that significantly affect the academic self-efficacy including teacher-student relationships with sense of school belonging. These theories were relevant to the study as these explains the effect of learning environment on student academic motivation and self-efficacy which states that high academic self-efficacy makes students confident in their competence in completing the academic process well, making them committed, trying, and diligent during the learning process in science learning (Shofiah, Taruna, and Asra, 2023). Thus, the learning environment impacts the student academic motivation and self-efficacy in learning science.

The conceptual paradigm in Figure 1 shows the independent variable, dependent variable and mediating variable of the study. The independent variable of the study is the student academic motivation was taken from (Shapiro, 2018). Which has its indicators such as *intrinsic motivation* which is defined as the drive to engage in an activity for its own sake, deriving satisfaction and fulfillment from the activity itself rather than from external rewards or pressure; *self-determination* which is the ability of individuals to make choices and govern themselves; *grade* motivation which is intrinsic and extrinsic factors that influence student's desire to achieve high grades and *career motivation* which is the intrinsic and extrinsic factors that drive individuals to pursue and excel in their
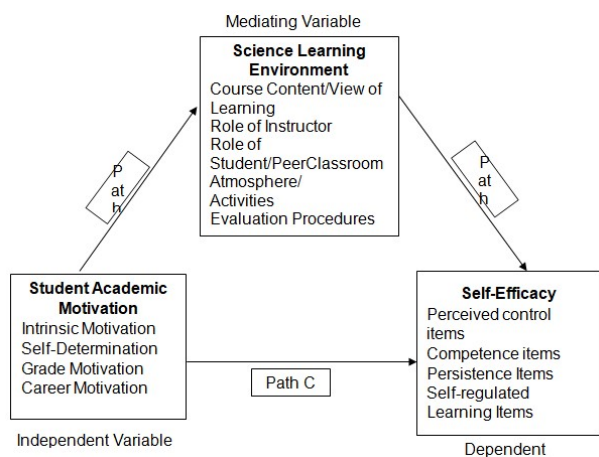
Figure 1. Conceptual Framework Showing the Relationship of the variables

professional paths. The dependent variable is the student self-efficacy in learning science was taken from (Dullas, 2018) which has the following indicators namely: perceived control items which encompasses how students perceive their capacity to manage and regulate their learning processes and academic challenges; competence items which emphasizes the perception of having the necessary skills and knowledge to succeed in various academic activities; persistence items assesses how students perceive their capability to continue working towards their objectives, even when faced with difficulties; and self-regulated learning items emphasizes that effective self-regulation leads to improved academic performance as students become more autonomous learners who can adapt their strategies according to the demands of different tasks. A mediating variable is a variable that explains the relationship between an independent variable and a dependent variable (Baron & Kenny, 1986). In other words, it is a variable that comes between the independent variable and the dependent variable and helps to explain how the independent variable affects the dependent variable. In the current study, science learning environment (Lavis, 2005) is the mediating variable that explains the relationship between student academic motivation (independent variable) and self-efficacy in learning science (dependent variable variable). The mediating variable in this study has the following indicators: course content/ view of learning, role of instructor, role of student/peers, classroom atmosphere/activities and evaluation procedures.

This study could provide understanding particularly in science learning environment ,student academic motivation and self-efficacy. Though there are literature directing out the relationship of the variable cover in learning overall. This is further motivated on self-efficacy and deliver demanding practical data for several self-efficacy variables can clarify modification in school performance further than intelligence and preceding accomplishment for current education program and school improvement. Further, the research would like to response to sustainable development goal four, which is quality education. Moreover, This could meaningfully be beneficial in applying practices applicably lined with science learning environment and with student academic motivation, similarly applying current teaching strategies to provide the self-efficacy of varied senior high students in learning science. This results

yearned that it will be beneficial for science teachers, school authorities, parents, and other people are concerned around the self-efficacy of the learners. Lastly, Future researchers can also help from the study as they can use this as one of their writings foundations or may be source for future research undertakings.

METHODS

The respondents to the study were public senior high school students enrolled during the school year 2023-2024 in a particular secondary school in Baganga North District, Baganga, Davao Oriental. 204 senior high students were identified to participate recommendd by using Raosoft sampling calculator at a 95 percent confidence level. These school are well-known in the public for their commitment in providing learners with excellent teaching in Baganga, Davao Oriental. The researcher employed stratified random sampling to calculate population sample size using Slovin's, formula to select the respondents. In this method, the population was cathegorized based on the inclusion criteria, then randomly select them. In the principle, the components of a population are separated into various strata with the elements within each stratum being comparable to one another in terms of certain survey-relevant features (Parsons, 2017). When elements in the population and all the elements in the sampling frame have the same chance of being chosen for the sample, stratified ramdom sampling is used (Ferguson, et al 2023). Senior high school students were assessed the science learning environment and student academic motivation of their self-efficacy. The researcher believed that Baganga Davao Oriental presents a unique context for this study due to its socio-economic conditions, cultural background, and educational challenges. Conducting research in this area can contribute to localized strategies for improving educational practices tailored to meet the needs of students in Baganga. They are the bonafide candidates for the study since they can deliver useful data to test the hypothesis.

Furthermore, the researcher has considered the inclusion and exclusion criteria in the selection of the respondents of the study. The respondents are senior high school students officially enrolled for the school year 2023-2024, chosen during the stratified random sampling, who voluntarily agreed to be respondents by accomplishing and signing the assent form (for students below 18 years old), and their parents voluntarily allowed them to participate in the study by accomplishing and signing the Inform Consent Form (ICF). Meanwhile, students whose parents refused to accomplish and sign the ICF and students who refused to accomplish and sign the Assent Form were excluded from this study. Additional, the students who withdrawn before and during the conduct of data gathering were excluded from the study. In addition, the school administrators, teachers, and non-teaching personnel are not included in this study. ng the stratified random sampling, who voluntarily agreed to be respondents by accomplishing and signing the assent form (for students below 18 years old), and their parents voluntarily allowed them to participate in the study by accomplishing and signing the Inform Consent Form (ICF). Students whose parents refused to accomplish and sign the ICF and students who refused to accomplish and sign the Assent Form were excluded from this study. Further, the students who withdrawn before and during the conduct of data

gathering were excluded from the study. Moreover, the researcher acknowledged the right of the respondents to withdraw their participation in this study at any time without penalty or loss of benefits. They are encouraged to inform the researcher promptly. In addition, respondents who withdraw from the study are not required to provide a reason for their decision, and the researcher removed their data from the analysis to ensure confidentiality.

Materials and Instruments

The researcher made use of the survey questionnaires taken from different studies and adapted to the context of the respondents. The instrument contained three parts for the students to answer. The first part is for questionnaire of student academic motivation was adapted from Shapiro (2018), which was modified from Components of the Science Motivation Questionnaire II (Glynn, Brickman, Armstrong, & Taasoobshirazi, 2011). The alpha coefficient for 20 item questionnaireis is 0.847 and has reflecting the following indicators: intrinsic motivation, self-determination, grade motivation, and career motivation. The second tool questionnaire the questionnaire was about for science learning environment among senior high student. The questionnaire was adapted from Lavis (2005), which was modified from the Science Learning Environment. The alpha coefficient for the 60 item questionnaire for science learning environment is 0.952. This adapted questionnaire is composed of 60 items with the following indicators: course content/view of learning, role of instructor, role of student/peers, classroom atmosphere/activities, and evaluation procedures. The third part was about student self-efficacy. This questionnaire was adapted from Dullas (2018). It is composed of 40 item questionnaire and generated a 0.993 alpha coefficient. The 40 item questionnaire has the following indicators: Perceived control items, Competence items, Persistence Items and Self-Regulated Learning Items. In evaluating the variables, 5-point likert scale was used of means of description for the students academic motivation, self-efficacy, and learning environment among senior high school students, these are the following range 4.20–5.00, or very high means measures are always manifested; 3.40–4.19, or High means measures are oftentimes manifested; 2.60–3.39, or moderate means measures are sometimes manifested; 1.80–2.59, or low means measures are seldom manifested; 1.00–1.79, or very low means measures are not manifested at all. To ensure the relevance of the questions that these questions could gather the necessary the instrument underwent revisions during the validation of the expert. It generates the average of mean 4.6 ratings from the validators and this rating was describe as very good and underwent a pilot testing and tested through Cronbach's alpha.

Design and Procedures: This study utilized a quantitative, non-experimental design of research using the correlational technique. The non-experimental study gathers data without presenting any treatment on the respondents (swart, Kramer, ratele, & Seedat, 2019). Quantitative research design is appropriate for the current study because it allows for objective measurement of variables such as learning science environment, student academic motivation, and the self-efficacy. This technique explores relationships between variables without influencing them. It permits for the investigation of multiple variables at the same time, such as student academic motivation, self-efficacy, and the learning environment. Statistical analysis can calculate the strong point and bearing of these relationships. The researcher did not manipulate or control the variables, therefore, it is non-experimental. No assumptions are prepared, and the relations between two separate variables are calculated based on statistical tools and method. Furthermore, descriptive research is information-gathering that examines the participants' individualities, manners, and experiences, it goals to create relationship between two associated variables or two distinct variables (Seeram, 2019). The mediation process was used to determine whether the relationship between student academic motivation as the independent variable and self-efficacy as the dependent variable is significantly reduced after inclusion of the mediator variable, which is science learning environment. That is, mediating relationships arise when a third variable significantly influences how the other two variables relate to one another. Thus Mediator variables seize the direct relationship between two variables. They reveal the nature of variables A relationship with variable B. This expound the setting in the study that science learning environment averts the direct relationship to student academic motivation to self-efficacy of the students. The wide ranging interpretation and analysis of the data, the statistical tool were employed the weighted mean that used to measure the level of science learning environment, student academic motivation, and self-efficacy of senior high students. Pearson product moment coefficient was utilized to determine the significance of the relationship between student academic motivation and self-efficacy; student academic motivation and science learning environment and science learning environment and self-efficacy of senior high students. Multiple Regression analysis was used to measure the influence of science learning environment and student academic motivation and sefl-efficacy of senior high school students; Universal sampling was used to determine the significance of the mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy of senior high school students.

Moreover, in this study, the researcher tails the protocol set by the University of Mindanao about research. The first draft of the adapted questionnaire was submitted to the research adviser for comments and suggestions. These comments were considered and integrated into the revised version of the first draft. Then, the final copies were submitted to experts for validation. The final revision was made by combining the improvements, remarks, and recommendations set by the expert validators before the collecting of data. After the approval the researcher conducted pilot testing, before its administration, the research instrument, and completed to 30 respondents were chosen to participate. Consequently, the researcher determines the validity and reliability of the adapted questionnaire through the Internal Consistency Method by computing its Cronbach's alpha. The researcher make sure even and ethical collection of data. First, the researcher prepared a letter-request approved by the Dean, Professional Schools. The approved letter was sent the School Division Superintendent of the Department of Education Division of Davao Oriental asking permission for the conduct the study. Next, the researcher furnished copy of the approved letter to the public school principal where the respondents are studying. Then, lists of names per grade level and sections was secured

from the Records Section In-charge, and the researcher then identied the number of respondents through stratified random sampling. After the determination of prospective research respondents, the researcher secured the Informed Consent Form (ICF) and Assent Form to all respondents. The researcher explained the content of the forms in the language they can understand. The respondents was asked to return the accomplished ICF and Assent Form 5 days after receiving the said forms. Students who return the accomplished form was given the survey questionnaires. The administration of survey questionnaire was done inside the classroom. To avoid conflict of schedules, the researcher informed the classroom advisers and subject teachers ahead of time about the conduct of the survey. The respondents were given 30 minutes to answer the survey, and the researcher explained comprehensively both in English and dialect used by the respondents the content of the survey questionnaire to avoid any confusion or misunderstanding. Then, appropriate statistical tools were used to derive the necessary data for interpretation and further analysis. Moreover, the researcher secured the Certificate of Compliance from UMERC (UMERC 2023-348) to ensure that ethical issues were dealt with accordingly and ethical considerations were observed throughout the duration of the study. The researcher underwent evaluation conducted by the members of the ethics review committee. After several review processes, this study was marked as passed and approved by the UM Ethics Review Committee. Furthermore, after verification and checking as to the completeness of the answers, all retrieved questionnaires were encoded in an Excel template. Then, after validating the results, the data was analyzed and interpreted according to the objectives of the study. Lastly, conclusions and recommendations were formulated based on the findings of the study.

RESULTS AND DISCUSSION

This chapter presents the results, interpretation, and analysis of the findings. The order of presentation follows that of the study objectives. Result presented in the following order: level of science learning environment, level of student academic motivation, level of teacher's self-efficacy, the significant relationship between science learning environment and student academic motivation, the significant relationship between student academic motivation and self-efficacy, the significant relationship between science learning environment and self-efficacy.

Science Learning Environment: Shown in the table 1 the mean of science learning environment score of senior high school of Baganga North District, with an over all mean of 3.87, was characterized as high and a standard deviation of 0.67. This means that the items related to science learning environment are oftentimes manifested by senior high school students. Moreover, the oftentimes degree of science learning environment was interpreted based on the obtained and computed mean rating of its indicators: course content, role of instructor, role of student, classroom atmosphere and evaluation procedures. The calculated mean score from highest to lowest indicators yielded the following total mean score, classroom atmosphere mean score of 3.98 described as High. Followed by evaluation procedures with a mean score of 3.97 High; role of instructor with a mean of 3.88 High; role of

student with a mean of 3.83 high; and lastly, course content with a mean of 3.67 high.

Table 1. Level of Science Learning Environment

Indicators	Mean	SD	Descriptive Level
classroom atmosphere	3.98	0.69	High
Evaluation procedures	3.97	0.79	High
role of instructor	3.88	0.71	High
Role of student	3.83	0.70	High
Course Content	3.67	0.66	High
Overall	**3.87**	**0.67**	**High**

The level of science learning environment is high, resulting high levels responses. All indicators have high ratings. The high level rating of all the indicators implies that student assessment enables instructors to measure the effectiveness of their teaching by linking student performance to specific learning objectives. This indicated that teachers help students to navigate challenges both inside and outside the classroom, fostering resilience and encouraging personal growth. It states that students are primarily responsible, engaging, organized and balance academic responsibilities and it implies that a positive environment is one in which students feel a sense of belonging, trust others, and feel encouraged to tackle challenges, take risks, and ask questions. The study results are comparable to belief of Haw, Sharif, & Han, (2022) they found out that when students are engaged in science learning environment they are committed to their work, even though they face challenges and show an apparent delight in completing their task, it tends to improve academic achievement and lower student dissatisfaction levels and dropout rates. In short, students may perform better with a higher level of achievement if they are engaged in translating theories into practice, confirming the concepts, developing technical and investigative skills in science learning environment (Bezci, & Sungur, 2021). The results are related to study of Fisher (2021) states teachers are able to institutionalize effective teaching choices in science learning environment and effective ones in their pedagogy; roles requires a dynamic skill set that allows educators not only to impart knowledge but also to inspire and empower their students accountability encourages student learning, and helps improve academic performance and achievements.

Student Academic Motivation: Shown in table 2 the mean level of student academic motivation of senior high school student with an over all mean of 3.81 characterize sa high, and a standard deviation of 0.78. It translate to student academic motivation as oftentimes observed by the respondents. Furthermore, the oftentimes degree of student academic motivation is described to the respondents agree that motivation is essential factor in science learning. Thus, student academic motivation was analyzed based on the obtained and computed mean ratings of the indicators: intrinsic motivation, self-determination, grade motivation, and career motivation. Furthermore, the calculated mean scores from highest to lowest indicators yielded the following total mean score. The indicator intrinsic motivation gained the highest mean score of 3.98 described as High. It is followed by grade motivation with a mean score of 3.78 described as High; self-determination with a mean score of 3.70 described as High; and lastly, career motivation with a mean score of 3.77 descriptively described as High. Based on the results, the respondents overall level of

Table 2. Level of Student Academic Motivation

Indicators	Mean	SD	Descriptive Level
intrinsic motivation	3.98	0.84	High
self-determination	3.70	0.81	High
grade motivation	3.78	0.83	High
career motivation	3.77	0.81	High
Overall	**3.81**	**0.72**	**High**

academic student motivations is oftentimes observed mainly because of the majority of variable's domains, including intrinsic motivation, self-determination, grade motivation, career motivation. The findings indicates that science learning becomes more effective as student's motivation increases and explain that students are intrinsically motivated perform activities for their individual growth, and extrinsically motivated students perform activities for any reward (Joseph, 2024). On the other hand, science academic motivation has been extensively studied in science education for a long time, with empirical and continued studies found that self-efficacy, intrinsic motivation, and grade motivation tended to decrease over time, while self-determination and career motivation exhibited both decreasing and increasing trends. In overall, the long continual effects of intrinsic and identified motivation on students' science performance are found that intrinsic motivation had a long-term positive impact on achievement, self-efficacy and identity (Lee, & Mun, 2023).

Self-efficacy: Discuss in the table 3 is the level of self-efficacy of the senior high students in Baganga North District. The overall mean is 3.72 characterized as high, meaning the self-efficay of senior high student is oftentimes displayed. This means that students with high self-efficacy increase the monitoring of their performances which leads to greater persistence of their positive academic behavior. Furthermore, the indicator *persistence* gained the highest mean score of 3.83 as high. It is followed by self-regulated learning with a mean score of 3.76 as high; perceived control with a mean score of 3.70 high; and lastly, competence with a mean score of 3.59 or High.

Table 3. Level of Student's Self-efficacy

Indicators	Mean	SD	Descriptive Level
persistence	3.83	0.78	High
Self-regulated learning	3.76	0.76	High
Perceived control	3.70	0.75	High
Competence	3.59	0.71	High
Overall	**3.72**	**0.69**	**High**

The results supports the study of Jiang & Bi (2022) that students with a higher sense of science self-efficacy have more confidence in their abilities and has willingness to compete the task, a stronger perseverance in completing difficult science task . In contrast, students with low science self-efficacy are more likely to give up on science tasks thus, self-efficacy center on enhancing their competencies and learning task. If a student feels that he or she lacks the ability to be competent in science tasks, this belief will lead to aversion to science and low academic achievement (Tan, Gao, Hong, & Song, 2023). On the other hand, it has found out that students' self-efficacy beliefs influence their motivation to learn, their ability to self-regulate, and their academic performance have positive mastery experiences, while students with low self-efficacy beliefs have experienced failure, and the high level of items is indicative that people who perceive have intrinsic motivation

which is also evident in people with high self-efficacy (Karimi, & Sotoodeh, 2020).

Significant Relationship between Science Learning Environment and Student Academic Motivation: Showed in Table 4.1 is the relationship between measures of science learning environment and student academic motivation.

Table 4.1. Significance of relationship between Science Learning Environment and Student Academic Motivation

	IM	SD	GM	CM	Overall
CC	0.530	0.545	0.503	0.578	**0.614**
	<.001	<.001	<.001	<.001	**<.001**
RI	0.539	0.497	0.445	0.532	**0.573**
	<.001	<.001	<.001	<.001	**<.001**
RS	0.591	0.527	0.515	0.573	**0.628**
	<.001	<.001	<.001	<.001	**<.001**
CA	0.637	0.566	0.556	0.619	**0.677**
	<.001	<.001	<.001	<.001	**<.001**
EP	0.661	0.577	0.574	0.641	**0.698**
	<.001	<.001	<.001	<.001	**<.001**
Overall	**0.652**	**0.595**	**0.571**	**0.647**	0.702
	<.001	**<.001**	**<.001**	**<.001**	**<.001**

It can be seen from the table that the correlation gained an overall r-value of 0.702 with p-value of 0.001 which is lower than the 0.05 level of significance. This indicates that there is significant relationship between science learning environment and student academic motivation. Therefore, the null hypothesis of no significant relationship between learning environment and student academic motivation is rejected. It can also be seen from the table that learning environment is significantly correlated to student academic motivation, since the p-value is 0.001 and the overall r-value of course content is 0.614, role of instructor is 0.573, role of student is 0.628, classroom atmosphere 0.677, evaluation procedure 0.698. Moreover, data revealed that student academic motivation is positively correlated with learning environment as the indicators revealed the following r-values: intrinsic motivation with 0.652, self-determination with 0.595, grade motivation with 0.571, and career motivation with 0.647; and the p-value is 0.001. Thus, the two variables are significantly associated. It implies that when science learning environment increases the student academic motivation also increases or vice versa. The correlation between the measures of learning environment and student academic motivation revealed a significant relationship. This implies that learning environment is significantly correlated with student academic motivation.

Based on result, this claim is in line with the study of Akkaya, (2024) when science learning environment is in context and relevant to their lives, many students increase interest in academic motivation and importance of science is relevant to students' lives which motivation drives the process of starting and continuing learning. In particular, by providing students with science learning environment opportunities the choices about their learning process, such as choosing topics to explore or designing their own experiments that the changes in the learning environment can lead to significant improvements in student motivation towards learning (Areepattamannil, Khurma, Ali, Al Hakmani, & Kadbey, 2023). This conclude that environments provide students with rich learning opportunities by implementing strategies that enhance

classroom dynamics such as cooperative learning techniques or integrating technology teachers can positively influence their students' motivational levels (Yıldırım, 2020).

Significance of relationship between Student Academic Motivation and Self-Efficacy: Presented in Table 4.2 is the significant relationship between student academic motivation and self-efficacy of senior high school learners. It can be seen from the table that when student academic motivation is correlated with the measures of self-efficacy, the overall r-value results to 0.854 with a p-value of 0.001 which is less than the 0.005 level of significance. This signifies that student academic motivation has a significant relation with self-efficacy.

Therefore, the null hypothesis of no significant relationship between student academic motivation and self-efficacy is rejected. Moreover, the correlation coefficient, r= 0.854, recommend that student academic motivation is associated to and can be explained by sefl-efficacy, almost 85 percent. The other 15 percent can be explicated by the other variables not enclosed in this study and may credited to a random probability distribution error.

From the table, the student academic motivation is positively correlated to self-efficacy, since the p-value is 0.001 and the overall r-value of intrinsic motivation is 0.774, self-determination is 0.783, grade motivation is 0.723, and career motivation is 0.719. Furthermore, data revealed that self-efficacy is positively correlated with student academic motivation, since the p-value is 0.001 and the overall r-value of perceived control is 0.729, competence is 0.759, persistence is 0.8333, and self-regulation is 0.82. Thus, two variables are significantly associated.

Table 4.2. Significance of relationship between Student Academic Motivation and Self-Efficacy

	PC	Com	Per	SRL	Overall
IM	0.687	0.682	0.732	0.746	**0.774**
	<.001	<.001	<.001	<.001	**<.001**
SD	0.647	0.675	0.796	0.758	**0.783**
	<.001	<.001	<.001	<.001	**<.001**
GM	0.618	0.657	0.728	0.657	**0.723**
	<.001	<.001	<.001	<.001	**<.001**
CM	0.607	0.649	0.668	0.723	**0.719**
	<.001	<.001	<.001	<.001	**<.001**
Overall	0.729	0.759	0.833	0.821	**0.854**
	<.001	<.001	<.001	<.001	**<.001**

The aboved results implies students who feel academically motivated are self-efficacy competent in performing well in school . The finding of this study is in line with the study of Wan (2021) that students that are more science motivated driven are more likely to use techniques that would boost self-efficacy in their performance and strengthens their capabilities (Schunk, & DiBenedetto, 2021).

Learners are more motivated to strive for goals that they perceive are difficult but attainable than goals they believe are very easy or overly difficult (Zheng, Chang, Lin, & Zhang, 2021). As students complete their goals, their confidence grows, further boosting their motivation compared to individuals who have self-doubts, people who have high self-efficacy participate more freely, work harder, persevere longer,

show greater interest in learning, and perform at higher levels (Alhadabi, A. 2021).

Significance of relationship between Science Learning Environment and Self-Efficacy: The significant relationship between science learning environment and self-efficacy of senior high school student was shown in Table 4.3. The overall correlation coefficient is 0.763 with p-value of 0.001, labelled as significant. revealed the results on the correlation between the measures of learning environment and self-efficacy. This means that the learning environment has a significant relationship with the self-efficacy. This implies rejecting the null hyphotesis of "no significant relationship between science learning environment and self-efficacy of senior high school student". The correlation coefficient, r= .763, suggest that science academic motivation is related to and can explained by the commitment approximately 76 percent. The other 24 percent can be explained by the other variables not covered in this study and may be attributed to a random probability distribution error.

Moreover, data revealed that science learning environment is positively correlated with self-efficacy as the indicators shown the following r-values: course content with 0.658, role of instructor with 0.650, role of student with 0.701, classroom atmosphere with 0.733, and evaluation process with 0.732; and the p-value is 0.001. Additionally, the overall r-value of perceived control is 0.708, competence is 0.609, persistence is 0.718, and self-regulated learning is The results of this study are aligned with the findings of the study of Sökmen, (2021) state that the important factors that affect students' science academic learning environment is self-efficacy; efficacy beliefs influence motivation, cognitive processing, educational practices, and skill development implies that a positive learning environment fosters greater self-belief among students with the teacher support, peer interactions, and available resources.

Table 4.3 . Significance of relationship between Science Learning Environment and Self-Efficacy

	PC	Com	Per	SRL	Overall
CC	0.596	0.546	0.609	0.668	**0.658**
	<.001	<.001	<.001	<.001	**<.001**
RI	0.602	0.504	0.609	0.672	**0.650**
	<.001	<.001	<.001	<.001	**<.001**
RS	0.660	0.567	0.646	0.704	**0.701**
	<.001	<.001	<.001	<.001	**<.001**
CA	0.678	0.577	0.696	0.742	**0.733**
	<.001	<.001	<.001	<.001	**<.001**
EP	0.684	0.580	0.705	0.718	**0.732**
	<.001	<.001	<.001	<.001	**<.001**
Overall	**0.708**	**0.609**	**0.718**	**0.769**	**0.763**
	<.001	**<.001**	**<.001**	**<.001**	**<.001**

Futhermore, students' self-efficacy can be pushed by mastery-oriented science learning environments that learning environments can impact students' interest and self-efficacy (Schweder, & Raufelder,2022).Thus, it relates to perceived beliefs about a person's capabilities rather than their actual capabilities that the higher the goals that are set the greater the commitment to perform specific tasks (Boeve-De Pauw, De Loof, Walan, Gericke, & Van Petegem, 2024). Correspondingly, as a result the correlation between the measures of learning environment and self-efficacy shown a significant relationship and suggests that the learning

environment is positively connected with self-efficacy. A well-structured and positive learning environment is vital in developing high self-efficacy and teachers should put emphasis on producing science learning environments to develop students' self-efficacy and motivation, eventually leading to better academic results (Lee, Liang, Wu, Chiou, Hsu, Wang, & Tsai, 2020).

Mediation Analysis of the Variables: Shown in Table 5 is the regression analysis result of the variables in the criteria of the presence of a mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy of senior high school. As presented below, there are three steps were encountered to act as mediator, characterized as steps 1 to 3. As described in step 1 student academic motivation as the independent variable (IV) significantly predicts self-efficacy, which is the dependent variable (DV) of the study at 0.05 significance level. Also described in step 2, student academic motivation significantly predicts science learning environment, the mediator (M) at 0.05 significance level. In step 3, science learning environment predicts self-efficacy at 0.05 significance level. Since the three steps (path a, b, and c) are significant, further analysis through universal sampling is necessary. Futhermore, this implies that a portion of the independent variable (student academic motivation) is mediated by the third variable (sefl-efficacy). Thus, other parts are either constant or mediated by extra variables not included in the study in the model. Moreover, since the effect was found to be significant at 0.05 level, partial mediation took place. In Table 5, the indirect effect of factors of student academic motivation on self-efficacy through science learning environment has an estimate of 0.335 with a standard error of 0.0491, and the 95% confidence interval (C.I.) for this effect ranges from 0.223-0.461. Since the p-value of 0.001 is lower than 0.05 the alpha level of significance, which means that the relationship is highly significant and second null hypothesis is rejected. This suggests that part of the influence of factors of student academic motivation on self-efficacy is mediated through learning environment.

The direct effect of the factors of student academic motivation on self-efficacy as shown in Table 5 estimated at 0.599 with a standard of error of 0.0565, and a 95% C.I. ranging from 0.482-0.705. This is statistically significant (z= 5.30, p <.001), indicating that the factors of student academic motivation directly influence self-efficacy when the controlling for the mediating effect of science learning environment. Since the p-value of 0.001 is lower than 0.05, this means that the relationship is highly significant and null hypothesis is rejected. This suggests that the student academic motivation have a significant direct impact on self-efficacy, independent of their influence through science learning environment. Similarly, the data revealed that the total effect of significant (B= 0.599, z= 10.60, p- <.001). Additionally, the mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy, whether full mediation, partial mediation, or no mediation. If the direct effect of factors of student academic motivation becomes non-significant when the mediator- learning environment, is included in the model, full mediation will be attained. It means that the mediator variable mediates all effects. Moreover, partial mediation occurs if the direct effect of factors of student academic motivation on self-efficacy remains significant even when the mediator is included in the model, indicating that both direct and indirect paths are contributing to the total effect. Given that the direct effect of factors of student academic motivation on self-efficacy (B=0.599, p- <.005) remains significant even after accounting for the indirect effect through science learning environment, therefore partial mediation is attained. The percent of total effect of factors of student academic motivation on self-efficacy that is mediated by learning environment is 26.5%. This indicates that almost one-third of the effect of factors of student academic motivation on self-efficacy goes through its influence on learning environment, while the remaining two-thirds represent direct effects Since partial mediation took place in this study, it can be understand that science learning environment is not sole reason student academic motivation can influence self-efficacy of senior high school student.

Table 5. Regression results of the variables in the criteria of the presence of mediating effect Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a)		β	z	p
				Lower	Upper			
Indirect	SAM ⇒ LEnv ⇒ SEff	0.216	0.0459	0.136	0.314	0.226	4.72	<.001
Component	SAM ⇒ LEnv	0.646	0.0497	0.545	0.735	0.702	13.01	<.001
	LEnv ⇒ SEff	0.335	0.0632	0.223	0.461	0.323	5.30	<.001
Direct	SAM ⇒ SEff	0.599	0.0565	0.482	0.705	0.627	10.60	<.001
Total	SAM ⇒ SEff	0.815	0.0386	0.743	0.893	0.854	21.12	<.001
% Mediation = 26.5								
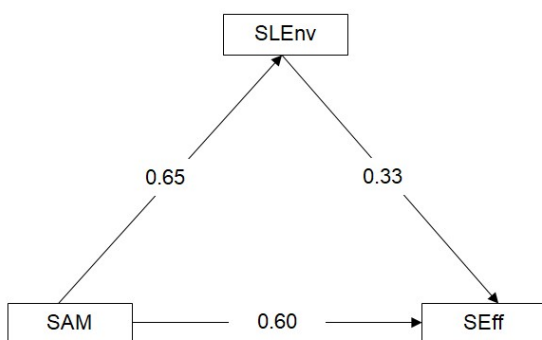
Figure 2.Medgraph showing the of variables of the study

CONCLUSION AND RECOMMENDATION

Concluded profound contemplation of the findings of the study, conclusions are drawn in this section. First, the results show an overall high descriptive level of factors of student academic motivation and science learning environment and self-efficacy. Second, this generally indicated a significant relationship between the three variables. Therefore, null hypothesis of this study is rejected. Third, it was revealed through path analysis that there was a partial mediating effect of science learning environment on the relationship between student academic motivation and self-efficacy. The findings of the study clearly confirmed the notion about the mediating

effect of learning environment on the relationship between student academic motivation and self-efficacy. The findings of study supports further evidence on the theory of Banduras' social cognitive theory which state that students with a higher sense of self-efficacy have more confidence in their abilities academic motivation, and preparedness to positively complete science tasks, when they are comportable in a science learning environment a robust determination in finishing challenging science tasks well be done (Schunk, & Di Benedetto, 2021). This study confirmed the theory of Self-Determination Theory which underscores the significance of science learning environment, competence, and connection in driving motivational and self-efficacy transformations within individuals establish a strong basis for creating strategies to improve student motivation and increased development learning environment (Lei, 2024). Futher more, Achievement Goal Theory by Nicholls, explained that students are more likely to devote themselves to their studies if they have a condusive science learning environronment, which can boost their self-efficacy as they succeed in their academic motivation (Yang, Zhang, Kong, Wang, & Hong, 2021).

Based on the findings and conclusions of the study, the following recommendations are offered: The least factors identified in the study is that teacher must encouraged to create a positive science learning environment because it is essential in fostering student motivation encourages a supportive atmosphere where mistakes are seen an learning oppurtunities rather than failures. It was recognized that there is a high level of science learning environment, student academic motivation, and high level of self-efficacy among senior high school student of Baganga North District.

The science learning environment and instructional methods must be considered to improved academic motivation and self-efficacy to all senior high school students and must give assistance to aid the difficulties they experience. In over-all, the results of the study indicate that student's with a high-quality science learning environment is important for nurturing student motivation, and self-efficacy access to quality learning practices. Implementing collaborative learning strategies, flexible learning spaces, and integrating motivational learning programs into the curriculum, can further enhance learning environments and improve academic outcomes. Moreover, the prorams and best teaching practices offered by teachers and with the curriculum provided by Department of Education must be tackled or retained and enhanced the teaching strategy to improved self-efficacy of the learning of the student in science learning. The researcher commends to ready students to start accurate and attainable goals. Therefore, a consistent, clear and productive criticism reemphasizing what learners have done well guide them on how they can progress so that they well raise the value of their development and prospective. Consequently, student self-efficacy can be improved by academic motivation that help students to set objectives, explain difficulties, and redirect on education. This include a science project-based learning fair where students will choose or propose a project that aligns with interests and curriculum goals. Let the students design an experiment or investigation plan in which they outline their hypothesis. This will tip to the progress of critical thinking skills and scince learning efficacy.

REFERENCES

Agustini, E.Y., Tarihoran, N., & Sapriati, A. (2023). The relationship between learning motivation and self-efficacy through science learning in elementary students. *Jurnal Pendidikan Sekolah Dasar*.

Akkaya, G. (2024). Investigation of the Relationship Between Science Motivation and the 21st Century Skill Levels of Secondary School Students. *Pegem Egitim Ve Ogretim Dergisi = Pegem Journal of Education and Instruction, 14*(3), 1-14. https://doi.org/10.47750/ pegegog. 14.03.01

Alhadabi, A. (2021). Science interest, utility, self-efficacy, identity, and science achievement among high school students: An application of SEM tree. *Frontiers in Psychology*, *12*, 634120.

Alnemare, A.K. (2020). Influence of Motivation on Academic Progression of Students: A Cross-sectional Study. *Journal of Clinical and Diagnostic Research*.

An, R., Wang, J., Li, S., Li, N., Yin, Y., & Wang, X. (2024). Relationship between readiness for interprofessional learning and academic self-efficacy among nursing students: a cross-sectional study. *BMC Medical Education, 24*, 1-9. https://doi.org/10.1186/s12909-023-04953-3

Areepattamannil, S., Khurma, O. A., Ali, N., Al Hakmani, R., & Kadbey, H. (2023). Examining the relationship between science motivational beliefs and science achievement in Emirati early adolescents through the lens of self-determination theory. *Large-Scale Assessments in Education, 11*(1), 25. https://doi.org/10.1186/s40536-023-00175-7

Bezci, F., & Sungur, S. (2021). How is Middle School Students' Scientific Reasoning Ability Associated with Gender and Learning Environment? *Science Education International*.

Boeve-De Pauw, J., De Loof, H., Walan, S., Gericke, N., & Van Petegem, P. (2024). Teachers' self-efficacy and role when teaching STEM in high-tech informal learning environments. *Research in Science & Technological Education*, *42*(2), 255-275.

Ferguson, R., Khosravi, H., Kovanović, V., Viberg, O., Aggarwal, A., Brinkhuis, M., & Yan, V. X. (2023). Aligning the goals of learning analytics with its research scholarship: An open peer commentary approach. *Journal of Learning Analytics*, *10*(2), 14-50.

Hammack, R., Yeter, I. H., Pavlovich, C., & Boz, T. (2024). Pre-service elementary teachers' science and engineering teaching self-efficacy and outcome expectancy: exploring the impacts of efficacy source experiences through varying course modalities. *International Journal of STEM Education, 11*(1), 4. https://doi.org/10.1186/s40594-024-00464-9

Haw, L.H., Sharif, S.B., & Han, C.G. (2022). Predictors of Student Engagement in Science Learning: The Role of Science Laboratory Learning Environment and Science Learning Motivation. *Asia Pacific Journal of Educators and Education*.

Hu, X., Jiang, Y., & Bi, H. (2022). Measuring science self-efficacy with a focus on the perceived competence dimension: using mixed methods to develop an instrument and explore changes through cross-sectional and

longitudinal analyses in high school. *International Journal of STEM Education*, *9*(1), 47.

Ibragimov, G. I., Zhdanov, S. P., Volosova, N. Y., Knyazeva, S. A., Efimushkina, S. V., & Kochneva, L. V. (2024). The competence, interest, and perceived self-efficacy of undergraduate students in science communication. *Eurasia Journal of Mathematics, Science and Technology Education, 20*(1)https://doi.org/10.29333/ejmste/14118

Joseph, A. R. (2024). *The impact of personalized learning on intrinsic motivation, academic proficiency, and behavioral issues* (Order No. 31146874). Available from ProQuest Central. (3034923927). Retrieved from https://www.proquest.com/dissertations-theses/impact-personalized-learning-on-intrinsic/docview/3034923927/se-2

Karimi, S., & Sotoodeh, B. (2020). The mediating role of intrinsic motivation in the relationship between basic psychological needs satisfaction and academic engagement in agriculture students. *Teaching in Higher Education.*

Kim, S. Y., & Alghamdi, A. K. H. (2023). Secondary school students' perceptions of science learning environment and self-efficacy in south korea: Gender differences. *Journal of Baltic Science Education, 22*(2), 269-281. doi:https://doi.org/10.33225/jbse/23.22.269

Lee, M. H., Liang, J. C., Wu, Y. T., Chiou, G. L., Hsu, C. Y., Wang, C. Y., . & Tsai, C. C. (2020). High school students' conceptions of science laboratory learning, perceptions of the science laboratory environment, and academic self-efficacy in science learning. *International Journal of Science and Mathematics Education*, *18*, 1-18.

Lee, G., & Mun, S. (2023). From science motivation to science identity: The mediating effect of science achievement according to gender. *Eurasia Journal of Mathematics, Science and Technology Education, 19*(10)https://doi.org/10.29333/ejmste/13633

Lei, Y. (2024). Unlocking the secrets of STEM success: Exploring the interplay of motivation to learn science, self-regulation, and emotional intelligence from a perspective of self-determination theory. *Learning and Motivation*, *87*, 102012.

Luzin, A., Rozhnov, A. A., Tkachenko, T. V., Shoustikova, T., Tukhvatullina, L. R., & Batrakova, I. A. (2024). Exploring the relationship between self-efficacy beliefs when teaching science and engineering. *Eurasia Journal of Mathematics, Science and Technology Education, 20*(8)https://doi.org/10.29333/ejmste/14919

Ma, X., Zhang, H., Zhou, X., & Li, B. (2024). Investigating the learning self-efficacy of a fully online teaching environment among undergraduate chinese medical students: A cross-sectional study. *BMC Medical Education, 24*, 1-11. doi:https://doi.org/10.1186/s12909-024-05890-5

Parsons, V. L. (2017). Stratified sampling [_eprint: https://onlinelibrary. wiley. com/doi/pdf/10.1002/97 811 18445112. stat05999. pub2]. *Wiley StatsRef: Statistics reference online*, 1-11.

Sökmen, Y. (2021). The role of self-efficacy in the relationship between the learning environment and student engagement. *Educational Studies*, *47*(1), 19-37.

Schunk, D. H., & DiBenedetto, M. K. (2021). Self-efficacy and human motivation. In *Advances in motivation science* (Vol. 8, pp. 153-179). Elsevier.

Schweder, S., & Raufelder, D. (2022). Students' interest and self-efficacy and the impact of changing learning environments. *Contemporary Educational Psychology*, *70*, 102082.

Tillotson-Chavez, K., & Weber, J. (2024). A New Generation of Citizen Scientists: Self-Efficacy and Skill Growth in a Voluntary Project Applied in the College Classroom Setting. *Citizen Science: Theory and Practice, 9*(1), 7. https://doi.org/10.5334/cstp.641

Wan, Z. H. (2021). Exploring the effects of intrinsic motive, utilitarian motive, and self-efficacy on students' science learning in the classroom using the expectancy-value theory. *Research in Science Education*, *51*(3), 647-659.

Xiang, Y. (2023). Correlation of Self-efficacy and English Performance. *The Educational Review, USA, 7*(10), 1560-1563. https://doi.org/10.26855/er.2023.10.019

Yang, X., Zhang, M., Kong, L., Wang, Q., & Hong, J. C. (2021). The effects of scientific self-efficacy and cognitive anxiety on science engagement with the "question-observation-doing-explanation" model during school disruption in COVID-19 pandemic. *Journal of Science Education and Technology*, *30*(3), 380-393.

Yentür, M.M. (2023). The Effect of Geography Teachers' Self-Efficacy Perceptions and Attitudes Toward Teaching on Their Motivation. *International Journal of Educational Research Review.*

Yıldırım, H. İ. (2020). The effect of using out-of-school learning environments in science teaching on motivation for learning science. *Participatory Educational Research*, *7*(1), 143-161.

Yurtseven, N., Atay, D., & Bulut, G. (2021). Perceived learning environment and academic motivation: An explanatory mixed methods study in a Molecular Biology and Genetics program. *Biochemistry and Molecular Biology Education, 50*, 21 - 28.

Zheng, B., Chang, C., Lin, C. H., & Zhang, Y. (2021). Self-efficacy, academic motivation, and self-regulation: how do they predict academic achievement for medical students?. *Medical Science Educator*, *31*, 125-130.

Zhu, J. -. B., & Luo, Y. -. Z. (2024). The Prediction Of Science Achievement With Science Identity And Science Learning Self-Efficacy Among China's Upper-Secondary Students. *Journal of Baltic Science Education, 23*(2), 390-410. https://doi.org/10.33225/jbse/24.23.390

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