13 (1) (2024) 20-32

Unnes Science Education Journal

Accredited Sinta 2

https://journal.unnes.ac.id/journals/usej

Exploring the Correlation between Motivation and Self-Regulation in Science Learning among Junior High School Students: A Case Study

Nabila Putri Sholahudin[1]✉, Shofa Nabilah[1], Nimas Ayu Lestari[1], Adi Rahmat[2], Nanang Winarno[1], Yanti Hamdiyati[2]

DOI: http://dx.doi.org/10.15294/usej.v13i1.350

[1]Department of Science Education, Universitas Pendidikan Indonesia, Indonesia
[2]Department of Biology Education, Universitas Pendidikan Indonesia, Indonesia

Article Info

Submitted 2024-01-20
Revised 2024-03-26
Accepted 2024-05-31

Keywords

Motivation; Self-regulation; Science Learning; Self-efficacy; Learning Goal

Abstract

A student's motivation influences students' self-regulatory abilities, and significantly impacts their attitude towards scientific concepts, contributing to a more enriched and successful learning experience. This research explores the correlation between motivation and self-regulation in science learning among junior high school students. The research methodology employed in this study adopts a quantitative approach with a survey research design. This research found that the average learning goal orientation is 4.12, task value is 3.97, and self-efficacy is 3.75. The total average for the dimensions of motivation and self-regulation is 3.95 and 3.89 respectively. These scores indicate that the motivation and self-regulation in science learning among junior high school students are categorized at a high level. Furthermore, there is a significant correlation between motivation dimensions (learning goal orientation, task value, and self-efficacy) and self-regulation in science learning. Based on the students' answers to open-ended questions, they are motivated to learn science because learning science is interesting and fun. Meanwhile, students who feel unmotivated to learn science find it challenging, especially when dealing with formulas and calculations. However, despite the lessons' difficulty, students still try to study because most of them desire to achieve good grades in science lessons.

How to Cite

Sholahudin, N. P., Sudarmin, S., Nabilah, S., Lestari, A. N., Winarno, N., & Hamdiyati, Y. (2024). Exploring the Correlation between Motivation and Self-Regulation in Science Learning among Junior High School Students: A Case Study. *Unnes Science Education Journal*, 13(1), 20-32.

✉ Correspondence Author:
E-mail: nabilaputs14@upi.edu

p-ISSN 2252-6617
e-ISSN 2502-6232

INTRODUCTION

In science education, particularly at the junior high school level, students are introduced to abstract concepts that form an integral part of the science curriculum (Chou & Ching, 2012; Wicaksono, 2022) These concepts often involve complex ideas that prove challenging to visualize directly. Students need to develop an attitude toward the subject of science, as their attitudes indicate whether they will be interested in or have positive feelings toward science, regardless of whether they like or dislike the subject (Gormally, 2017; Kurniawan et al., 2019).

Junior high school students face challenges in learning science, particularly in terms of student motivation, cognitive ability, teacher characteristics, and instructional resources (Sadera et al., 2020). Several studies in the field of science education have demonstrated that the success of students in the learning process hinges significantly on motivation and self-regulation. Motivation assumes a crucial role by supplying the necessary energy, guiding, and sustaining positive student conduct, ensuring their continuous engagement in the learning process, and shaping the evolution of their learning experiences (Law et al., 2019; Tanti et al., 2020; Velayutham et al., 2013). When students are aware of what they have mastered and what still needs to be learned, and actively

seek information while making a concerted effort to comprehend the lessons, it significantly influences the success of their learning (Zimmerman, 1990). Students with strong self-regulation skills not only elevate their consciousness of educational tasks, encompassing knowledge, confidence, and argumentation but also exhibit a more directed approach to their studies (Schunk, 2005; Schunk & Zimmerman, 1997; Zimmerman, 1989). The acquisition of science process skills further equips students to adeptly tackle challenges, emphasizing the importance of emphasizing these skills to improve educational outcomes and foster positive personal development (Ratnasari et al., 2018; Wong et al., 2022).

A student's motivation, influence students' self-regulatory abilities, significantly impacts their attitude towards scientific concepts, contributing to a more enriched and successful learning experience (Neber & Schommer-Aikins, 2002; Pintrich, 2004; Velayutham et al., 2011). In essence, understanding and fostering the relationship between self-regulation and motivation is integral to cultivating a positive and effective science learning environment (Järvelä et al., 2012; Schraw et al., 2006; Velayutham et al., 2011; Wolters, 2003).

Previous research conducted by Aldridge & Rowntree (2022) investigate the influence of students' self-reported motivation on their self-regulation. The study employed a scale adapted from Velayutham et al., (2011) which divided motivation into three key dimensions: learning goals orientation, task value, and self-efficacy. The findings revealed a significant correlation between students' perceptions of the learning environment, their motivation levels, and their self-regulation. However, a notable gap in the research was identified, as the study lacked qualitative information that could offer additional insights into the causal correlation observed in the quantitative data. To address this gap, the present study aims to incorporating both quantitative data derived from structured questionnaires and qualitative information obtained through open-ended questions. This approach is designed to enrich the findings and offer a more perspective on the intricate correlation between motivation and self-regulation among students.

Analyzing the profile of motivation and self-regulation is crucial in education as it provides valuable insights into students' cognitive and emotional engagement in the learning process (Corno & Mandinach, 1983; Wolters, 2003; Xie et al., 2020). Understanding their motivation helps educators tailor instructional strategies to enhance learning experiences, while insights into self-regulation shed light on students' ability to manage their own learning, fostering autonomy and effective study habits (Wolters, 2003; M. R. Young, 2005). This comprehensive analysis enables educators to address individual needs, optimize educational outcomes, and cultivate a supportive environment that nurtures both motivation and self-regulation in students. The importance of understanding the correlation between self-regulation and motivation in the context of science education has increasingly become a focal point of research. These factors, motivation and self-regulatory abilities play a crucial role in determining the success of students in the learning process. The research questions proposed in this study are:

How are the students' motivation and self-regulation in science learning among junior high school students?

How is the correlation between students' motivation and self-regulation in science learning among junior high school students?

METHOD

Research Design

The research methodology employed in this study adopts a quantitative descriptive approach with a survey research design. According to Creswell (2012), survey research is instrumental in identifying trends in attitudes, opinions, behavior, or population characteristics without intervention from researchers. In alignment with this design, data collection was executed through surveys, aiming to provide a comprehensive portrayal of the current state of students' motivation and self-regulation. The quantitative descriptive method enables the systematic analysis of survey responses, facilitating the identification of patterns, trends, and correlations within the dataset.

Participants

We conducted a cross-sectional study investigating students' quality of motivation and self-regulation in science learning. This study was conducted among 318 seventh-, eighth-, and ninth-graders at public schools in West Java Province, Indonesia. 46% from seventh grade, 25% from eighth, and 30% from ninth grade. The age range of participants in this study is 12 to 15 years old. 12% of students are 12 years old, 45% are 13 years old, 24% are 14 years old, and 19% of students are 15 years old. Students included in the study group were selected using the convenience sampling method. There are three secondary schools in West Java Province for the data collection. The frequencies of the sample can be seen in Table 1.

Table 1. Participants in the study (N=318)

Grade	Gender	Number	%
7	Female	83	26
	Male	63	20
	Total	146	46
8	Female	44	14
	Male	34	11
	Total	78	25
9	Female	55	17
	Male	39	12
	Total	94	30
Total	Female	182	57
	Male	136	43
Total		318	100

Data Collection Tool

To assess the students' motivation and self-regulation in science learning, we translated and adopted the Motivation and Self-regulation scale (Velayutham et al., 2011), with Cronbach's alpha values of 0.91 for each component in learning goal orientation and self-regulation, and 0.92 for each component in task value and self-efficacy. This instrument is used to measure important related factors for students' motivation and self-regulation in lower secondary science classes. In the cross-sectional study, a Likert scale was employed to evaluate students using a comprehensive set of 32 items. The assessment focused on three pivotal components of motivation—namely, learning goal orientation, task value, and self-efficacy. These elements have consistently demonstrated their relevance to students' adaptive motivational beliefs, playing a crucial role in fostering successful engagement in self-regulated learning. Additionally, the study addressed the vital aspect of self-regulation of effort, recognizing it as a key component influencing students' active involvement in science-based learning. For more in-depth data collection, we added 3 open-ended questions, such "What makes you motivated to study science?", "What makes you unmotivated to study science?", "What makes you keep doing science assignments even though you don't like them?"

The data collection tool was applied to 327 junior high school students in West Java. The scale is assessed to students through two different types of tests, paper-based and computer-based. Those assessed on a paper-based basis are schools whose students were also observed and interviewed by the author. For the other 3 schools, Google Forms was used to collect data.

Data Analysis

The data was analyzed by calculating the average and standard deviation of the score gained. The data interpretation can be seen in Table 2.

Table 2. Data Interpretation of Survey Result

Mean Scores	Level of interpretation
4.51 - 5.00	Very High
3.51 - 4.50	High
2.51 - 3.50	Moderate
1.51 - 2.50	Low
1.00 - 1.50	Very low

(Wang & Shen, 2023)

Table 3. The category of Spearman's Correlation

Grading Standards	Correlation Degree
$\rho = 0$	No correlation
$0 < \lvert\rho\rvert \leq 0.19$	Very week
$0.20 \leq \lvert\rho\rvert \leq 0.39$	Weak
$0.40 \leq \lvert\rho\rvert \leq 0.59$	Moderate
$0.60 \leq \lvert\rho\rvert \leq 0.79$	Strong
$0.80 \leq \lvert\rho\rvert \leq 1.00$	Very strong
1.00	Monotonic correlation

To test the correlation between motivation and self-regulation in junior high school students, Spearman correlation was used because the data was not normally distributed. Other descriptive statistics studied were means and standard deviations. We used IBM SPSS Statistics (Version 23) statistical software to perform basic analyses. The correlation degree between the variables can be used according to the grading standards of ρ (Yan, 2019) shown in Table 3.

RESULT AND DISCUSSION

Profile students' motivation and self-regulation toward science learning in junior high school

The purpose of this study is to profile students' motivation and self-regulation toward science learning in junior high school based on a questionnaire from Velayutham et al., 2011. Student motivation comprises three components: learning goal orientation, task value, and self-efficacy, each of which contributes to the formation of student motivation and is integral to successful engagement in self-regulated learning (Zimmerman, 2020). Based on the Figure 1, learning goal orientation, task value, self-efficacy, and self-regulation have mean scores of 3.75 - 4.12. The average score of motivation that has three dimensions (learning goal orientation, task value, self-efficacy) merge, so the mean score is 3.95, these mean scores indicate that the motivation and self-regulation of students have a high level.

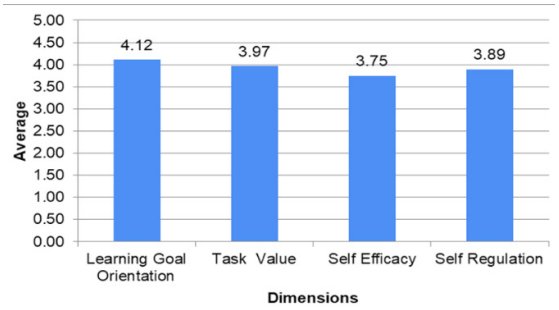

Figure 1. Average of Motivation and Self-Regulation Result

Based on the presented figure 1, it is evident that learning goal orientation boasts the highest average score of 4.12, while self-efficacy records the lowest average at 3.75. According to Velayutham (2011) learning goal orientation and self-efficacy are component of motivation. This indicates that junior high school students engaged in science learning already exhibit a commendable level of learning goal orientation. Students who perceive their teachers as prioritizing learning goals tend to employ adaptive cognitive, emotional, and behavioral regulatory strategies (Ryan, Gheen, & Midgley, 1998; Urdan & Midgley, 2003). The concept of learning goal orientation provides valuable theoretical insights into understanding the factors influencing students' engagement in academic tasks (Pintrich, 2000).

The findings related to student motivation in the learning goals orientation dimension align with the outcomes obtained from open-ended questions number one regarding what motivates students during science learning. It can be concluded that student motivation in the learning process of sciences as much as 14.8% is influenced by the belief that mastery of science can develop scientific thinking skills, improve critical thinking skills, and allow them to more deeply understand the environment and living things. Previous research finding learning goal orientation was a statistically significant and positive predictor of students' self-regulation (Aldridge & Rowntree, 2022; Velayutham & Aldridge, 2013; Velayutham et al., 2011).

In the context of science education, learning goal orientation assesses how actively students engage in science lessons with the aim of acquiring knowledge, comprehending, and mastering scientific concepts (Velayutham et al., 2011a). Students who have a learning goal orien-

tation actively look for challenges and persist in the face of difficulties (Aldridge & Rowntree, 2022). Table 4 presents the average and standard deviation toward science learning in Junior High School according to learning goal orientation dimensions, which is a key component of student motivation.

Table 4. Mean and Standard Deviation of Students' Learning Goals Orientation

Items	N	Mean	SD
LGO1	318	4.12	0.67
LGO2	318	4.11	0.59
LGO3	318	3.64	0.87
LGO4	318	4.23	0.57
LGO5	318	4.32	0.59
LGO6	318	4.13	0.66
LGO7	318	4.31	0.60
LGO8	318	4.06	0.68
AVERAGE		4.12	0.65

Based on Table 4 the average score for learning goal orientations is 4.12, highlighting that LGO1, LGO4, LGO5, LGO6, and LGO7 is above the average. Junior high school students express diverse goals related to science learning. They aim to acquire as much knowledge about science as possible (LGO1), they emphasize the importance of understanding the assignment (LGO4), learning the content presented (LGO5), enhancing their science skills (LGO6), and understand what is being taught in science class (LGO7). These findings collectively highlight students' strong motivation and commitment to comprehensively engaging with and improving their understanding of science. Items LGO2, LGO3 and LGO8 fall below the average. Students state that one of their goals are to learn new science content (LGO2) and to master new science skills (LGO3), and they emphasize that understanding science ideas is important to them (LGO8). The average score for (LGO3) items is the lowest among other items, although it is still categorized as high. This can be interpreted as students still not being entirely convinced that the goal of their science learning is to master new science skills. To encourage higher learning goal orientations, it is important for teachers to emphasize understanding, engagement, and mastery of learning concepts (Aldridge & Rowntree, 2022). The impact of the teacher support scale, which measures the degree to which the teacher assists, befriends, trusts, and shows interest in the student, was statistically significant on students' learning goal orientation. Students taught by teachers who consistently highlight the importance of mastering and comprehending the information presented in class are likely to have a heightened perception of learning goal orientation. So if teachers are helpful, friendly and trustworthy to students, students' learning goal orientation are likely to increase (Velayutham & Aldridge, 2013).

Table 5. Mean and Standard Deviation of Students' Task Value

Items	N	Mean	SD
TV1	318	3.97	0.67
TV2	318	3.97	0.70
TV3	318	4.12	0.67
TV4	318	4.14	0.61
TV5	318	3.58	0.77
TV6	318	3.79	0.73
TV7	318	4.05	0.69
TV8	318	4.13	0.63
AVERAGE		3.97	0.69

Science task value involves the degree to which the student perceives the science learning tasks in terms of interest, importance, and utility. Task value is strongly associated with cognitive and self-regulatory strategies (Velayutham et al., 2011a). Table 5 shows the average and standard deviation of students' motivation toward science learning in Junior High School according to the task value dimensions.

Based on Table 5 showed that the average task value is 3.97. It is observed that TV3, TV4, TV7, and TV8 are above average. Students believe what they learn in science class is useful to know (TV3), they also said that what they learn is helpful (TV4), what they learn satisfies their curiosity (TV7) and also encourages students to think (TV8). In open-ended questions, students also expressed that they are motivated to learn science because science education is beneficial for them. Students are motivated to learn science because they want to know more about it. It can be identified that students have a curiosity about science. The items as coded TV1 and TV2 are equal to average. Students believe what they learn in science class can be used in their daily life (TV1) and also what they learn is interesting (TV2). In response to the open-ended question, students

also expressed the opinion that "our lives can be explained through science." This means that science learning is applied in everyday life. Additionally, students are motivated to learn science because they find the subject interesting. According to Velayutham (2011) Students who find their learning activities interesting and important are more actively involved in trying to understand and comprehend the presented materials. The item as coded TV5 and TV6 are below average. Students think what they learn in science class is relevant to them (TV5) and they think what they learn is of practical value (TV6). The lowest score in the task value aspect is on item (TV5), where students perceive that what they learn in science is related to themselves. In other words, students are uncertain about this statement. Despite this score being the lowest among other items, it is still categorized as high. Teacher support has a significant impact on task value, indicating that teachers play a crucial role in assisting students in understanding the importance of the tasks they are engaging in during class. The impact of the teacher support scale, measuring how much the teacher assists, befriends, trusts, and is interested in the student, significantly influenced the task value perceived by students (Velayutham & Aldridge, 2013).

Successful completion of science assignments builds students' confidence in their ability to tackle complex scientific challenges, strengthening the belief that they have the necessary skills and competencies. As students witness their own ability to persist in their best efforts in science class, their self-efficacy in science grows. Table 6 shows the mean and standard deviation of students' self-efficacy.

Table 6. Mean and Standard Deviation of Students' Self-Efficacy

Items	N	Mean	SD
SE1	318	3.61	0.75
SE2	318	3.69	0.76
SE3	318	3.90	0.67
SE4	318	4.05	0.64
SE5	318	3.62	0.79
SE6	318	4.01	0.57
SE7	318	3.82	0.63
SE8	318	3.29	0.76
AVERAGE		3.75	0.70

Table 6 presents the key findings regarding the mean and standard deviation of self-efficacy among junior high school students, based on the responses from 318 participants. The overall mean self-efficacy score was 3.75, indicating a high level of self-efficacy among the students. However, a closer examination reveals variations in self-efficacy across specific statements. Notably, statements SE1, SE2, SE5, and SE8 scored below the overall mean. Students expressed lower confidence in their proficiency in science learning (SE8), leading to doubts about achieving high scores in science (SE5). Confidence in science mastery among students is correlated with their science achievement, with higher achievement resulting in greater self-confidence and interest in science (Baea & DeBusk-Lane, 2018; Chang & Cheng, 2008). Moreover, there was uncertainty about mastering the skills taught in science (SE1), and some students indicated confusion when faced with challenging science tasks (SE2). Pujani et al., (2018) increased students' mastery of concepts by implementing the Collaborative Rank-task model in science learning. The research results prove that there is an increase in students' mastery of concepts. In response to the open-ended question, students also mentioned that what makes them unmotivated to learn science is their inability or lack of proficiency in science education. Additionally, students expressed that the assigned tasks are numerous and difficult, and they find the learning materials and content challenging to understand. In addition to the aforementioned findings, certain statements got high agreement from middle school students, as reflected in SE3, SE4, SE6, and SE7. A substantial number of students expressed confidence in their ability to engage with challenging science tasks (SE3) and believed in their capacity to overcome difficulty through effort (SE4). The motivation to persist in their best efforts was discussed in their responses to open-ended questions. Furthermore, students believe that they can understand the contents taught (SE7) and have confidence in learning their knowledge in the assigned tasks (SE6). These affirmative responses underscore the positive attitudes and beliefs that students hold toward their capabilities in science class.

Students with high self-efficacy tend to exhibit stronger self-regulatory skills, as their confidence in their capabilities motivates them to set challenging goals and regulate their efforts effectively. To foster self-regulated learning among students in lower secondary science classes, educators should initially employ approaches that ef-

fectively enhance students' self-efficacy in science education, aiming to boost their confidence in the subject. For instance, teachers might customize science assignments according to individual abilities, ensuring successful experiences that build confidence and minimize setbacks that could undermine efficacy (Britner & Pajares, 2006). Table 7 shows the mean and standard deviation of students' self-regulation.

Table 7. Mean and Standard Deviation of Students' Self-Regulation

Items	N	Mean	SD
SR1	318	3.93	0.77
SR2	318	3.77	0.83
SR3	318	3.72	0.82
SR4	318	4.08	0.68
SR5	318	3.69	0.80
SR6	318	3.98	0.73
SR7	318	3.82	0.72
SR8	318	4.14	0.58
AVERAGE		3.89	0.74

The table 7 presents the average and standard deviation toward science learning in Junior High School according to self-regulation dimensions. The average score for self-regulation dimensions is 3.89, highlighting that SR1, SR4, SR6, and SR8 are above the average. Junior high school students express their commitment to task completion, even when the tasks are uninteresting or challenging. They convey a determination to persevere through difficulties and keep working until they finish what they are supposed to do. During science lessons, students actively concentrate to avoid missing important points. In the table, items SR2, SR3, SR5, and SR7 are below the average. Students express their dedication by working diligently, even when faced with tasks they don't particularly enjoy. They persist in their efforts, choosing to continue working despite the presence of more appealing activities. Additionally, they value completing their work and assignments punctually. Moreover, students maintain focus during class sessions.

The SR5 items indicate a below-average performance, suggesting that students struggle to complete assignments within the stipulated time frame. This is in alignment with the responses to open-ended question number 2, where 9.17% of junior high school students expressed a lack of motivation in learning science as perceived difficulty of assigned tasks. This observation finds support in the outcomes of our research during science classes. Students faced challenges in completing assignments promptly due to the high level of difficulty in the student worksheet designed for junior high school students. The abundance of complex questions further compounded the issue, especially considering the limited time allocated for completion.

Furthermore, the observed struggle in completing assignments within the stipulated time frame (SR5) finds support in cognitive load theory. This theory posits that when tasks are perceived as excessively complex, students may experience heightened cognitive load, impeding task completion within allocated time constraints (de Jong, 2010; Van Merriënboer & Sweller, 2005; J. Q. Young et al., 2014).

However, according to the responses to open-ended question number 3, which inquired, "Why do you always strive to do your best in science learning, even though sometimes you find it difficult, dislike it, feel tired, and have many assignments?" Approximately 10% of students answered that the tasks assigned to them should be completed as a form of responsibility as a student, fulfilling the given assignments from the teachers. This aligns with the intrinsic motivation concept, wherein individuals engage in activities for their inherent satisfaction and personal interest (Ann Renninger, 2000; Lee & Reeve, 2017).

Student Response Toward Open-Ended Question

This research asks 3 open ended questions to students. Student responses are then categorized based on the similarity of their responses. The number of categories varies for each open-ended question. In this analysis of student responses, the author identifies and characterizes student responses based on their categories.

Q1: What keeps you motivated when studying science?

The analysis of students' response to these questions was classified into nine distinct categories, including enjoyable and engaging learning experiences, the usefulness of the learning process, curiosity enhancement, practical implementation of experiments, the influence of teachers, preferences for specific learning specifications, and long-term goals. A total of 208 students responded to these nine categories.

Category I: The reason behind their motivation for science subjects is the enjoyable learning ex-

perience. Approximately 11.87% of respondents cited this as their motivating factor.

Category II: Students find motivation in science subjects due to the engaging learning experiences, with approximately 23.74% of respondents mentioning this as their driving force, even though the learning process may not be easy.

Category III: They feel motivated because science education provides profound insights into nature, the environment, and mathematics. About 14.16% expressed that their primary motivation is to produce something, and learning science enlightens them to new aspects, such as changes in substances, the human body's organs, and surrounding phenomena. Additionally, many students mention that the practicality of learning science and its application in daily life serve as motivating factors.

Category IV: A total of 12.32% of students responded that their strong curiosity serves as a significant motivator in studying science. They express a keen interest in discovering new and intriguing topics previously unknown to them.

Category V: The involvement in practical work and experiments proves to be a significant factor in sustaining their motivation, with 16% of students acknowledging its importance. Students express a high level of enthusiasm for practical work and experiments, highlighting the enjoyment and delight these activities bring to their science learning experience. Some of them emphasize the camaraderie of group experiences, the engaging nature of practical materials, and the excitement of experiments as key drivers of their motivation.

Category VI: A total of 13% responded that what influences their motivation to study science is the impact of teachers. They mentioned that an engaging, fun, and adept teacher who can explain simply makes it easy for students to comprehend the material. The presence of a good, friendly, and motivational teacher is highlighted as a crucial factor in maintaining their enthusiasm for learning.

Category VII: A total of 2.28% of students responded that their interest and fascination with specific topics in science are key elements in maintaining their motivation to learn. Aspects such as their enthusiasm for specific subjects like chemistry and physics serve as primary drivers of their motivation.

Category VIII: Students find motivation in science subjects due to they want to get the best result. This result orientation shows that students want to get a high score and want to get a good rank in their class. This students' category was supported by the response from 11 students (5.02%) out of 208 students. For this reason, the students might be motivated to finish all of the science work, but the matter is when students are motivated to understand science learning well.

Category IX: Long-term goals, such as aspiring to become a doctor or pursue a career in the healthcare field, serve as the primary driving force for their motivation in studying science, as indicated by 4.56% of respondents. The desire to comprehend and apply scientific knowledge to achieve their aspirations is a strong factor in sustaining their enthusiasm for learning.

Q2: What makes you less motivated to study science?

The finding of students' responses toward this question was categorized into 11 categories, such as lessons that are difficult to understand, many formulas and calculations, difficult tasks, teaching methods, do not like science lessons, a lot of material and theory, too many practicum activities, the material is less interesting, tired, learning is boring, and less proficient in science learning. These categories were answered by 209 students. There are 38 responses states there is nothing that makes them less motivated, in other words they are always motivated to learn science. There are 20 responses that we can't categorize because students do not give appropriate answers.

Category I: The cause of the lack of motivation to study science is because the lessons are difficult to understand. This students' category was supported by the response from 66 students (28.82%). Subjects that are difficult to understand vary among students; some express difficulty comprehending physics materials, while others struggle with biology content.

Category II: This category was supported by the response from 35 students (15.28%). Students also argue that the abundance of formulas and calculations in science education demotivates them from learning science content. Therefore, this also becomes a reason for their difficulty in studying materials that involve formulas and calculations.

Category III: The cause of lack of motivation to study science is because the task given is difficult. The assignments given to students are in

the form of worksheets that the students need to complete. This students' category was supported by the response from 21 students (9.17%).

Category IV: The cause of lack of motivation to study science is due to the learning method delivered by the teacher. Students express that the delivery of the material by the teacher makes them feel sleepy. Also, the learning is conduct in the classroom, listening to lectures from the teacher and simply taking notes on the learning material. This students' category was supported by the response from 15 students (6.55%).

Category V: Not liking and not being interested in science also becomes a reason why students are not motivated to learn science. This students' category was supported by the response from 8 students (3.49%).

Category VI: The excessive amount of material and theory that they have to memorize and understand also becomes a reason why students are not motivated to learn science. This students' category was supported by the response from 8 students (3.49%).

Category VII: The abundance of practical activities conducted also demotivates some students from learning science. This is further supported because in practical sessions, students also have to fill out worksheets, and as mentioned above, students face difficulties in completing their assignments to fill the worksheet. This students' category was supported by the response from 4 students (1.75%).

Category VIII: Subjects that are considered less interesting by students become a cause for their lack of motivation to learn science. Some students are only interested in science when the biology material is being explained, while others are only interested in learning science when physics or chemistry topics are being discussed. This students' category was supported by the response from 4 students (1.75%).

Category IX: The cause of lack of motivation is because of fatigue and tiring. Students argue that when science subjects are scheduled towards the end of the class, they feel tired and less motivated to study. This is because the academic workload they have received earlier makes them feel fatigued and exhausted. This students' category was supported by the response from 4 students (1.75%).

Category X: The cause of lack of motivation is because learning is boring. Students get bored during lessons also because of the teaching method that involves just listening to the teacher's lecture and taking notes, as mentioned in the previous categories. This students' category was supported by the response from 3 students (1.31%).

Category XI: The cause of lack of motivation is due to being unable or less proficient in science lessons. Students perceive themselves as not proficient in science subjects, even though they have studied. However, during exams, they struggle to achieve satisfactory results. This students category was supported by the response from 3 students (1.31%).

Q3: Why do you always try your best to study science even though sometimes you find it difficult, you don't like it, you're tired and you have a lot of work to do?

The finding of students' responses to these questions was categorized into 5 categories, such as result orientation, responsibility, self-motivation, external motivation, and curiosity. These 5 categories of results were answered by 218 students. There are 11 responses that we can't categorize because students do not give appropriate answers.

Category I: The motivation that makes students always do their best even though they find science learning difficult is because they want to get the best result. This result orientation shows that students want to get a high score and want to get a good rank in their class. This students' category was supported by the response from 82 students (38%) out of 218 students. For this reason, the students might be motivated to finish all of the science work, but the matter is when students are motivated to understand the science learning well.

Category II: self-motivation being the main reason why students keep trying their best to study science even though they find it difficult. This category was supported by 96 students (44%) out of 2018 students. This self-motivation is shown by the students' never giving up attitude in completing difficult science assignments. Students are also motivated to continue to try their best in learning science because they like learning science and know that learning science can be beneficial for everyday life and life in the future. This is based on their desire to major in science

at high school level. In addition, students feel that studying science requires strong reasoning skills so they will try harder even if they don't like it or feel tired.

Category III: A sense of responsibility influences students' motivation to continue doing science assignments even though they find it difficult in science assignments. as many as 22 (10%) stated that they had to continue doing science assignments even though they felt it was difficult because they felt it was their duty and obligation as students to continue doing all the assignments given by their teachers.

Category IV: Curiosity to find out more about learning science makes students continue to try as hard as possible in learning science. 13 students (6%) stated that their curiosity to study science in depth made them motivated to study it.

Category V: This category shows the large number of minority groups in their motivation to learn science. As many as 5 students (2%) thought that external factors encouraged them to keep trying their best in learning science, including motivation from their closest friends, wanting to make their parents happy, and the factor of a good teacher also influencing student motivation. in science lessons.

The Correlation Between Motivation and Self-Regulation among Junior High School Students

The data distribution is not normally distributed, this research technique uses Spearman's Rho method to test the correlation between components or variables. The result of the correlation test using Spearman's Rho shows that motivation has a positive correlation with self-regulation with a value of r = 0.662 and p = 0.000 (<0.05) which can be seen in Table 8. Since the correlation coefficient is positive (0.662), it implies that as levels of motivation increase, levels of self-regulation also tend to increase, and vice versa. In practical terms, this might mean that more motivated students are also more likely to exhibit higher levels of self-regulation in their learning activities.

Furthermore, the application of the Spearman's Rho method enables a thorough investigation into the correlation between motivation and self-regulation. The outcomes of the correlation test, utilizing Spearman's Rho, reveal a significant correlation between the motivational dimensions (learning goal orientation, task value, and self-efficacy) and self-regulation. Notably, the dimensions of task value and self-efficacy exhibit greater correlation compared to the dimension of learning goal orientation. Specifically, task value demonstrates a strong correlation with an r-value of 0.604 and p-value of 0.000 ($p < 0.05$). Similarly, the self-efficacy dimension shows a strong correlation with self-regulation, indicated by an r-value of 0.600 and p-value of 0.000 ($p < 0.05$). Lastly, the dimension of learning goal orientation is also significantly related to self-regulation, with an R-value of 0.501 and a p-value of 0.000 ($p < 0.05$). Comprehensive details are available in Table 9.

Table 8. Result of Spearman's Correlation between Motivation and Self-Regulation

	Variables	Correlation (r)	Sig. (p)	Explanation
Spearman's Rho	Correlation between motivation and self-regulation	0.662	0.000	Positive correlation

Table 9. Correlation between Dimension of Motivation and Self-Regulation

Dimensions of Motivation	Self-Regulation		Explanation
	Correlation	Sig.	
Learning Goal Orientation	0.501	0.000	Moderate Correlated and significant
Task Value	0.604	0.000	Strong correlated and significant
Self-Efficacy	0.600	0.000	Strong Correlated and significant

Based on the study's findings, it can be concluded that there is a significant correlation between motivation dimensions (learning goal orientation, task value, and self-efficacy) and self-regulation in science learning. The results suggest consistent and robust positive correlations between each dimension of motivation (Learning Goal Orientation, Task Value, Self-Efficacy) and Self-Regulation. These findings imply that as students' motivation in terms of learning goal orientation, task value, and self-efficacy increases, so does their level of self-regulation. The statistical significance of these correlations strengthens the confidence in the observed relationships, supporting the idea that fostering motivation in these

dimensions may positively impact students' self-regulatory behaviors in the context of learning. These insights could have practical implications for educational interventions and strategies aimed at enhancing both motivation and self-regulation among students.

The current study aligns with previous research conducted by Mcdowell (2019), confirming that task value and self-efficacy exhibit a higher correlation with self-regulation compared to learning goals orientation. Task value indicating how far students argue that the science work is important to them. Mcdowell (2019) found that as students' perceptions of the importance of science work declined, accompanied by a decrease in their confidence and belief in their abilities, there was a corresponding reduction in the utilization of self-regulatory strategies. Moreover, self-efficacy, representing the value students place on their ability to perform well in science class. The research indicates that when students harbor confidence in their capability to excel in the science class, there is a positive impact on self-regulation. This underscores the interconnectedness between motivational factors, particularly task value and self-efficacy, and the effective deployment of self-regulatory strategies in the context of science learning.

Self-regulation of motivation allows students to motivate themselves and guide their behavior, and thus, becomes part of the self-regulation process (Paulino et al., 2016). The results were in line with the previous research, shows that self-efficacy, task value, and achievement goals may be important in improving students' regulation. Additionally, the research conducted by Ning & Downing (2012) implied that when students with lower levels of self-regulation and motivation experience a certain type of learning, the impact on their academic performance is not only direct but is also significantly influenced by their levels of self-regulation and motivation. This underscores the importance of interventions or educational strategies that target and enhance self-regulation and motivation, especially for students who may be starting with lower levels of these attributes.

To enhance motivation and consequently promote students' self-regulation in science education, aspects of the learning environment, such as fostering positive teacher-student relationships and incorporating collaborative learning, also need to be improved (Aldridge & Rowntree, 2022). This teacher-student relationship can positively impact self-efficacy levels. In addition, learning goal orientation and science task value are likely to increase if teachers are helpful, friendly and trustworthy to students (Velayutham & Aldridge, 2013). To make learning more interesting and motivating for students while ensuring they grasp the concepts, teachers can use context-based science education, linking scientific ideas to real-world situations (King et al., 2011).

CONCLUSION

In conclusion, this study aimed to investigate the motivation and self-regulation of junior high school students in the context of science learning. The findings reveal that students exhibit a high level of motivation, as evidenced by an average score of 3.95, while their self-regulation in science learning is slightly lower with an average of 3.89. Importantly, the study established a significant positive correlation ($r = 0.662$, $p = 0.000$) between students' motivation and self-regulation, indicating that as motivation levels increase, so do self-regulation levels, and vice versa. This implies that fostering and enhancing students' motivation may contribute to the development of effective self-regulation strategies in the science learning domain. Based on the students' answers to open-ended questions, they are motivated to learn science because learning science is interesting and fun. Meanwhile, students who feel unmotivated to learn science find it challenging, especially when dealing with formulas and calculations. However, despite the difficulty of the lessons, students still make an effort to study because most of them express a desire to achieve good grades in science lessons.These insights can inform educators and policymakers on the importance of addressing both motivation and self-regulation aspects concurrently to optimize the learning experience for junior high school students in science education. Furthermore, future research could delve deeper into specific interventions and strategies that could enhance students' motivation and self-regulation, such as fostering positive teacher-student relationships, incorporating collaborative learning, emphasizing context-based science education, and linking scientific ideas to real-world situations. However, this study is still limited to three regions in West Java; therefore, the recommendation for further research is to expand the coverage of regions so that the results can be generalized.

REFERENCES

Aldridge, J. M., & Rowntree, K. (2022). Investigating Relationships Between Learning Environment Perceptions , Motivation and Self-Regulation

for Female Science Students in Abu Dhabi , United Arab Emirates. Research in Science Education, 52, 1545–1564. https://doi.org/10.1007/s11165-021-09998-2

Ann Renninger, K. (2000). Individual interest and its implications for understanding intrinsic motivation. Intrinsic and Extrinsic Motivation, 373–404. https://doi.org/10.1016/B978-012619070-0/50035-0

Baea, C. L., & DeBusk-Lane, M. (2018). Motivation belief profiles in science: Links to classroom goal structures and achievement. Learning and Individual Differences, 67, 91–104. https://doi.org/https://doi.org/10.1016/j.lindif.2018.08.003

Chang, C.-Y., & Cheng, W.-Y. (2008). Science Achievement and Students' Self-confidence and Interest in Science: A Taiwanese representative sample study. International Journal of Science Education, 30(9), 1183–1200. https://doi.org/https://doi.org/10.1080/09500690701435384

Chou, C. P., & Ching, G. (2012). Course, Curriculum, and Textbooks. International and Development Education, 89–98. https://doi.org/10.1057/9780230120143_6

Corno, L., & Mandinach, E. B. (1983). The role of cognitive engagement in classroom learning and motivation. Educational Psychologist, 18(2), 88–108. https://doi.org/10.1080/00461528309529266

de Jong, T. (2010). Cognitive load theory, educational research, and instructional design: some food for thought. Instructional Science, 38(2), 105–134. https://doi.org/10.1007/S11251-009-9110-0

Gormally, C. (2017). Deaf, Hard-of-Hearing, and Hearing Signing Undergraduates' Attitudes toward Science in Inquiry-Based Biology Laboratory Classes. Https://Doi.Org/10.1187/Cbe.16-06-0194, 16(1), 1–13. https://doi.org/10.1187/CBE.16-06-0194

Kurniawan, D. A., Astalini, A., & Anggraini, L. (2019). Evaluation of Junior High School Students' Attitudes Against Science in Muaro Jambi Regency. JURNAL ILMIAH DIDAKTIKA, 19(1), 124–139. https://doi.org/10.22373/JID.V19I1.4198

Law, K. M. Y., Geng, S., & Li, T. (2019). Student enrollment, motivation and learning performance in a blended learning environment: The mediating effects of social, teaching, and cognitive presence. Computers & Education, 136, 1–12. https://doi.org/10.1016/J.COMPEDU.2019.02.021

Lee, W., & Reeve, J. (2017). Identifying the neural substrates of intrinsic motivation during task performance. Cognitive, Affective, & Behavioral Neuroscience, 17(5), 939–953. https://doi.org/10.3758/S13415-017-0524-X

Ning, H. K., & Downing, K. (2012). Influence of student learning experience on academic performance: The mediator and moderator effects of self-regulation and motivation. British Educational Research Journal, 38(2), 219–237. https://doi.org/https://doi.org/10.1080/01411926.2010.538468

Paulino, P., Sá, I., & Silva, A. L. da. (2016). Self- regulation of motivation: Contributing to students' learning in middle school. Cognitive - Social, and Behavioural Sciences, 5(1), 1–6. https://doi.org/10.15405/epsbs.2016.05.1

Pujani, N. M., Suma, K., Sadia, W., & Wijaya, A. F. C. (2018). Applying Collaborative Ranking Tasks to Improve Students' Concept Mastery and Generic Science Skills. Indonesian Journal of Science Eeducation, 7(3), 293–301. https://doi.org/https://doi.org/10.15294/JPII.V7I3.14304

Tanti, Maison, Syefrinando, B., Daryanto, M., & Salma, H. (2020). Students' self-regulation and motivation in learning science. International Journal of Evaluation and Research in Education, 9(4), 865–873. https://doi.org/10.11591/ijere.v9i4.20657

Van Merriënboer, J. J. G., & Sweller, J. (2005). Cognitive Load Theory and Complex Learning: Recent Developments and Future Directions. Educational Psychology Review, 17(2), 147–177. https://doi.org/10.1007/S10648-005-3951-0

Velayutham, S., Aldridge, J., & Afari, E. (2013). Students' Learning Environment, Motivation and Self-Regulation: A Comparative Structural Equation Modeling Analysis. In Application of Structural Equation Modeling in Educational Research and Practice. Brill. https://doi.org/10.1007/978-94-6209-332-4

Velayutham, S., Aldridge, J., & Fraser, B. (2011a). Development and validation of an instrument to measure students' motivation and self-regulation in science learning. International Journal of Science Education, 33(15), 2159–2179. https://doi.org/10.1080/09500693.2010.541529

Velayutham, S., Aldridge, J., & Fraser, B. (2011b). Development and Validation of an Instrument to Measure Students ' Motivation and Self - Regulation in Science Learning Development and Validation of an Instrument to Measure Students ' Motivation and Self-Regulation in Science Learning. International Journal of Science Education, 33(15), 2159–2179. https://doi.org/10.1080/09500693.2010.541529

Velayutham, S., & Aldridge, J. M. (2013). Influence of Psychosocial Classroom Environment on Students' Motivation and Self-Regulation in Science Learning: A Structural Equation Modeling Approach. Research in Science Education, 43(2), 507–527. https://doi.org/10.1007/S11165-011-9273-Y/TABLES/6

Wang, F., & Shen, Z. (2023). Research of Theme-based Teaching's Effectiveness in English Language Education. The Educational Review, USA, 7(7), 962–967. https://doi.org/10.26855/er.2023.07.020

Wicaksono, A. G. (2022). Johnstone's Levels of Representation in Science Learning. SPEKTRA: Jurnal Kajian Pendidikan Sains, 8(1), 19. https://doi.org/10.32699/SPEKTRA.V8I1.224

Wolters, C. A. (2003). Regulation of Motivation: Evaluating an Underemphasized Aspect of Self-Regulated Learning. Educational Psychologist, 38(4), 189–205. https://doi.org/10.1207/S15326985EP3804_1

Xie, K., Vongkulluksn, V. W., Lu, L., & Cheng, S. L. (2020). A person-centered approach to examining high-school students' motivation, engagement and academic performance. Contemporary Educational Psychology, 62. https://doi.org/10.1016/J.CEDPSYCH.2020.101877

Young, J. Q., Van Merrienboer, J., Durning, S., & Ten Cate, O. (2014). Cognitive Load Theory: Implications for medical education: AMEE Guide No. 86. Medical Teacher, 36(5), 371–384. https://doi.org/10.3109/0142159X.2014.889290

Young, M. R. (2005). The Motivational Effects of the Classroom Environment in Facilitating Self-Regulated Learning. Journal of Marketing Education, 27(1), 25–40. https://doi.org/10.1177/0273475304273346