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RESEARCH PAPER

Unraveling the Motivational Factors Contributing to Low Achievement in General Science among Elementary School Students

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ABSTRACT

Achievement and motivation to learn are positively correlated, according to decades of research. Learners that are driven to learn perform better academically in the classroom. The goal of this study was to identify the motivational factors that influence elementary school students' performance in the general science subject. Qualitative research design was used under interpretivism. The elementary school teachers of the Lahore district in Punjab, Pakistan, were the study's accessible population. To determine the motivational factors behind elementary school pupils' poor performance in general science, a purposeful sample of fifteen general science teachers was chosen for an interview. The study may have implications for how general science teachers can adapt activities that encourage motivation for learning to the nature and breadth of scientific subjects. To improve their students' enthusiasm to learn general science, science teachers can incorporate motivational activities that encourage learning during their lessons.

KEYWORDS Mindset, Motivation to Learn, Science Achievement

Introduction

The ability to be motivated is essential for pupils to succeed in a variety of academic subjects. When it comes to science education, eighth-grade children need to be motivated to learn especially because they are in a position where their academic performance and interest in science might have a big influence on their future employment and educational pathways. It is critical to comprehend the role that motivation plays in science education and how it affects eighth-grade students' science achievement (Ministry of Education, 2006).

The purpose of this study is to investigate the relationship between eighth-grade students' motivation for science learning and their scientific achievement. We will explore the factors that affect motivation, how motivation affects students' educational experiences, and doable tactics to improve motivation in scientific classes. By the time this conversation ends, we want to have made clear how important motivation is to eighth-grade students' performance in science (Rauf & Shahed, 2015).

Modern society is built on science education, which promotes critical thinking, problem-solving abilities, and technical breakthroughs. It gives students the information and abilities they need to comprehend the world, make wise decisions, and pursue jobs in a variety of scientific domains. As a result, a student's academic path must include science instruction, and the eighth grade is a crucial year in this regard (Iqbal et al., 2009).

The eighth grade is a critical year in a student's academic journey. It serves as a transitional year for students, the last year of middle school, and a link between elementary and high school. As children become ready for the demands of high school, this stage is characterized by increasing stakes, a more demanding curriculum, and elevated academic standards. Under these circumstances, scientific instruction becomes a crucial part of a student's academic record.

Students need to show that they are genuinely interested in science in order to succeed in the subject, in addition to being able to understand complex scientific topics. This is when motivation comes into play. Students that are motivated are more likely to participate fully in the learning process, persevere through difficulties, and reach greater comprehension and competency levels in science. In order to support their success and create a lifetime love of science, it is crucial to investigate the role that motivation plays in eighth-grade kids' scientific achievement (AEPAM,1999; Mirza & Hameed,1996; PEC,2018; PEC,2019).

Literature Review

A student's motivation to learn science is influenced by a number of things. These elements fall into two categories: extrinsic and intrinsic motivators.

a. Curiosity: Students' innate curiosity about the world around them can be a strong source of intrinsic motivation. Students that are curious are more inclined to go extensively into scientific material, investigate, and pose questions.

a. Personal Interest: Motivation might come from a sincere interest in science-related subjects or specific scientific fields. Students are more inclined to put in the time and effort to learn a subject if they are enthusiastic about it.

c. Self-Efficacy: One important internal motivator is students' confidence in their capacity to comprehend and excel in science. Students are more inclined to take on challenges and stick with something when they are confident in their scientific abilities.

d. Autonomy: Giving pupils a degree of independence during their education can increase their drive. Students are typically more engaged and motivated when they have some influence over what they learn and how they study it (Blackwell et al., 2007; Duckworth et al., 2007).

Grades and Rewards: According to Dweck et al. (2011), children may be encouraged to perform well in science by receiving external rewards like grades or teacher praise. One of the motivations for students to study and participate in the topic is the desire to receive recognition or good grades.

b. Peer Influence: A student's motivation can also be impacted by peer pressure and the need to blend in. Sometimes, when peers demonstrate an interest in science, it might inspire kids to do better in the subject.

c. Parental Expectations: A student's motivation can be greatly impacted by parental expectations and support. Parents that value and promote science education are more likely to instill motivation in their children to do well in the subject.

d. Future Objectives: Students may be inspired by the knowledge that a science degree may open up job options in the future. They might see science as a tool to help them reach their long-term objectives, which could include going into medical, engineering, or research careers. It is crucial to remember that these internal and external

variables interact in a complicated way to determine motivation. Extrinsic motivators can be beneficial if educators and parents employ them well, even if intrinsic motivation is typically thought to be more desired and sustainable for long-term learning.

The Impact of Motivation on Science Achievement

According to Buzzetto-Hollywood et al. (2019), eighth-grade students' science achievement is directly impacted by motivation. Academic performance and motivation have a dynamic relationship that has various important effects:

Enhanced Engagement: Pupils that are driven to study are more involved in their education. They actively engage in class discussions, pose inquiries, and look for further materials to help them comprehend scientific ideas more fully.

Increased Persistence: Students that are motivated are more likely to persevere in the face of difficulties. When faced with challenging subjects or obstacles, they are more inclined to persevere and ask for assistance when necessary.

Confront challenging material or face obstacles, and the Improved Memory and Comprehension: Students who are driven typically retain information better and understand scientific ideas more fully. They have a growth mentality when it comes to learning, thinking that they can get better over time (Burgoyne et al., 2018).

Good Emotional Health: Motivation cultivates a healthy emotional bond with science. Learning becomes more pleasurable and meaningful when students experience happiness and fulfillment in their scientific pursuits. This has a ripple impact on the students' general wellbeing.

Greater Achievement: One of motivation's most significant effects may be on academic performance. Pupils who are driven to learn science are more likely to score highly on tests, obtain better grades, and gain a deeper comprehension of the material.

Long-Term Interest in Science: Students who are driven in the eighth grade are more likely to become lifelong scientists. This curiosity may continue throughout high school and beyond, with the possibility of pursuing post-secondary education and employment in scientific domains (Kaufman, 2013).

Practical Strategies to Enhance Motivation in Science Education

According to Dweck (2010), parents and teachers can use a variety of techniques to encourage motivation in eighth-grade scientific instruction:

Establish a Helpful Learning Environment: Provide a setting in the classroom or at home where students may show their curiosity, feel free to ask questions, and make errors without worrying about being judged.

Connect Science to Practical Uses: Assist students in realizing the applications of science to their daily life. Show them the numerous sectors and professions that apply scientific concepts.

Encourage Inquiry-Based Learning: Encourage students to study and explore scientific concepts through projects, experiments, and practical activities to foster active learning.

Encourage a growth mindset in your kids by emphasizing that intelligence and aptitude for science are not fixed attributes. Promote a growth attitude in them, where they see themselves as capable of learning and development.

Give pupils some autonomy by letting them choose the subjects they study and the projects they work on. Motivation can rise when you give kids the freedom to take charge of their education.

Acknowledge and Reward Effort: Rather than concentrating just on final scores, recognize and commend pupils for their diligence, tenacity, and progress.

Include Technology: To make scientific instruction more dynamic and interesting, make use of digital tools and technology. Apps for schooling, simulations, and virtual labs can all improve motivation.

Link with genuine Scientists: Organize field trips, virtual conferences, or guest lectures as ways for students to engage with and gain knowledge from genuine scientists.

Make definite goals: Establish precise goals and objectives for learning and let students know what they need to know (Boaler, 2015; Dweck, 2010; MacNabb, 2006; Pawlina & Stanford, 2011).

Material and Methods

The research methodology employed in this study falls under the interpretivism typology, utilizing qualitative research methods. The population of interest for this study consisted of elementary school teachers in the metropolitan city of Lahore, located in the Punjab district of Pakistan. A purposive sampling technique was utilized to select fifteen (15) elementary school teachers who had a minimum of 10 years of teaching experience for the purpose of conducting interviews. To investigate the mindset and motivational factors contributing to low achievement in the subject of General Science among elementary school students, the researcher developed a semi-structured interview specifically designed for elementary school science teachers. This interview protocol was developed based on a comprehensive review of relevant literature. According to Irvine et al. (2013), face-to-face interaction is considered to be an essential component of semi-structured interviews. This form of interaction facilitates the establishment of rapport between the interviewer and interviewee, allowing for a more natural encounter. Such encounters are crucial for the successful execution of qualitative research.

Furthermore, conducting an in-person interview offered several advantages, such as the ability of the interviewer to effectively monitor responses and address any potential confusion that may arise during the dialogue (Irvine et al., 2013). Additionally, a team of researchers enhanced the face validity of the questions by incorporating multiple expert viewpoints. The researchers also sought the input of experts in STEM education to provide their valuable opinions.

The participants were provided with numerous opportunities for member checking, which involved a thorough process of revisions. The data and interpretations were carefully edited as well (Yüksel, P., & Yıldırım, S. 2015).

Data Analysis

The semi-structured interview aimed at acquiring insights from science teachers focused on six key concepts. These concepts encompassed the teachers' understanding of the importance of motivation in learning, their interpretation of self-efficacy, their

perspective on learning goal orientation, their perception of task value, their comprehension of self-regulation, and their interpretation of mindset. The objective of this study was to draw upon these concepts from existing literature to gain practical knowledge in identifying the underlying motivational factors contributing to low academic achievement in general science among elementary school students.

Results and Discussion

Science Teachers' quotes and their interpretations

The subsequent data analyses exemplify the three primary focal points of this interview. The initial focus was to ascertain whether elementary school teachers were already familiar with the essence and importance of motivation. The second focus was to ascertain from these teachers the principal factors contributing to students' average and below average performance in the subject of General Science, despite the teachers' awareness of motivation, if it existed.

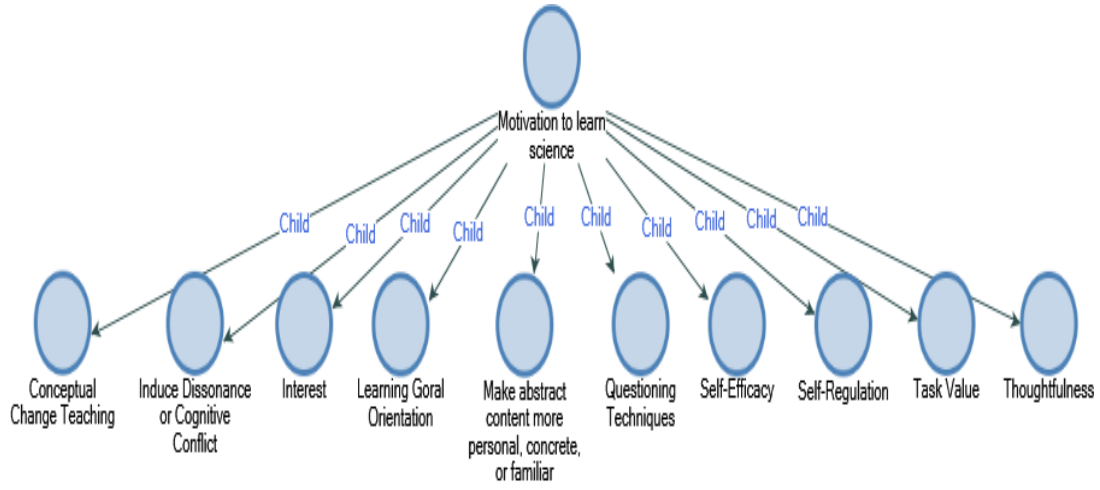

Figure 1 Causes of low achievement in terms of Motivation to learn General Science

Figure showed the parent and child themes regarding teachers' perception of nature and significance of Mmotivation to Learn.

Understanding of Terms

What is your present comprehension of the concepts 'Mindset' and 'Motivation to learn' within the realm of General Science? Do you believe that your pedagogical approaches and tactics effectively reinforce students in their 'Mindset' and 'Motivation to learn' during the process of acquiring knowledge in General Science disciplines?

I now have a better understanding of the concepts of Mindset, learning motivation, and their importance in teaching General Science subjects. Although I had previously learned these terms, I had never fully appreciated their significance in cognitive development. These non-cognitive activities are often overlooked, but they can have a significant impact on student learning if applied properly (Science teacher 1).

Although I may not have a clear understanding of the specific cognitive and non-cognitive strategies that fall under the umbrella of Motivation to learn and Mindset, I am familiar with what Mindset is. It is a mental attitude that encompasses every student's outlook on their future. I believe that motivation to learn stems from engaging in creative, freedom-providing and space-providing activities that allow students to showcase their potential. However, I must concede that such an approach is not feasible within our

current education system. As per the briefing you provided, this teaching system (Growth Mindset) requires students to receive separate training in brainology before commencing with the syllabus. Given the constraints we face in Pakistan, where we must adhere to a strict syllabus and have numerous classes each day, it can be challenging to find time for additional activities that promote innovation among our students *(Science teacher 4).*

Learning Goral Orientation

During the process of instruction, it is not uncommon for educators to encounter instances in which students exhibit signs of ennui toward a particular subject matter. It is imperative for students to comprehend the applicability of said material to everyday existence and to foster a pragmatic comprehension of its ramifications. How does one effectively navigate such a predicament?

The learning objectives of the lesson are what I refer to. They help me determine what and how to explain. Every teacher has an intuitive sense that anticipates students' learning problems. I use my intuitive sense to fill the learning gap of the students. I try to explain practical life to them through the examples of their life that are most common to their age (Science teacher 3).

While students may question the relevance of certain lessons to their real lives, we as teachers aim to provide practical knowledge by incorporating activities and real-life examples into our teaching. This approach is necessary given the limited time we have with each student. In my class, for example, each student receives forty minutes of instruction per class, and there are typically sixty students in attendance. In such a situation, it is essential that I present information in an embedded way to ensure that each student receives the attention they need? (Science teacher 5).

Induce Dissonance or Cognitive Conflict

The educators were inquired regarding the deficiency of focus on the behalf of the students studying General Science within the classroom. Occasionally, a student may encounter a subject matter that they believe they have already acquired some knowledge of. This instills a sense of excessive confidence within them, resulting in a lack of attentiveness towards the instructional material. How does one manage such a circumstance?

Occasionally, students attend classes having watched a YouTube tutorial or presentation on Scribd. With this limited understanding of the topic, they consider themselves experts, but I handle this situation in three ways. Firstly, I acknowledge their attempts and ask them some fundamental questions, which they are able to answer. Secondly, I draw their attention to areas related to the topic that they are unfamiliar with and provide them with challenges that they can solve with minimal effort. Finally, I offer them advanced knowledge and challenges that they can work on. This approach helps them understand the limitations of their knowledge and inspires them to come to class better prepared in the future (Science teacher 4)

I have noticed that students often lack understanding of the distinction between authentic and inauthentic material related to a topic. They tend to rely on sources that align with their interests, which can result in a narrow and misinformed foundation of knowledge. As their teacher, I believe it is crucial to guide their thinking by distinguishing between right and wrong. To do this, I begin by showing them a video presented by a well-known expert on the subject, followed by an interactive lecture that further reinforces the key concepts. This approach helps to clarify their understanding and provides a deeper and more accurate understanding of the topic. (Science teacher 9)

Conceptual Change Teaching

How can one effectively manage the misconceptions that students acquire based on their prior understanding of life? For example, the concept of food might lead them to misunderstand the true importance of photosynthesis, which is the process by which plants synthesize their own nutrients. They may mistakenly believe that external factors such as fertilizers are responsible for providing sustenance to plants.

Misconceptions can arise when students apply general knowledge to new information. To address this, I begin my lectures by discussing common misconceptions related to scientific facts. For example, I clarify that a cow has only one digestive system, not four. By correcting these misunderstandings early on, I ensure that students receive accurate information without delving too deeply into the topic. This saves us time (Science teacher).

My extensive experience in teaching General Science has provided me with an understanding of the types of questions that students might have regarding scientific misconceptions. To address these misconceptions, I begin by discussing them and eliminating any incorrect ideas. Then, I present the original concepts and encourage the students to refer to their course materials for further clarification. To save time, I use explanatory language that is similar to the students' linguistic backgrounds. This allows me to explain each concept quickly and ensure that I cover the course material within the allotted time (Science teacher 3).

Make abstract content more personal, concrete, or familiar

When you believe that students are struggling to grasp abstract ideas like motion, inertia, kinetic and potential energy, what do you do? How do you help your pupils understand those ideas more clearly?

One way to achieve this is by sharing experiences or stories that demonstrate how the content can be applied to the lives of individuals that your students find relatable or identifiable (Science Teacher 1).

Using concrete examples from real life experiences, such as a car and a bus travelling at the same speed but requiring different amounts of force and time to stop when the brakes are applied, can help make abstract concepts like momentum and inertia more understandable for students (Science teacher 4).

Using audio-visual aids to provide a practical demonstration to students is a simple and efficient method for explaining abstract concepts to students. These aids effectively engage the students and save time compared to traditional lectures (Science Teacher 6).

In situations like these, where you are forced to teach the material straight from the syllabus without providing any additional activities to help students understand, how would you design thought-provoking exercises and questions to help students see the world more broadly and from a smaller, more detailed picture in their minds?

The greatest strategy to help students make scientific information their own is to pose thought-provoking questions that encourage them to look for relevant instances of scientific principles in everyday situations. However, that necessitates a significant amount of classroom discussion time, which is not feasible given the structure of our schools. (Science teacher 2).

Asking them questions in a way that encourages them to investigate one notion separately from the others is, in my opinion, the greatest approach. Subsequently, the queries ought to elicit random concept instances. They learn best in this way. However, that requires more class time. (Science teacher 5).

I like to have students connect the scientific ideas to their everyday experiences so often that they start to link various life events to the knowledge they have gained in science. They get the best education possible in this way. But I rarely do this (Science teacher 6).

Questioning Techniques

How do you ask questions that are intended to help students become more adept at critical thinking?

Using the "you" strategy is the first thing I do. I indicate a pupil who I believe is qualified to respond to my query. He typically responds to my questions in a way that meets my expectations. I then pose the identical question to one of the class's weaker students. As time goes on, I continue to make the questions more challenging. In this approach, while at varying comprehension levels, almost all pupils acquire the concepts. But I don't have enough time for conversation to cover every topic in this manner (Science teacher 4).

Discussion

The aforementioned answers unequivocally demonstrate that almost all respondents had some prior knowledge of the ideas of mindset and learning motivation. The majority of them concurred that it is important to teach these ideas to general science students. However, almost everyone voiced their worry that, in order to pass the Matric board exam, which is the first test of academic proficiency, students must memorize and copy passages from guidebooks into their papers. Scholarships are awarded by colleges based on high percentages rather than on a student's inventiveness, mindset, or desire to learn. As a result, the introduction of such activities necessitates a modification to the matric test education system. The teachers' primary concern over the limited time allotted to covering the material was the third one. They thought that teaching brainology separately would be an additional burden. The teachers' final worry was using these exercises without a formal purpose. They believed that they could only teach growth mindset and inspire pupils to learn if these kinds of activities were included in the education policy (Blackwell et al., 2007).

You will still need to inspire pupils to understand the material covered in the curriculum, whether or not you employ motivational techniques or involve any sort of material reward to pique their interest in general science. As the classes are taught via various activities, this has to adopt strategies that help the teachers and students stay goal-oriented. Additionally, it requires the essential knowledge and abilities to be developed in a way that deepens students' comprehension of the material, validates their understanding, and encourages them to apply what they have learned to actual circumstances (Duckworth et al., 2007).

Learning objectives constantly give teachers and students a path forward. Teachers receive training on both what and how to teach. Pupils are aware of their final destination. Each lesson plan and exercise has certain objectives in mind.

It is easier for teachers to see how these activities and lessons relate to the goal objectives when they are aware of the learning objectives. Additionally, every lesson and the activities that go along with it help the teachers stay informed about both the larger study program and the specific portion that each lesson represents. Knowing a component of the whole gets easier when one is familiar with the whole. Teachers can organize and arrange the themes according to primary, secondary, and tertiary importance with the use of this expertise. The pupils are also guided by this. Every lesson's main ideas are simple for them to identify and concentrate on.

They are aware of their direction. They become aware of the importance and worth of what they are learning as a result. Since kids are aware that their goal is to achieve something in life rather than just impress their teachers, it enables them to keep track of their own progress. Understanding that they have goals in life to pursue, they work diligently on their assignments, seek clarification when needed, add significance to their work, and make a persistent effort to see results. They gain a thorough comprehension of the subject matter from this constancy, which also guarantees innovation. This strengthens their focus on learning objectives (Boaler, 2015).

To attain learning goal orientation, general science sample teachers from Pakistan appear to have used these tactics to some degree. However, due to the short lecture times, the policies of the academic institutions on the content of the syllabus, and the examination system's lack of assistance, they were unable to apply it all. They did, however, make an effort to include these tactics into their regular lectures. They had done as good as they could (MacNabb, 2006).

The sample teachers appear to think that a decent way to start a motivational conversation is to offer thoughtful questions that require additional reading. Additionally, it demonstrates how successfully the learner has formed the mindset that encourages him to learn more about the topic or subject. Thoughts among educators regarding the order, format, or style of questioning vary. There are many who argue that the teacher ought to present the questions to the class as a whole before inviting pupils to voluntarily respond. Some claim that the "you" method is the most effective; the teacher should rely on his own gut feeling and ask just the students who, in his opinion, are capable of responding. This is due to the fact that students at this point are already aware that their test system merely calls for cramming—rather than using an original strategy (Pawlina & Stanford, 2011).

Some people think that there are never enough enthusiastic readers in Pakistani classrooms. Because it can take more time to incorporate more students in a debate like this, just these kids should participate. Then there are those who believe that asking questions one-on-one is a waste of time since they are burdened with anything beyond the lesson-oriented activities. As a result, they just focus on the pertinent questions during the lecture and don't give the students' extra reading or self-efficacy any thought. Certain educators think that answering questions should be automated by having each pupil add to what the one before him has already said. Some educators believe that the most effective and efficient method is to simply post a challenge on the board and wait for the kids to react (Dweck, 2010).

Conclusion

Based on the study's findings, it can be said that instructors have a somewhat vivid understanding of mindset and learning motivation. The study's participants concurred that general science students must be exposed to activities that motivate them to learn. The overwhelming amount of material included in the syllabus makes it challenging for science teachers to implement the motivational activities that are separated from it in the classroom. The elementary school curriculum needs to be changed in order to incorporate these kinds of activities. Only when these are mandated by the education policy can teachers implement these activities. A range of learning activities and styles can be included in lesson plans, which can be organized around impactful concepts. The combination of the activity itself, its content base, and the way teachers introduce and scaffold it should address the value aspects of their students' motivation in multiple ways. Individual activities should be suitably challenging and scaffolded to address the expectancy aspects of students' motivation.

Recommendations

The study's suggestions are as follows, based on its findings and conclusion:

1. It is advised that motivating activities be incorporated by elementary school teachers into their General Science lessons, taking into account the nature and scope of scientific issues.

2. To help them achieve better results, elementary school pupils are advised to participate in motivational activities. Depending on the nature of the scientific issues, they can choose these activities.

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