शोधामृत

(कला, मानविकी और सामाजिक विज्ञान की सहकर्मी समीक्षित, मूल्यांकित, त्रैमासिक शोध पत्रिका)

ISSN : 3048-9296 (Online)
3049-2890 (Print)
IIFS Impact Factor-4.0
Vol.-3; issue-2 (April-June) 2026
Page No- 285-290
DOI : 10.71037/Shodhaamrit.v3i2.41

https://shodhaamrit.gyanvividha.com

Author's :

1. Rakesh Kumar Singh
(Research Scholar) Department of Education, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

2. Hemant Yadav
(Research Scholar) Department of Education, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

Corresponding Author :

Rakesh Kumar Singh
(Research Scholar) Department of Education, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

Influence of Scientific Interest on the Academic Achievement of Secondary School Students in Science : A Conceptual Research Paper

Abstract : Scientific interest plays an important role in students' engagement, motivation, and learning outcomes in science education. This conceptual research paper examines the influence of scientific interest on the academic achievement of secondary school students in science. Scientific interest refers to students' curiosity, enjoyment, enthusiasm, and willingness to engage with scientific concepts, activities, and experiences. The paper examines how scientific interest may influence achievement through attention, classroom participation, learning effort, persistence, motivation, and meaningful understanding of scientific concepts. It also considers the influence of individual, instructional, and environmental factors on the development of scientific interest. The proposed conceptual framework provides useful directions for teachers, researchers, curriculum developers, and policymakers seeking to strengthen science learning and academic achievement among secondary school students.

Keywords : Scientific Interest, Academic Achievement, Secondary School Students, Science Education, Science Motivation, Science Self-Efficacy, Science Identity, Inquiry-Based Learning.

Introduction : Science occupies a central position in modern education because scientific knowledge contributes to technological development, economic progress, health, environmental sustainability, and informed citizenship. At the secondary school level, students encounter increasingly specialized and abstract concepts in biology, chemistry, physics, environmental science, and related disciplines. The quality of science education during adolescence can influence students' future educational choices, career aspirations, participation in STEM fields, and ability to understand scientific issues throughout life.

Interest is particularly important because it influences how learners interact with academic content. Students who are interested in a subject may be more

willing to pay attention, ask questions, participate in activities, spend additional time learning, and persist when difficulties arise. Hidi and Renninger (2006) conceptualized interest as a developing relationship between a person and particular content. Their Four-Phase Model describes the progression from triggered situational interest to maintained situational interest, emerging individual interest, and well-developed individual interest. The relationship between scientific interest and academic achievement is important because achievement is a major outcome of formal science education. Existing research provides evidence of a positive association. Alhadabi (2021), using data from 14,815 high school students, examined science interest, science utility, self-efficacy, science identity, and science achievement and found positive relationships among these variables It may interact with self-efficacy, science identity, perceived usefulness, engagement, instructional practices, and classroom experiences. This conceptual paper therefore examines how scientific interest may influence science achievement and proposes a framework explaining the possible pathways between the two variables.

Background of the Study : Science education has traditionally emphasized cognitive outcomes such as knowledge, understanding, application, analysis, and problem solving. However, effective science education also involves affective outcomes. Students need not only to acquire scientific knowledge but also to develop curiosity, positive attitudes, confidence, and willingness to engage with scientific ideas. The importance of interest is particularly evident during adolescence. Secondary school students increasingly develop preferences for academic subjects and begin forming beliefs about whether they are capable of learning science. Some students develop the perception that they are "good at science," while others begin to distance themselves from science. Scientific interest may develop from many sources, including an engaging teacher, an exciting experiment, a scientific documentary, family influence, a scientific discovery, a real-world problem, or personal curiosity. When interest is supported through meaningful learning experiences, temporary curiosity may develop into more enduring interest.

Hidi and Renninger's (2006) Four-Phase Model is useful for explaining this process. In the first phase, an event captures students' attention. This developmental perspective suggests that students do not necessarily have to enter the classroom with strong scientific interest. Teachers and schools can create conditions that stimulate and strengthen interest. Scientific interest may also interact with students perceptions of competence. Students who enjoy science and experience success may develop stronger science self-efficacy, while repeated failure may weaken both confidence and interest.

Statement of the Problem : The central problem addressed in this conceptual paper is the-**Influence of scientific interest on the academic achievement of secondary school students in science.**

Objectives of the Study : The paper aims to:

1. Explain the concept of scientific interest among secondary school students.
2. Clarify the meaning of academic achievement in science.
3. Examine theoretical perspectives concerning the development of scientific interest.
4. Discuss the relationship between scientific interest and science achievement.
5. Identify possible mechanisms through which interest influences achievement.
6. Develop a conceptual framework linking scientific interest with science achievement.

Research Questions : The paper is guided by the following questions:

1. What is scientific interest among secondary school students?
2. What is academic achievement in science?
3. How does scientific interest develop?
4. What relationship exists between scientific interest and science achievement?
5. Through what mechanisms might scientific interest influence achievement?

6. What educational practices can strengthen students' scientific interest?

Conceptual Clarification of Scientific Interest : Scientific interest refers to students' tendency to find science enjoyable, meaningful, valuable, or intellectually stimulating and to willingly engage with scientific content and activities. It includes both affective and cognitive elements. The affective component involves enjoyment and positive feelings toward science, while the cognitive component includes curiosity, attention, questioning, and the desire to understand scientific ideas.

Students with strong scientific interest may enjoy science lessons, demonstrate curiosity about natural phenomena, ask questions, conduct experiments, read science-related materials, participate in science clubs, solve scientific problems, discuss science outside school, and consider science-related careers. Scientific interest differs from academic achievement. Achievement concerns what students know and can do, whereas interest concerns their relationship with the content.Hidi and Renninger (2006) emphasize that interest develops over time. Their model therefore provides a useful basis for understanding how temporary curiosity can become sustained individual interest among secondary school students.

Academic Achievement in Science : Academic achievement refers to the knowledge, understanding, skills, and competencies demonstrated by students following learning experiences. In science, achievement may involve recalling facts, explaining concepts, applying scientific principles, solving numerical and conceptual problems, interpreting data, analyzing evidence, conducting investigations, evaluating explanations, and drawing conclusions. Science achievement is commonly measured through examinations, standardized tests, classroom assessments, practical assessments, projects, or cumulative grades. For this paper, academic achievement refers broadly to students' demonstrated mastery of scientific knowledge and skills.

Interest and achievement should not be considered identical or deterministically related. A student may have high scientific interest but low achievement because of inadequate instruction, weak prior knowledge, or limited resources. Conversely, a student may achieve highly despite limited interest. Therefore, scientific interest should be viewed as one important contributor to achievement within a wider educational system.

Theoretical Framework :

There is Four-Phase Model of Interest Development

The principal theoretical foundation is Hidi and Renninger's (2006) Four-Phase Model.

Triggered Situational Interest: Interest begins when something captures the learner's attention. In science, a surprising experiment, unusual phenomenon, demonstration, or challenging question may trigger curiosity.

Maintained Situational Interest: Interest becomes sustained when learning experiences continue to provide meaningful engagement. Teacher support, collaboration, inquiry, practical activities, and relevant content can maintain students' attention.

Emerging Individual Interest: Students begin developing a more stable personal interest in particular areas of science. They may voluntarily seek scientific information or participate in science activities.

Well-Developed Individual Interest: Science becomes an enduring area of personal interest. Students may independently explore scientific topics, read scientific materials, participate in science-related activities, or consider science-related careers.

The model demonstrates that teachers and learning environments can play an important role in moving students from temporary curiosity toward enduring scientific interest.

Mechanisms Linking Interest and Achievement :

a) Attention and Engagement : Interest can direct students' attention toward relevant

learning materials. Students who are interested in science are more likely to concentrate on explanations, demonstrations, experiments, and problem-solving activities. Increased attention can support comprehension and retention.

Interest may also increase classroom engagement. Interested students are more likely to ask questions, participate in discussions, complete assignments, and engage in investigations. Greater engagement creates more opportunities for meaningful learning.

b) Effort and Persistence : Science learning often requires sustained effort. Students must practice, revise, solve problems, and work through difficult concepts. Scientific interest may make these activities more meaningful and encourage students to invest additional time and effort. Interest may also support persistence. Scientific investigations frequently involve mistakes, unexpected results, and challenging problems. Students who are genuinely interested may be more willing to continue investigating rather than giving up when difficulties arise.

c) Deep Learning : Scientific interest may promote deeper cognitive processing. Students who are interested in a concept may want to understand not only what happens but why it happens. They may make connections between concepts, generate questions, seek evidence, and apply knowledge to unfamiliar situations. Such processes can support conceptual understanding and higher-order

d) Empirical Evidence : Alhadabi (2021) provides particularly relevant evidence because the study focused on high school students. Using the High School Longitudinal Study of 2009, the research analyzed 14,815 students and examined science interest, utility, self-efficacy, identity, and achievement. The findings indicated positive relationships among these variables and suggested that science interest could contribute to achievement through motivational pathways involving self-efficacy and science identity. Mao et al. (2021) conducted a three-level meta-analysis involving 37 studies, 132 effect sizes, and 1,042,537 participants. The researchers found an overall positive relationship between attitudes toward science and science achievement, with an overall correlation of approximately .248. However, the strength of the relationship varied according to the specific attitude examined.

These findings support the broader proposition that students' affective relationships with science matter for achievement. At the same time, they demonstrate that scientific interest is only one component of a broader motivational system.

Conceptual Framework : The proposed framework identifies scientific interest as the principal independent variable and academic achievement in science as the dependent variable.

The framework proposes three main pathways:

Scientific Interest → Engagement → Science Achievement

Scientific Interest → Self-Efficacy → Science Achievement

Scientific Interest → Science Identity → Science Achievement

Teacher support, instructional methods, perceived usefulness, prior achievement, socioeconomic background, school resources, and classroom environment may strengthen or weaken these relationships.

Propositions of the Conceptual Study :

a) Scientific interest is positively associated with academic achievement in science.

b) Scientific interest is positively associated with students' engagement in science learning.

c) Science engagement is positively associated with academic achievement.

d) Scientific interest is positively associated with science self-efficacy.

e) Science self-efficacy is positively associated with science achievement.

f) Scientific interest is positively associated with science identity.

g) Science identity is positively associated with science achievement.

h) Engagement, self-efficacy, and science identity may partially mediate the relationship

between scientific interest and academic achievement.

Discussion : The conceptual analysis indicates that scientific interest may be an important contributor to students' science achievement. First, interest can increase attention by making scientific content more meaningful. Second, it can encourage engagement and effort, leading students to spend more time participating in learning activities. Third, interest may support persistence when students encounter difficult concepts or unsuccessful experiments. Interest may also influence achievement through self-efficacy. Students who enjoy science and experience successful learning may develop stronger beliefs in their abilities. These beliefs can encourage further effort and persistence.

Sustained interest may additionally contribute to science identity, helping students perceive themselves as capable science learners. However, scientific interest alone cannot guarantee high achievement. Students require appropriate instruction, adequate resources, prior knowledge, supportive teachers, and opportunities for active learning. The relationship may also be reciprocal. Students who achieve success in science may become more interested in the subject, while interest may simultaneously encourage achievement. Longitudinal studies are therefore necessary to establish the direction and development of these relationships.

Role of Teachers, Schools, and Parents : Science teachers have a central role in developing scientific interest. They can stimulate curiosity through meaningful questions, demonstrations, experiments, and real-world problems. Teachers can also connect science with health, technology, agriculture, environmental issues, sports, transportation, and careers. Providing students with choices in projects and investigations can strengthen ownership of learning. Constructive feedback can improve confidence and help students understand that mistakes are a normal part of scientific inquiry.

Schools can support interest by providing laboratories, learning materials, science clubs, fairs, exhibitions, competitions, projects, and educational visits. Interaction with scientists, engineers, doctors, and other STEM professionals can help students understand the relevance of science beyond examinations.

Parents can encourage children's scientific curiosity by supporting questions, reading, investigations, educational activities, and discussions about science.

Implications for Curriculum and Policy : Curriculum developers should consider both cognitive and affective dimensions of science education. Science curricula should include real-world problems, investigations, experiments, inquiry activities, environmental issues, technology applications, collaboration, open-ended questions, projects, and connections with careers. Educational policymakers should recognize that improving science achievement is not simply a matter of increasing instructional time or examination preparation. Teacher professional development should include inquiry-based instruction, practical science, project-based learning, formative assessment, and strategies for developing student interest. Investment in functional laboratories, digital resources, models, and practical materials is also necessary to create engaging science-learning environments.

Recommendations : Based on the conceptual analysis, the following recommendations are proposed:

1. Science teachers should use inquiry-based and activity-oriented teaching methods.
2. Practical experiments should be regularly incorporated into science instruction.
3. Scientific concepts should be connected with everyday experiences and future careers.
4. Students should be encouraged to ask questions and investigate scientific problems.
5. Schools should promote science clubs, fairs, projects, competitions, and exhibitions.
6. Teachers should strengthen science self-efficacy through supportive feedback and appropriately challenging activities.

7. Curriculum developers should reduce excessive dependence on memorization and emphasize investigation and application.

Conclusion : Scientific interest is an important factor that may contribute to the academic achievement of secondary school students in science. Students who are interested in science are more likely to pay attention, participate actively, invest effort, persist through difficulties, and engage deeply with scientific concepts. These behaviors can create favorable conditions for academic success.Hidi and Renninger's (2006) Four-Phase Model provides a useful theoretical explanation of how temporary curiosity can develop into enduring individual interest. The model also highlights the importance of supportive learning environments in maintaining and strengthening students' interest. Empirical evidence supports the broader relationship between science-related motivational factors and achievement. Alhadabi (2021) identified positive relationships among science interest, self-efficacy, science identity, and achievement among high school students.

Mao et al. (2021) similarly found an overall positive relationship between attitudes toward science and science achievement across a large body of research. Scientific interest should therefore not be regarded as a single or direct cause of achievement. Instead, it should be understood as part of a broader motivational system. Interest may encourage engagement; engagement may create opportunities for successful learning; successful learning may strengthen self-efficacy; and self-efficacy and sustained engagement may contribute to science identity and achievement. Ultimately, developing scientific interest may be an important educational strategy for improving students' relationship with science and supporting stronger academic outcomes.

However, meaningful improvement in science achievement requires a comprehensive approach that combines student interest with quality teaching, adequate resources, prior knowledge, supportive learning environments, and opportunities for active scientific engagement.

References :

1. 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. https://doi.org/10.3389/fpsyg.2021.634120.
2. Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. Annual Review of Psychology, 53, 109-132. https://doi.org/10.1146/annurev.psych.53.100901.135153.
3. Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. Educational Psychologist, 41(2), 111-127. https://doi.org/10.1207/S15326985EP4102_4.
4. Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. Science, 326(5958), 1410-1412.
5. Mao, Y., Cai, Z., He, X., Chen, X., & Fan, X. (2021). The relationship between attitude toward science and academic achievement in science: A three-level meta-analysis. Frontiers in Psychology, 12, 784068. https://doi.org/10.3389/fpsyg.2021.784068.
6. Renninger, K. A., & Hidi, S. (2016). The power of interest for motivation and engagement. Routledge.
7. Schiefele, U. (1991). Interest, learning, and motivation. Educational Psychologist, 26(3-4), 299-323.
8. Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. Developmental Psychology, 42(1), 70-83.
9. Stets, J. E., Brenner, P. S., Burke, P. J., & Serpe, R. T. (2017). The science identity and science achievement. Social Psychology Quarterly, 80(2), 121-139. https://doi.org/10.1177/0190272517708400.