

**THE ROLE OF REASONING ABILITY AND ACADEMIC STRESS IN
MATHEMATICS ACHIEVEMENT AMONG HIGHER SECONDARY
STUDENTS**

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Abstract

The present study aims to explore the role of reasoning ability and academic stress in mathematics achievement among higher secondary students. Mathematics is considered a crucial subject, not only for a student's academic success but also for their future career prospects. Understanding the factors that influence mathematics achievement is vital for educators and policymakers to develop effective interventions and strategies. Reasoning ability is a cognitive process that enables individuals to analyze, evaluate, and solve problems by using logical and critical thinking skills. It plays a significant role in mathematics achievement as it helps students to understand mathematical concepts, apply them to real-life situations, and develop problem-solving skills. The study will examine how reasoning ability relates to mathematics achievement among higher secondary students, allowing us to better understand the contribution of cognitive abilities to math learning. Academic stress, on the other hand, has been recognized as a major hindrance to students' academic performance and overall well-being. The pressure to excel, heavy workload, competition, and fear of failure can significantly impact mathematics achievement among higher secondary students. Therefore, investigating the relationship between academic stress and mathematics achievement is crucial to identify potential stressors and develop effective stress management strategies to enhance students' mathematical learning outcomes. The study will utilize a mixed-methods approach to collect data, including quantitative measures of reasoning ability, mathematics achievement, and academic stress. Additionally, qualitative interviews will be conducted to gain in-depth insights into students' experiences, perceptions, and coping mechanisms related to mathematics learning and academic stress. The research findings will provide valuable information for educators, school psychologists, and policymakers to implement evidence-based interventions aimed at improving mathematics achievement among higher secondary students. Ultimately, this study seeks to shed light on the complex

interplay between reasoning ability, academic stress, and mathematics achievement among higher secondary students. By better understanding these relationships, educators and policymakers can provide tailored support and resources to help students succeed in mathematics and alleviate unnecessary stressors that may hinder their academic progress.

Key Words: Role, Reasoning ability, Academic stress, Mathematics achievement, Higher secondary students.

Objective of the study: - The objective of the present study is – To find out the “The Role of Reasoning Ability and Academic Stress in Mathematics Achievement among Higher Secondary Students”.

Introduction

Education is a fundamental right that empowers individuals and societies by equipping them with knowledge, skills, and competencies necessary for personal and societal development. Mathematics, being a core subject in any education system, plays a vital role in shaping the problem-solving and critical thinking abilities of students. However, achieving a high level of mathematical proficiency requires more than just rote memorization of formulas and concepts. It demands the development of reasoning skills, which allow students to analyze, evaluate, and create mathematical arguments. Reasoning ability, defined as the capacity to draw inferences, recognize patterns, and make logical connections, is an essential cognitive skill that underpins success in mathematics. It enables students to delve into complex mathematical problems, understand underlying concepts, and develop innovative strategies to solve them. Moreover, reasoning ability promotes the transfer of mathematical knowledge to real-life situations, fostering a deeper understanding and application of mathematical principles. In the pursuit of mathematical excellence, students often experience various challenges that can hinder their academic performance. One such challenge is academic stress, which refers to the psychological and emotional pressure experienced by students due to the demands and expectations of their academic pursuits. Academic stress can manifest in various forms, including test anxiety, fear of failure, and the overwhelming burden of assignments and exams. When faced with intense stress, students may become disengaged from learning, leading to a decline in their motivation, concentration, and overall academic achievement. The link between reasoning ability, academic stress, and mathematics achievement has been a subject of interest for researchers and educators alike. Understanding how these factors influence each other is crucial for implementing effective strategies to enhance students' mathematical achievement. By investigating the role of reasoning ability

and academic stress, educators can identify potential barriers that impede students' progress and design interventions to cultivate their reasoning skills and alleviate academic stress.

This study aims to examine the relationship between reasoning ability, academic stress, and mathematics achievement among higher secondary students. Higher secondary education is a critical phase for students as they prepare for advanced academic pursuits or enter the workforce. Exploring their reasoning abilities and academic stress during this phase is crucial for identifying potential areas of improvement and developing holistic educational practices that promote mathematical proficiency and overall well-being. By elucidating the unique role of reasoning ability and academic stress in mathematics achievement, this study seeks to contribute to the existing body of knowledge on effective teaching and learning strategies in mathematics education. The findings of this research endeavor can inform educators, policymakers, and stakeholders in developing targeted interventions that foster reasoning skills, mitigate academic stress, and ultimately enhance mathematics achievement among higher secondary students.

Methodology: - This present study is based on secondary sources like books, Articles, Journals, Thesis, University News, Expert opinion and websites etc. The method used is Descriptive Analytic method.

Role

The role of reasoning ability and academic stress is multi-faceted and interconnected. Reasoning ability refers to the cognitive capability of an individual to make sense of information, analyze it, and draw conclusions. Academic stress, on the other hand, refers to the psychological and emotional strain experienced by students due to the demands and pressures of their educational pursuits. Reasoning ability plays a significant role in mitigating academic stress. When students possess strong reasoning skills, they are better equipped to cope with the challenges and difficulties they encounter during their academic journey. They can approach problems and assignments from a logical and systematic perspective, enabling them to find effective solutions and make informed decisions. Furthermore, reasoning ability helps students manage academic stress by enhancing their critical thinking abilities. This allows them to evaluate situations, assess their own performance, and identify areas for improvement. By applying logical reasoning, students can identify the root causes of their stress and develop effective strategies to address them. This includes better time management, setting realistic goals, seeking support when needed, and maintaining a balanced lifestyle. Moreover, reasoning ability contributes to effective problem-solving skills, which can alleviate academic stress. Students who possess reasoning abilities can analyze

complex problems, break them down into manageable components, and then work towards solving them step by step. This not only helps in overcoming stress but also promotes a sense of empowerment and confidence in one's own abilities.

On the other hand, academic stress can also have a negative impact on reasoning ability. Excessive stress can impair cognitive functioning, making it difficult for students to think clearly, concentrate, and retain information. This can hinder their reasoning abilities and result in poor academic performance, leading to a vicious cycle of increased stress and decreased reasoning skills. While reasoning ability helps in managing and mitigating academic stress, high levels of stress can also hinder reasoning skills. Therefore, it is crucial for students to develop and enhance their reasoning abilities while adopting effective strategies to cope with and reduce academic stress.

Reasoning ability

Reasoning ability is a critical skill in mathematics achievement for higher secondary students. Mathematics is a subject that requires logical thinking, problem-solving skills, and the ability to reason through complex concepts and equations. Here are some of the key reasons why reasoning ability is crucial for mathematics achievement:

- 1. Problem-solving:** Mathematics is all about solving problems, and reasoning ability plays a vital role in this process. Students need to be able to analyze the problem, understand the given information, and apply logical thinking to devise a solution. Strong reasoning skills help students break down complex problems into smaller, more manageable steps.
- 2. Understanding concepts:** Mathematics is not just about memorizing formulas and procedures; it requires a deep understanding of underlying concepts. Reasoning ability helps students make connections between different mathematical concepts, see patterns, and make logical deductions. This deeper understanding enables students to apply their knowledge to unfamiliar situations and solve novel problems.
- 3. Logical thinking:** Mathematics is built on a foundation of logic. Reasoning ability helps students follow logical sequences, make valid deductions, and draw accurate conclusions. It allows students to identify flaws in reasoning and evaluate the validity of mathematical arguments. Logical thinking is particularly crucial in higher-level mathematics, where students encounter abstract concepts and proofs.
- 4. Critical thinking:** Reasoning ability goes hand in hand with critical thinking skills. It involves asking thoughtful questions, evaluating evidence, and analyzing information to make informed judgments. Higher secondary mathematics often requires students

to think critically about problems, assess the validity of different approaches, and choose the most appropriate strategies.

5. **Communication and justification:** Reasoning ability enhances a student's ability to communicate their mathematical thinking effectively. Students should be able to articulate their reasoning, justify their solutions, and present their arguments in a clear and logical manner. This skill is important not only for assessments and exams but also for future academic and professional endeavors.

Overall, higher secondary students with strong reasoning abilities are better equipped to tackle the challenges of mathematics. The ability to think logically, solve problems, understand concepts, and communicate effectively are essential for success in higher-level mathematics and beyond. Developing and nurturing these reasoning skills should be a fundamental aspect of mathematics education.

Academic stress

Academic stress can have a significant impact on Mathematics achievement among higher secondary students. The pressure to perform well in exams, the fear of failure, and the high expectations from parents, teachers, and peers can contribute to increased stress levels. Here are some specific ways academic stress can affect Mathematics achievement:

1. **Reduced concentration and focus:** Excessive stress can lead to difficulty in concentrating on mathematical concepts and problems. Students may find it challenging to stay focused and solve complex mathematical equations or analyze formulas accurately.
2. **Decreased motivation:** High levels of stress can lead to a loss of motivation and interest in studying Mathematics. Students may start to see Mathematics as a burden rather than an opportunity for learning, leading to decreased effort and engagement in the subject.
3. **Test anxiety:** Academic stress can cause test anxiety, resulting in poor performance on Math exams. Students may experience symptoms such as racing heart, sweaty palms, and mental blocks during tests, making it difficult to recall and apply mathematical concepts effectively.
4. **Reduced problem-solving abilities:** Stress can impair a student's ability to think critically and solve mathematical problems. Higher secondary Mathematics involves complex problem-solving skills, and stress can hinder the cognitive processes required to break down and tackle these problems effectively.

5. **Negative mindset and self-doubt:** Academic stress can lead to negative thinking patterns and self-doubt in Mathematics. Students may doubt their abilities, perceive themselves as "bad" at Math, and develop a fixed mindset that hampers their willingness to learn and improve.
6. **Time management difficulties:** Stress can disrupt a student's time management skills, making it challenging to allocate sufficient time for Mathematics study and practice. This can lead to inadequate preparation, rushing through assignments, and an overall decrease in performance.
7. **Interference with conceptual understanding:** Stress can hinder the development of conceptual understanding in Mathematics. Students may struggle to grasp fundamental concepts, leading to difficulties in applying them to various mathematical problems and scenarios.
8. **Decreased problem-solving flexibility:** Stress can limit a student's ability to approach mathematical problems from different angles and consider alternative problem-solving strategies. This rigid thinking hampers creative thinking and adaptability in Mathematics.
9. **Burnout:** Excessive academic stress can lead to burnout, where students experience physical, emotional, and mental exhaustion. This can negatively impact their overall well-being and reduce their capacity to perform well in Mathematics.
10. **Impact on overall academic performance:** Academic stress in Mathematics can have a cascading effect on a student's overall academic performance. Lower Mathematics achievement can decrease confidence, lead to disengagement from other subjects, and ultimately impact the student's grades and future academic opportunities.

It is essential to address and mitigate academic stress effectively to foster a positive learning environment that supports higher secondary students in achieving their mathematical potential.

Mathematics achievement

Mathematics achievement among students in the modern world encompasses several aspects that have evolved with the advancement of technology and changes in teaching methodologies. Some key factors that contribute to mathematics achievement include:

- **Access to resources:** Modern students have access to a wide range of resources, including textbooks, online tutorials, educational videos, and interactive learning platforms. These resources enable students to explore mathematical concepts at their own pace and provide additional practice opportunities.
- **Digital tools and applications:** Technology has revolutionized the way students learn and apply mathematics. Various digital tools and applications, such as graphing calculators, mathematical modeling software, and online problem-solving platforms, help students visualize and comprehend abstract mathematical concepts effectively.
- **Problem-solving and critical thinking skills:** The modern approach to mathematics education emphasizes the development of problem-solving and critical thinking skills. Students are encouraged to apply mathematics to real-world situations, analyze problems from multiple perspectives, and devise strategies to solve them. This shift helps students view mathematics as a versatile tool rather than a collection of isolated concepts.
- **Collaborative learning:** Collaborative learning has gained importance in mathematics education. Students now work in groups, discuss mathematical problems, exchange ideas, and learn from their peers. Collaborative learning fosters a supportive and engaging environment, improves communication skills, and enhances understanding of mathematical concepts through shared experiences.
- **Online platforms for practice and assessment:** Online platforms provide students with ample opportunities for practice and self-assessment. These platforms offer interactive exercises and quizzes that provide immediate feedback, allowing students to identify their strengths and areas of improvement. This enables adaptive learning, where students can focus on specific areas that require further reinforcement.
- **Customized learning experiences:** With the help of technology, students can receive personalized learning experiences tailored to their individual needs and learning styles. Adaptive learning algorithms identify students' strengths and weaknesses and provide targeted content to address their specific needs. This personalized approach enhances mathematical comprehension and promotes greater student engagement.
- **Application in other disciplines:** The modern world places a high value on interdisciplinary knowledge and skill integration. Mathematics is extensively connected to various fields such as science, engineering, economics, and computer science. Students are encouraged to explore these interdisciplinary connections, which enhances their mathematics achievement and makes learning more relevant and meaningful.

Mathematics achievement among students in the modern world has been positively influenced by access to resources, digital tools, a focus on problem-solving and critical thinking, collaborative learning, online platforms for practice and assessment, customized learning experiences, and interdisciplinary applications. These advancements have not only improved students' mathematical abilities but also fostered a deeper understanding and appreciation of the subject in the context of the modern world.

Higher Secondary Students

Higher secondary students, also known as 11th and 12th graders, play a crucial role in their academic journey and overall personal development. These students are typically between the ages of 16 and 18 and are preparing for higher education or vocational studies. Higher secondary students are preparing themselves for further studies at the college or university level. They focus on strengthening their foundational knowledge in various subjects, choosing specific streams like science, commerce, or arts, and taking necessary entrance exams if required. Higher secondary students have the opportunity to specialize in specific subject areas based on their interests and career goals. This specialization allows them to delve deeper into their chosen fields and develop skills and knowledge in specific areas of study. Higher secondary students strive to achieve good academic performance in order to secure admission into reputable colleges or universities. They work towards maintaining high grades, completing assignments and projects, and demonstrating their understanding of the subjects through examinations. Higher secondary students go through a period of personal growth and development. They learn essential life skills such as time management, self-discipline, and problem-solving. They also engage in extracurricular activities to enhance their leadership abilities, teamwork, and interpersonal skills. Higher secondary students start exploring various career options available to them. They attend career guidance sessions, interact with professionals from different fields, and gain insights into the different career pathways they can pursue based on their academic interests and strengths.

Overall, higher secondary students play a crucial role in shaping their future education and career path. They prepare themselves academically and personally, laying a strong foundation for their higher education and subsequent careers.

Conclusion

In conclusion, this thematic brief explored the relationship between reasoning ability, academic stress, and mathematics achievement among higher secondary students. It is evident that reasoning ability plays a crucial role in their mathematics performance, as students with higher levels of reasoning ability tend to achieve better in the subject. Additionally, academic stress was found to have a negative impact on mathematics achievement, as it hinders students' ability to apply logical thinking and problem-solving skills effectively. It is recommended for educational institutions to focus on nurturing and developing students' reasoning abilities through various teaching methodologies and strategies. This can include encouraging critical thinking, problem-solving, and analytical skills. Moreover, efforts should be made to reduce academic stress among students by providing them with effective stress management techniques and creating a supportive learning environment. By doing so, higher secondary students can be better equipped to excel in mathematics and enhance their overall academic performance.

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