



The Interplay Between Mathematical Achievement And Interest In Students Struggling With Mathematics: An Exploration With Multimedia Approach

Ex. Senior Research Fellow, Dr. Pankaj Bala

(Department of Community Education and Disability Studies, P.U., Chandigarh)

ABSTRACT

In this current research, a novel and hands-on instructional technique rooted in the Multimedia Approach was employed. A sample of sixty fifth-grade students experiencing challenges in Mathematics was chosen at random to participate. The research design followed a One-Group Pretest-Posttest Experimental design. Data were collected using a Mathematical Achievement test and a Mathematical Interest Inventory. The data analysis employed Mean calculations, correlation assessments, and graphical depiction of correlations. The findings demonstrated a noteworthy and positive correlation between Mathematical Achievement and Mathematical Interest. Moreover, subsequent interventions based on the Multimedia Approach led to an amplification of the significant positive correlation.

Keywords: Mathematical Achievement (MA), Mathematical Interest (MI), Challenges in Mathematics, Multimedia Approach (MMA)

Introduction

Mathematics fosters within us a range of attributes, including the capacity for logical reasoning, abstract thought, creative problem-solving, and critical thinking. It also holds a pivotal role in comprehending various other disciplines such as science, social studies, music, and art. The process of learning Mathematics can be rendered more accessible and pleasurable through the integration of mathematical activities and games into our teaching techniques. Hence, for the current study, an inventive and activity-centered teaching approach founded on the Multimedia Approach was adopted.

Operational Definitions

- **Multimedia Approach:** The Multimedia Approach to teaching is a pedagogical method that integrates various forms of media and technology to enhance the learning experience. This approach utilizes a combination of visual, auditory, and interactive elements to deliver educational content in a more engaging and effective manner. The goal is to cater to different learning styles and preferences while promoting deeper understanding and retention of the subject matter. The use of multimedia tools can include videos,

animations, interactive simulations, graphics, audio recordings, and more. In the present study, teaching modules rooted in the Multimedia Approach were employed as the independent variable.

- **Mathematical Achievement:** The concept of achievement can be defined as "a measure of one's knowledge or proficiency in a specific subject or group of subjects," as noted by Charles (2001). Within the scope of this study, the term "Mathematical Achievement" refers to the acquisition of knowledge related to the topic of "Area and its Boundary." This was evaluated using a Mathematical Achievement Test, serving as the dependent variable.
- **Mathematical Interest:** Within this study, "Mathematical Interest" is taken as the dependent variable that signifies students' inclination toward engaging with and learning mathematics. This interest is reflected in their willingness to solve problems, engage in practice, and participate in mathematical activities during leisure time. The level of Mathematical Interest was assessed through a Mathematical Interest Inventory.
- **Challenges in Mathematics:** For the purposes of this study, students encountering challenges in mathematics were identified as those in the fifth grade who struggled with various aspects. These difficulties encompassed challenges in performing calculations, sequencing the steps of mathematical problems, experiencing fatigue during mathematical exercises, and encountering difficulty in comprehending mathematical problems. These challenges were indicative of students with challenges in Mathematics.

Review of literature

Clark and Mayer (2016): "e-Learning and the Science of Instruction" - This book offers a comprehensive exploration of multimedia principles for effective learning. Richard E. Mayer and Ruth Colvin Clark provide evidence-based guidelines for designing multimedia materials that optimize learning outcomes.

Singh and Gupta (2016): conducted a study on the effectiveness of multimedia approach in teaching science to secondary school students in India. The study found that multimedia approach significantly improved the students' achievement in science and helped develop a positive scientific attitude.

Mayer (2009): "Multimedia Learning" - In this book, Richard E. Mayer elaborates on cognitive theory and research related to multimedia learning. He outlines multimedia design principles to enhance comprehension and retention.

Höffler and Leutner (2007): "Instructional Animation versus Static Pictures: A Meta-Analysis" In this meta-analysis, Höffler and Leutner compare the effectiveness of instructional animations and static pictures. They find that well-designed animations can lead to better learning outcomes.

Rationale of the Study

The rationale of the study is rooted in the recognition of the multifaceted challenges faced by students who encounter difficulties in mathematics. Mathematics plays a foundational role in various academic disciplines and cognitive skills development. However, for some students, the struggle to comprehend mathematical concepts can lead to diminished interest and engagement in the subject. The study aims to address this issue by investigating the dynamic relationship between mathematical achievement and students' interest, particularly focusing on those who are struggling with mathematics. It seeks to examine whether the innovative use of a Multimedia Approach can positively influence both their mathematical achievement and their interest in the subject. The significance of this study lies in its potential to offer insights into effective pedagogical strategies for students who find mathematics challenging. By integrating multimedia elements such as visuals, animations,

and interactive simulations, the study intends to tap into diverse learning modalities, making the learning process more engaging and tailored to individual needs. The exploration of the impact of the Multimedia Approach on both achievement and interest aims to contribute to a more holistic understanding of its effects on struggling students.

Moreover, this study aims to shed light on the possible interconnectedness between achievement and interest. If the Multimedia Approach can enhance both of these aspects, it could potentially create a positive feedback loop, where increased achievement leads to heightened interest and vice versa. Such findings could have implications not only for mathematics education but also for educational practices across disciplines.

Objectives

- a) To examine the Mathematical Achievement in of fifth class students with challenges in mathematics.
- b) To examine the Mathematical Interest of fifth class students with challenges in mathematics.
- c) To study the relationship between Pre Mathematical Achievement and Mathematical Interest scores of fifth class students with challenges in mathematics.
- d) To study the relationship between Post Mathematical Achievement and Mathematical Interest scores of fifth class students with challenges in mathematics.

Hypothesis

H₀₁ There will be no relationship between Pre Mathematical Achievement and Mathematical Interest scores of fifth class students with challenges in mathematics.

H₀₂ There will be no relationship between Pre Mathematical Achievement and Mathematical Interest scores of fifth class students with challenges in mathematics.

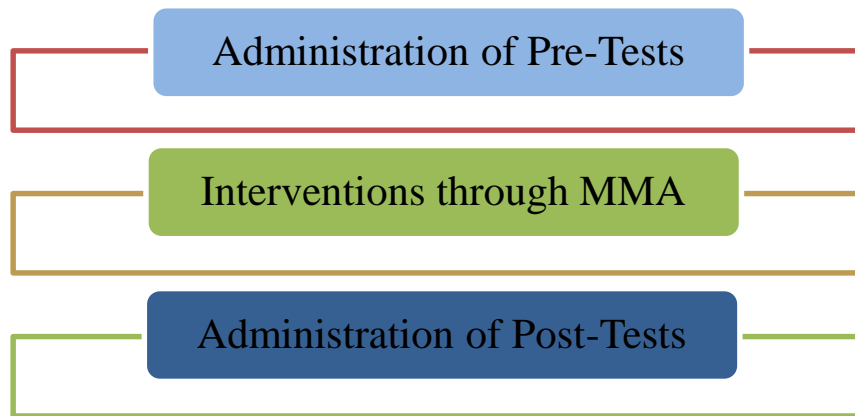
Delimitations

- The study was delimited to five Government model schools of Chandigarh.
- The study was delimited to 60 fifth class students with Challenges in mathematics.
- The study was delimited to four variables i.e. Multimedia Approach, Mathematical Achievement, Mathematical Interest, and Challenges in mathematics.

Methodology

In the present study one group pretest-posttest design was used, to find the relationship between Mathematical Achievement and Mathematical Interest of students with Challenges in mathematics due to Multimedia Approach Interventions.

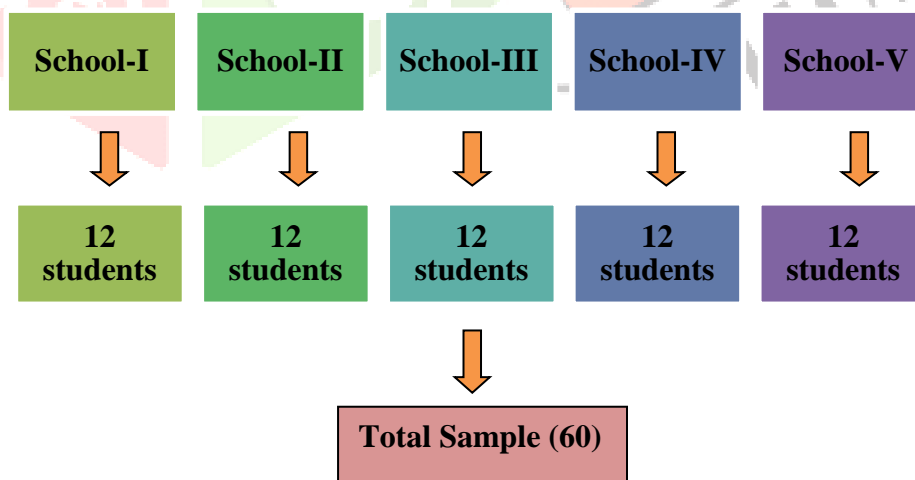
Design of the Study



Sample

The study's sample was deliberately chosen from five specifically selected Government Model schools located in Chandigarh. From each of these schools, 12 students from the fifth grade, who were facing challenges in mathematics, were randomly selected. This selection process yielded a total sample size of 60 fifth-grade students dealing with mathematical challenges. The identification of students facing challenges in mathematics was based on their mathematical academic records from the preceding two years, as well as input from teachers. The combination of these criteria aided in the selection of students who were experiencing difficulties in the subject. This approach ensured that the chosen participants truly represented the target group of students struggling with mathematics.

Division of Sample



Tools

- Mathematical Achievement Test (Post-MAT) developed by researcher.
- Mathematical Interest Inventory by L.N. Dubby adapted by researcher.
- Teacher Referral Form developed by researcher.
- Teaching Modules based on Multimedia Approach developed by researcher.

Data Collection

The researcher conducted field visits to five Government Model schools in Chandigarh in order to gather data from sixty fifth-grade students facing challenges in mathematics. To begin, the researcher established a rapport with both the students and teachers. Information regarding the students' previous two years of mathematical academic records was collected from the teachers. Subsequently, teacher referral forms were distributed to the teachers to aid in the identification and selection of students who were encountering challenges in mathematics. Following the initial steps, pre-tests were administered to assess the baseline knowledge of the students. The next phase involved providing interventions through the utilization of modules based on the Multimedia Learning Approach (MMA). These modules were designed to address the unique learning needs of the students struggling with mathematics. Lastly, post-tests were administered to evaluate the impact of the interventions and any improvements in the students' mathematical achievement.

Statistical Techniques

The study employed descriptive statistics, including measures such as mean, median, and standard deviation, to provide insights into the nature of the scores collected from the participants. Additionally, appropriate graphical representation techniques were utilized to visually present the data. Furthermore, the study utilized correlation analysis to explore the relationship between two key variables: Mathematical Achievement and Mathematical Interest of students facing challenges in mathematics. Correlation analysis allowed the researchers to quantify the strength and direction of the association between these variables.

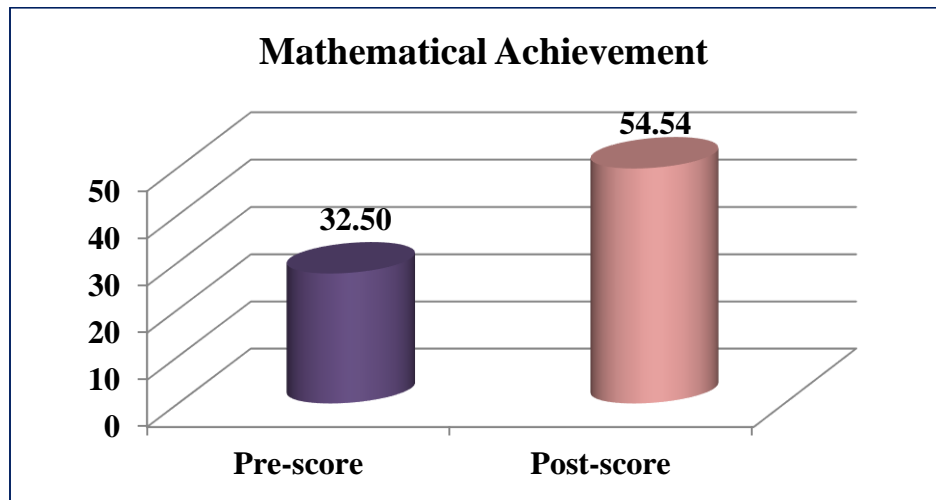
Results and Discussions

Objective (a) To examine the Mathematical Achievement in of fifth class students with mathematical difficulties.

Table-I Mathematical Achievement scores

Variable	Scores	Mean	Median	S.D.
Mathematical Achievement	Pre-test	32.50	31.33	3.75
	Post-test	54.54	52.51	2.25

Table-I shows the Pre (32.50) and Post (54.54) mean scores of Mathematical Achievement. Table-I presents the Median and standard deviation values for both pre and post-test scores of Mathematical Achievement. The proximity of the Median value to the mean suggests that the data followed a normal distribution.

Figure-I Mean scores of Mathematical Achievement

The difference in pre (32.50) and post (54.54) Mathematical Achievement scores is clearly visible with the help Figure-I.

Objective (b) To examine the Mathematical Interest in of fifth class students with mathematical difficulties.

Table-II Mathematical Interest scores

Variable	Scores	Mean	Median	S.D.
Mathematical Interest	Pre-test	12.85	11.00	2.54
	Post-test	22.54	20.25	3.34

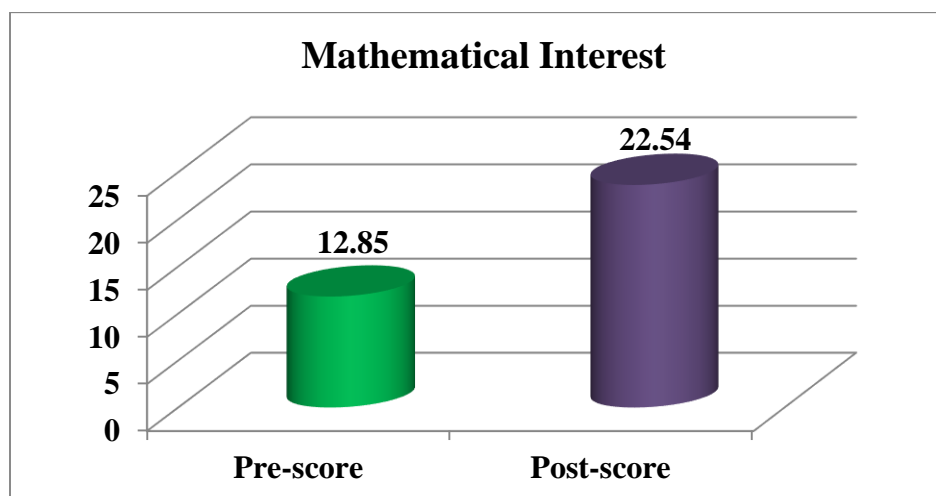
Figure-II Mean scores of Mathematical Interest

Table-II represents the Pre (12.85) and Post (22.54) mean scores of Mathematical Interest. Table-I provides the Mean, Median and standard deviation values for both pre and post-test scores of Mathematical Interest. The close alignment of the Median value with the Mean value indicates a normal distribution of the data.

In Figure-II the difference between pre (12.85) and post (22.54) Mathematical Interest scores is distinctly noticeable

Objective (c) To study the relationship between Pre Mathematical Achievement and Mathematical Interest scores of fifth class students with mathematical difficulties.

Table-III Relationship between Mathematical Achievement and Mathematical Interest before MMA Interventions

Scores	Variable	Mean	'r' value	'p'-value
Pre-scores	Achievement in Mathematics	32.50	0.344	0.005**
	Mathematical Interest	12.85		

There was positive and significant relationship at 0.01 level ($p < 0.01$) before MMA

Figure-III Relationship between Achievement and Interest before Interventions

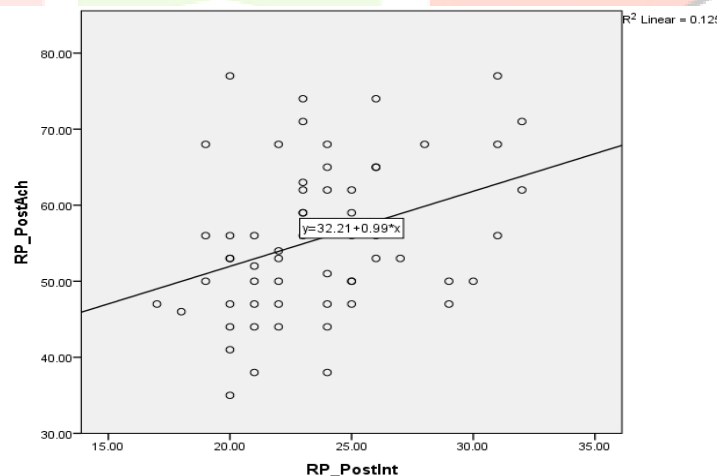


Table-III exhibits the relationship between pre-test scores of Mathematical Achievement and Mathematical Interest before using Multimedia Approach interventions and the correlation is shown in Figure-III.

The correlation between Mathematical Achievement and Mathematical Interest before Multimedia Approach interventions was calculated as 0.344. The respective p-value was 0.005 which showed the positive and significant correlation between the variables at 0.01 level of significance, which means Achievement in Mathematics and Mathematical Interest scores, has a positive correlation.

Hence, H_{01} “There will be no relationship between Pre Mathematical Achievement and Mathematical Interest scores of fifth class students with mathematical difficulties” stands rejected.

Objective (d) To study the relationship between Post Mathematical Achievement and Mathematical Interest scores of fifth class students with mathematical difficulties.

Table-IV Relationship between Mathematical Achievement and Mathematical Interest after MMA Interventions

Scores	Variable	Mean	‘r’ value	‘p’-value
Post-scores	Achievement in Mathematics	54.54	0.457	0.000**
	Mathematical Interest	22.54		

There was positive and significant relationship at 0.01 level ($p < 0.01$) after MMA

Figure-IV Relationship between Achievement and Interest after Interventions

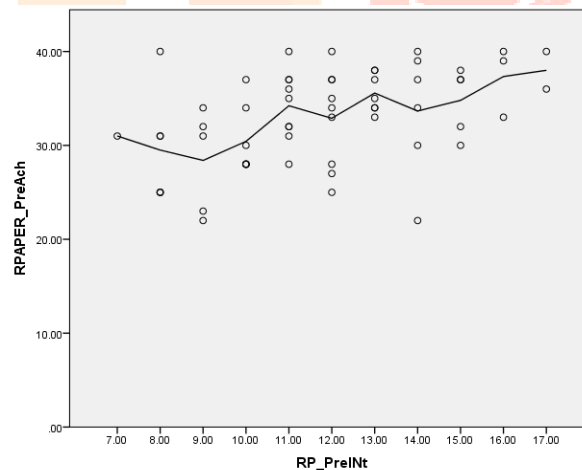


Table-IV exhibits the relationship between pre-test scores of Mathematical Achievement and Mathematical Interest before using Multimedia Approach interventions and the correlation is shown in Figure-IV.

The correlation between Mathematical Achievement and Mathematical Interest before Multimedia Approach interventions was calculated as 0.457. The respective p-value was 0.000 which showed the positive and significant correlation between the variables at 0.05 level of significance, which means Achievement in Mathematics and Mathematical Interest scores has a positive correlation.

Hence, H_{02} “There will be no relationship between Post Mathematical Achievement and Mathematical Interest scores of fifth class students with mathematical difficulties” stands rejected. This disclosed that Achievement in Mathematics and Mathematical Interest positively affects each other. This result might be due to MMA interventions which makes learning realistic and interesting. Further this helps in arousing the Mathematical interest among students and when students learn with interest they score better.

The following are the main findings of the study:

- The Mathematical Achievement of students with Mathematical difficulties enhanced after Multimedia Approach Interventions.
- More Interest in Mathematics aroused in students after getting Multimedia Approach Interventions.
- Mathematical Achievement and Mathematical Interest were positively correlated.

The following are the main findings of the study:**Educational Implications**

The study holds several important educational implications that can significantly impact both teaching practices and curriculum development.

- The findings of this study can guide educators in designing instructional materials and strategies that cater to the unique needs of students struggling with mathematics.
- The study's exploration of the interplay between mathematical achievement and interest has the potential to encourage educators to use multimedia-rich content to enhance students' engagement and interest in mathematics.
- The study's insights can be particularly beneficial for students with diverse learning styles and needs. Educators can use the multimedia approach to differentiate instruction, ensuring that struggling students receive content in various formats that suit their learning preferences and abilities.
- By demonstrating that the Multimedia Approach positively influences both achievement and interest, this study encourages educators to foster positive attitudes toward mathematics.
- Creating a positive learning environment that leverages multimedia tools can contribute to the development of students' self-confidence and resilience in approaching mathematical challenges.
- The study underscores the importance of educators' proficiency in using multimedia tools effectively. Teacher professional development programs can be designed to equip instructors with the skills and strategies required to integrate multimedia elements into their teaching practices.
- The study's implications extend to curriculum designers, who can consider incorporating multimedia resources and activities to make mathematical content more relatable and engaging.
- This approach could potentially impact the design of textbooks, digital resources, and lesson plans.

In conclusion, the educational implications of this study underscore the potential of the Multimedia Approach to transform the teaching and learning experience for students struggling with mathematics. By fostering both achievement and interest, this approach has the power to reshape students' attitudes, enhance their skills, and ultimately contribute to their overall academic success. However, it's important to note that while the Multimedia Approach offers numerous advantages, its successful implementation requires careful consideration of factors such as technology availability, content quality, pedagogical design, and alignment with learning objectives. Additionally, the role of the teacher in guiding and facilitating the learning process remains crucial even in multimedia-rich environments.

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