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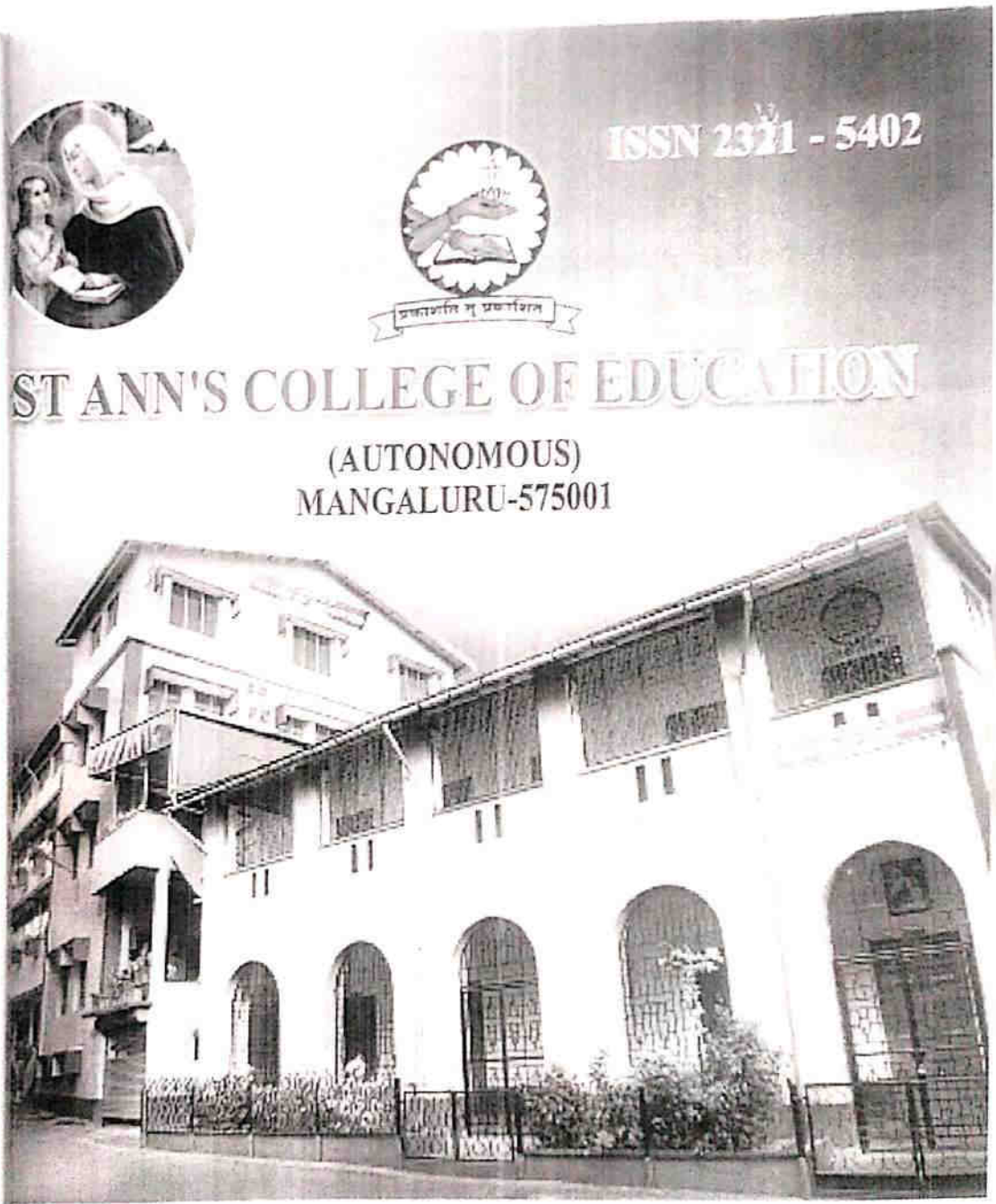

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CONTENTS

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IMPORTANCE AND USES OF ICT IN THE TEACHING LEARNING SCENARIO

Karthik P. S*
Dr Praveena K. B**

Abstract

John Dewey 1916, States that, Education is a social process - " A process of living & not a preparation for future living". India is in a transition phase with respect to Education, Science & Technology etc. in the 21st century. Life has got entangled with technology. The technological innovations have paved way for new ways of learning, evolution & growth. The digital literacy& culture has influence the way of people live, work, play & learn. Individuals with lack of computer skills or digital culture are in a handicapped situation. UNESCO has made integrating ICT into education as a part of its efforts to ensure equity & access to education. This paper explains the common educational applications of ICT which comprises of usage of computer based learning with laptops, tablets, class-room learning with interactive smart board, E-readers, flipped class-rooms, usage of internet, video-conferencing, etc. It also sheds light on SAKSHAT - a one stop educational portal, the ministry of human resource development, need & importance of ICT, its advantages & disadvantages for the today's generation.

Key Words: Computer, Internet, smart board, video-conferencing, "SAKSHAT".

Introduction

Education is a process of inviting truth and possibility, of encouraging and giving time to discovery. It is as John Dewey (1916) put it, a social process – 'a process of living and not a preparation for future living'. In this view educators look to act with people rather than them. Their task is to educe, to bring out or develop potential. Such education is:

- *Deliberate and hopeful.* It is learning we set out to make happen in the belief that people can 'bemore';
- *Informed, respectful and wise.* A process of inviting truth and possibility
- *Grounded in a desire that at all may flourish and share in life.* It is a cooperative and inclusive activity that looks to help people to live their lives as well as they can.

Importance of education in India comes from the very roots of our history. India is a country that has had scholars in each field. The very culture of our country relies heavily upon a sound education system which has always helped in producing the best minds, which are today spread across the globe. As time passes by, changes take place and this is precisely the case study of even Indian way of education. Today, India is in a transition phase where education is no exception. In order to maintain a strong balance during the time of changes, it is imperative that institutions come out with innovations. Modern Teaching Methodology Education system in our country is provided by the government as well as private bodies. And as we have stepped more towards globalised

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environment, technology has started to play a crucial role towards simplifying the education system, where private institutions are gaining momentum. Going back a bit in time, we used to have blackboards and chalks for classrooms, whereas today, things have changed. White boards, markers, projectors, screens and presentations are the tools of the modern day education. The young ones today, begin learning right at the age of 4/5 by fiddling with their parents' smart phones and tablets. The findings observed make it clear that digital education is indeed a revolution both inside and outside the classroom. The internet has something for everyone, making every mindset of any age satisfactory and every solution to a problem clear.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO), a division of the United Nations, has made integrating ICT into education part of its efforts to ensure equity and access to education. The following, taken directly from a UNESCO publication on educational ICT, explains the organization's position on the initiative. Information and Communication Technology can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration. UNESCO takes a holistic and comprehensive approach to promoting ICT in education. Access, inclusion and quality are among the main challenges they can address. The Organization's Intersectral Platform for ICT in education focuses on these issues through the joint work of three of its sectors: Communication & Information, Education and Science. Information and communication technology (ICT) can complement, enrich and transform education for the better. As the lead United Nations Organization for education, UNESCO guides international efforts to help countries understand the role such technology can play to accelerate progress toward Sustainable Development Goal 4 (SDG4), a vision captured in the Qingdao Declaration.

UNESCO shares knowledge about the many ways technology can facilitate universal access to education, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improve education administration and governance. The Organization scans the world for evidence of successful ICT in education practices, whether in low-resource primary schools, universities in high-income countries, or vocational centres – to formulate policy guidance. Through capacity-building activities, technical advice, publications, fieldworks, and international conferences such as the International Conference on Artificial Intelligence and Education and Mobile LearningWeek, and fieldwork, UNESCO helps governments and other stakeholders leverage technology for learning. Computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, impacting the construction and distribution of knowledge and power [illegible]. Graduates who are less

familiar with digital culture are increasingly at a disadvantage in the national and global economy. Digital literacy - the skills of searching for, discerning, and producing information, as well as the critical use of new media for full participation in society has thus become an important consideration for curriculum frameworks.

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of tele communications and computers, as well as necessary enterprise software, middleware, storage, and audio-visual systems, that enable users to access, store, transmit, and manipulate information.

The term *ICT* is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution, and management. ICT is an umbrella term that includes any communication device, encompassing radio, television, cell phones, computer and network hardware, satellite systems and so on, as well as the various services and appliance with them such as video conferencing and distance learning.

ICT is a broad subject and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. Theoretical differences between interpersonal-communication technologies and mass-communication technologies have been identified by the philosopher Piyush Mathur.

Importance & Uses of ICT in the teaching learning

Computer-based learning: Computer-based learning is one of the modules of school communication tool that helps students to enhance their learning skills through computer aided education. It imparts computer knowledge in students and enables them to obtain large amounts of information from various websites. After two decades of introducing computers to schools, education has been revolutionized ever since then. It reduces time spent on mechanical tasks such as rewriting, producing graphs and increases the scope of searching. It not only helps in finding information but also in organizing information making it easier to share with others.

- **One laptop per child:** Less expensive laptops have been designed for use in school on a 1:1 basis with features like lower power consumption, a low cost operating system, and special re- programming and mesh network functions. Despite efforts to reduce costs, however, providing one laptop per child may be too costly for some developing countries.
- **Tablets:** Tablets are small personal computers with a touch screen, allowing input without a keyboard or mouse. Inexpensive learning software

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can be downloaded into tablets, making them a versatile tool for learning. The most effective apps develop higher order thinking skills and provide creative and individualized options for students to express their understandings.

Classroom Learning: With the introduction of ICT in education, classroom learning is one attribute that makes learning experiential and experimental to students. Students can listen to the instructor or teacher, receive visual cues through Powerpoint images, handouts or whiteboard lists and participate actively. This helps in immediate interaction and students have opportunities to ask questions and participate in live discussions. This school communication software module further benefits in building and maintaining personal and professional relationships as classrooms offer greater personal contact with other students and teachers.

- **Interactive White Boards or Smart Boards:** Interactive white boards allow projected computer images to be displayed, manipulated, dragged, clicked, or copied. Simultaneously, handwritten notes can be taken on the board and saved for later use. Interactive white boards are associated with whole-class instruction rather than student-centred activities. Student engagement is generally higher when ICT is available for student use throughout the classroom.
- **E-readers:** E-readers are electronic devices that can hold hundreds of books in digital form, and they are increasingly utilized in the delivery of reading material. Students-both skilled readers and not so skilled readers. Those have positive responses to the use of e-readers for independent reading. Features of e-readers that can contribute to positive use include their portability and long battery life, response to text, and the ability to define unknown words. Additionally, many classic book titles are available for free in e-book form.
- **Flipped Classrooms:** The Flipped Classroom model, involving lecture and practice at home via computer-guided instruction and interactive learning activities in class, can allow for an expanded curriculum. Student perceptions about Flipped Classrooms are mixed, but generally positive, as they prefer the cooperative learning activities in class over lecture.
- **Internet:** Internet tools like Email, social networks, newsgroups and video transmission have connected the world and made it global village . Students can now communicate using emails and social networking groups that provide knowledge based information. Distance learning, online learning is also enabled through the internet. Students can learn online and also talk to experts online. Notes, readings, tutorials, assignments can be received by students from anywhere. The Internet provides major information in texts, audios, videos and graphics which can be

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accessed by the individual. Online learning allows students to interact with each other and faculty to interact with students.

- Video Conferencing: This is yet another medium of communication wherein students can communicate with other students or instructors online. It enables students to become active participants in their own learning. Video Conferencing is a powerful communication tool that has the potential to change the way we deliver information to students. It is just one of the today's integrative technologies that empower students to prepare for a betterfuture.

ICT in Educational Portal

Realising the importance of Information and Communication Technology (ICT) the Ministry of Human Resource Development as per the Mission Document, ICT is the tool in education available to enhance the current enrolment rate in Higher Education, at present 15 percent to 30 percent by the end of the 11th Plan period.

The Ministry also launched a web portal named "SAKSHAT" a 'One Stop Education Portal'. The high quality e-content once developed will be uploaded on SAKSHAT in all disciplines and subjects. Several projects are in the completion stage and are expected to change the way teaching and learning is done in India.The case in point is the project, "Developing suitable pedagogical methods for various classes, intellectual calibres and research in e-learning," anchored by IIT Kharagpur. Faculties from all the IITs and several NITs are participating in this curriculum development project.

The National Mission on Education through Information and Communication Technology (ICT) has, under its aegis, created Virtual Labs, Open Source and Access Tools,Virtual Conference Tools, Talk to Teacher programs, a Non-Invasive Blood Glucometer and also for simulated lab experiments, a Di. Electric frequency shift application development of resonator for low cost oscillators. The National Mission on Education through Information and Communication Technology (ICT) has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in providing high quality personalized and interactive knowledge modules over the internet/ intranet for all the learners in Higher Education Institutions in any time any where mode. This is expected to be a major intervention in enhancing the Gross Enrolment Ratio (GER) in Higher Education by 5 percentage points during the XI Five Year Plan period and in ensuring access and equity in Higher Education.

The Mission has two major components content generation and connectivity along with provision for access devices for institutions and learners. It seeks to bridge the digital divide, i.e., the gap in the skills to use computing devices for the purpose of teaching and learning among urban and rural teachers/learners in Higher Education domain and empower those, who have hitherto remained untouched by

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the digital revolution and have not been able to join the mainstream of the knowledge economy. It plans to focus on appropriate pedagogy for e-learning, providing facility of performing experiments through virtual laboratories, on-line testing and certification, on-line availability of teachers to guide and mentor learners, utilization of available Education Satellite (EduSAT) and Direct to Home (DTH) platforms, training and empowerment of teachers to effectively use the new method of teaching learning. On the one hand, the Mission would create high quality e-content for the target groups and on the other, it would simultaneously seek to extend computer infrastructure and connectivity to over 18000 colleges in the country including each of the departments of nearly 400 universities/deemed universities and institutions of national importance. The peer group assisted content development would utilise the Wikipedia type of collaborative platform under the supervision of a content advisory committee responsible for vetting the content. Interactivity and problem solving approach would be addressed through "Talk to a Teacher" segment.

Characteristics that make ICT in education a prominent teaching/ communication tool.

- variety of services can be accessed
- reliable and provides interactive learning experiences.
- Very flexible and provides comfortable learning.
- motivates and creates interest among students to learn.
- facilitates communication and promotes creativity.
- provides access to the digital library where information can be retrieved and stored beyond textbooks.

Advantages of ICT in Education

Every way of our life is affected by information and communication technology. We were searching for the advanced way of learning and teaching. ICT has made it easier for us. The new technologies have given us the modern ways of learning and teaching.There are lots of advantages of information and communication technology. Let us discuss some advantages:

Learn from Internet

Nowadays, if a student learns his lesson from internet, he will search it on the internet. He will get the tons of result. From there he can easily solve his problem.

Read e-books

There are lots of ebooks on the internet. You will find many ebooks on every topic on the internet. Just go to the browser and search which topic you want to know.

No need for the library

A student can read any types of books without going to any library. So you can have a cup of tea on your hand and get the book from online and read it on your tablet, phone or computer.

Social Media is the storehouse of knowledge

Nowadays people spend more and

more time on social media than study. But there are lots of opportunities to use social media in a proper way. It will help the students and they will learn out of traditional ways. YouTube has created channels where they teach several students.

Multimedia classes

Multimedia classes are more interesting than the traditional way of teaching. A student can easily understand any topic when he will practically observe the topic properly. A teacher can easily describe the topic by using a computer and a projector. So the effectiveness of ICT in the education sector is much higher than a lot of things.

- Enhanced group collaboration made possible via ICT.
- New educational approaches can be used.
- It can provide speedy dissemination of education to target disadvantaged groups.
- It offers the combination of education while balancing family and worklife.
- It enhances the international dimension of educational services.

Conclusion

ICT is a broad subject and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. Its variety of services that can be accessed, reliable and provides interactive learning experiences, very flexible and provides comfortable learning, motivates and creates interest among students to learn, facilitates communication and promotes creativity, provides access to the digital library where information can be retrieved and stored beyond textbooks. Realising the importance of Information and Communication Technology (ICT) the Ministry of Human Resource Development as per the Mission Document, ICT is the tool in education available to enhance the current enrolment rate in Higher Education, at present 15 percent to 30 percent by the end of the 11th Plan period.The Ministry also launched a web portal named SAKSHATH a 'One Stop Education Portal'. There are many interesting ways of teaching using ICT, if we make the best use of it, then the advantages dominate the disadvantages.

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3.2.1 Research papers/articles published by Dr. Leela. K.S

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1	Challenges & Issues of Teacher education in India	Dr. Leela. K.S	6th International Multidisciplinary Conference on "Educational Development and social welfare"	27th January 2018	-	-
2	"Improving teacher student interaction in the English medium classroom-An action research report"	Dr. Leela. K.S	IJRASET	Volume 9 Issue VIII August 2021	ISSN No.2321-9653	Paper ID IJRASET37206

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Dr. LEELA.K.S
Assistant Professor, Sarada Vilas Teachers College, Mysore

has presented the paper on

The Challenges And Issues Of Teacher Education In India

in one-day International Multidisciplinary Conference on "**Educational Development and Social Welfare**" jointly organised by St. Philomena First Grade College, Hassan, India, Oriental Research Institute, University of Mysore, State Planning Board, Naresuan University and Development Research Foundation, Mysore, India on 27th January 2018 at St. Philomena First Grade College, Hassan, Karnataka, India and we appreciate your active participation in the Conference.

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Conference Director *Organising Secretary* *Principal & Chairperson Conference Organising Committee*

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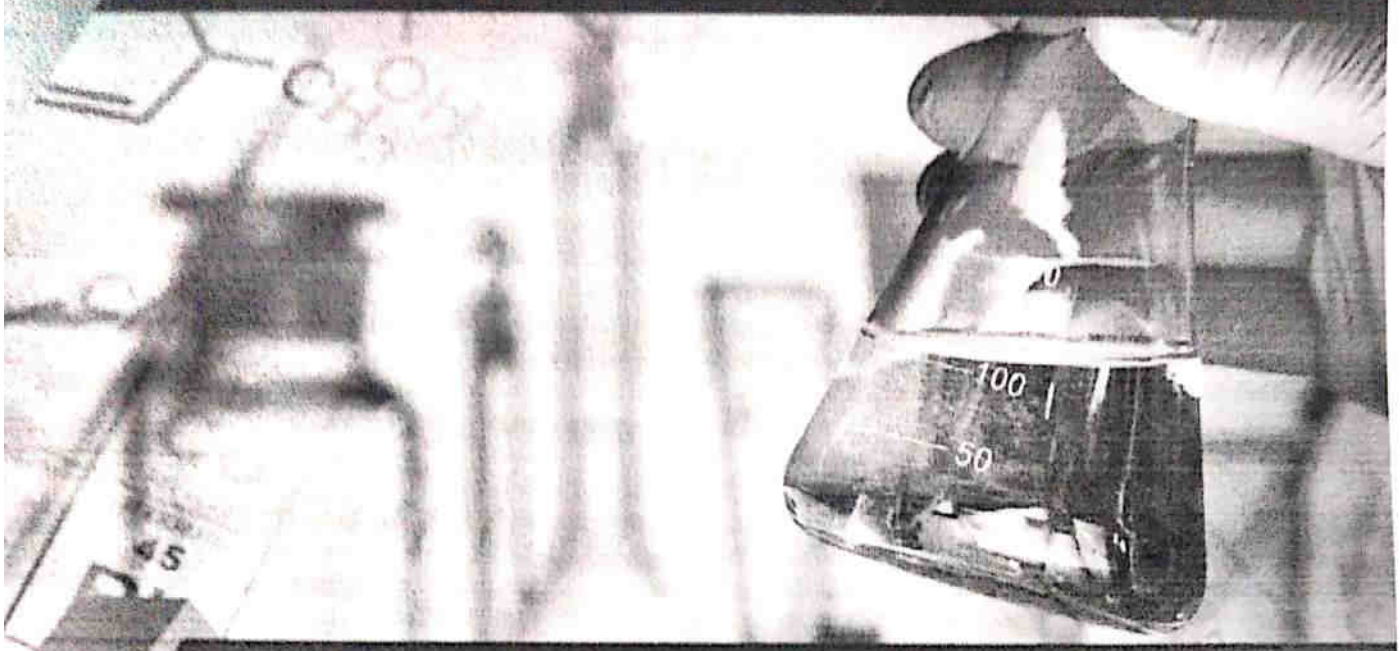

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Improving Teacher-Student Interaction in the English Classroom: An Action Research Report

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[1]Principal, Sarada Vilas Teachers College, Mysuru, Karnataka India
[2]Gopalaswamy High School, Mysuru

Abstract: ***It is a common scene in many of the secondary school classrooms where a teacher does not encounter a participatory class. Especially in English classrooms students find it tough to converse fluently in English and this is a great inhibitory factor for the teacher to bring out her fullest efficiency. The present study aims to bridge this gap by making students feel comfortable and less inhibited inside classroom. This study aims to develop a congenial environment by instilling confidence by interactive methods and thus making students respond more in classroom. The student teacher who taught carried this out efficiently and was patient enough to deal with various nuances of learning .She was adept enough to steer with the learning variations of students and motivate them. This study establishes the fact that the manoeuvring ability of teacher makes a difference in the classroom. The untiring enthusiasm of pupil teacher was the key factor in successful interactive session.***

I. INTRODUCTION

A common problem for English teachers in India is dealing with a passive class, where students with regional language as their mother tongue are unresponsive and avoid interaction with the teacher. This is particularly obvious when an teacher looks for communication in an instructional class discourse, like posing inquiries to the class overall, expecting no less than one student to react. This can be a disappointing interaction for them both- student and teacher. Clearly, there will be times when no student can respond to a teacher's inquiry, however regularly students don't answer regardless of whether they comprehend the inquiry, know the appropriate response and can deliver the appropriate response. Moreover, students can frequently be exceptionally hesitant to give criticism or ask the teacher an inquiry before the class. An undesirable distance is kept up with by pupils in light of their failure to react uninhibitedly. This action research project endeavoured to investigate this issue and looked to make a more intuitive instructor class exchange in English students of eighth class.

II. ACTION RESEARCH DEFINED

Action research is worried about attempting to working on one explicit point in a teacher's procedure in a specific classroom utilizing experimental estimation. Teacher-initiated classroom research looks forward to expand the teacher's comprehension of classroom instruction and learning and to achieve enhancement in study hall rehearses. Action research typically involves small-scale investigative project in the teacher's own classrooms. This normally incorporates having an observer gather information and with the teacher fostering an activity intend to achieve the ideal change, follow up on the arrangement, and afterward notice the impact of the arrangement in the study hall.

III. CLASS DESCRIPTION

The class noticed was a gathering of 23 sophomores at a private organization by name "Gopalaswamy High School". The objective of this particular class is to show the understudies fundamental English discussion, perusing, talking, tuning in and composing abilities. It is also to teach the students basic English conversation, reading, speaking, listening and writing skills. Their English ability level ranged from upper beginner to intermediate. During the observation period, the students appeared motivated and attentive, and they seemed to be enjoying the class.

IV. PROBLEM IDENTIFICATION

The students, as a class, didn't react wiiliingly to the educator's inquiries and didn't take part in class conversations. Students usually never asked the instructor inquiries outside one-on-one circumstances. Subsequently the instructor got minimal oral criticism. As per the educator, the majority of the students sat gazing directly ahead utilizing negligible looks, motions and verbal expressions. What she needed was for the students to be more illustrative, expressive and all the more obviously open in their dynamic collaboration. She needed the students to pose inquiries, offer remarks and to react with gestures and shakes of the head, with hints of arrangement or hints of comprehension and furthermore, she needed them to be both responsive and proactive and display plain conduct which made her showing more cognisant.

V. PRELIMINARY INVESTIGATION

It was seen that the student teacher's class during the main seven day stretch of the training in-instructing, in the initial 45 minutes, the class went through a moderate level interaction/participation. Students were reluctant to talk- later they communicated that they couldn't settle on the right selection of words. The understudies initially tuned in with their books close, on the other hand with the books open. Then, they did a correspondence practice comprising of 25 short sentences dependent on the discourse. The student teacher then, at that point discussed the sociolinguistic and sentence structure points of the activity and proceeded to test for comprehension. At the point when student teacher posed inquiries to assess their understanding they liked to stay quiet and lethargic. This constructed a bridge in their further advancement and hindered their open propensities.

The student teacher posed a couple of different inquiries which additionally drew no reaction or response from the students The understudies then, at that point needed to respond to certain inquiries regarding the discussion in their book. A large portion of the understudies appeared to experience little difficulty doing this, and in case there were any inquiries, they promptly asked the understudy sitting close to them.

The second 50% of the class was committed to match work utilizing the expressions and jargon from the discourse. The student appeared to partake in this, and generally attempted to make their own discourse. The educator strolled about the room keeping an eye on the advancement of each pair. The class environment was extraordinarily not quite the same as the primary portion of the class, with gab and incidental chuckling filling the air. The understudies addressed a large portion of the educator's inquiries with cheerful readiness, and some even posed their own inquiries.

VI. HYPOTHESIS

Since the students appeared for the most part to comprehend the educator's inquiries, it was felt that there was something different that held the understudies back from reacting intentionally in the class-instructor exchanges. Since most understudies are educated to tune in and not to scrutinize an educator in class, they have almost no involvement with 'in-class' connection with the instructor, like addressing or remarking or giving criticism. Understudies are generally educated to be peaceful and deferentially pay attention to the teacher.

By showing the students that class cooperation with the English teacher isn't just worthy, yet ordinary, helpful and advantageous, it was accepted that the students would turn out to be more intelligent with the pupil teacher's class collaboration.

VII. PLAN INTERVENTION

Following the speculation, two stages were taken to execute the arrangement:

First, on the accompanying class, the instructor clarified about "rules" for posing inquiries in class in English. The instructor made an activity out of it and made students recite the passage for all to hear to the class and clarified a couple of troublesome words and invested extra energy developing the content. The "rules" were extrapolated from a cultural point were as per the following:

The unique "rules" about how students should act in the homeroom. In certain subjects, students are required to tune in and just the educator should talk in class. Be that as it may, in English class, it is acceptable and imperative to respond to the educator's inquiries and ponder with inquiries of their own. It implies that you are intrigued and focusing. In English, it is your obligation to pose inquiries in the event that you don't comprehend.

The educator proceeded to say that in the event that they actually felt awkward posing and noting inquiries, they needed to essentially gesture or shake their head as a reaction to the instructor's inquiries.

Secondly, the instructor helped the understudies to remember the "rules" toward the start of each resulting class and further urged them to turn out to be more dynamic in the class when the educator was talking.

Students were motivated at each stage with praises and oral rewards such that they felt a high level of energy and confidence to participate and interact with each other Students who were actively interacting felt motivated and even those who were not interactive also felt involved. This paved a smooth way for a highly encouraging atmosphere and majority of them felt energised and this reduced their hesitation level.

VIII. OUTCOME

In the fourth seven day stretch of the training in instructing, the class was noticed once more in a keen manner. An exercise like the past one was introduced. Toward the start, the understudy educator helped the class to remember the "rules." The educator started discussing the discourse, making syntax, use and sociolinguistic focuses, sprinkled with inquiries concerning the section and the teacher's clarifications. This continued for around twenty minutes and included general appreciation check questions, for example, 'do you comprehend?' and 'are you OK?' just as explicit inquiries regarding the exchange.

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Concerning comprehension questions, the greater part of the students gestured accordingly and a couple of addressed 'yes' to these inquiries. Also, it was accepted that they did, truth be told, comprehend.

With the particular inquiries, notwithstanding, something sudden occurred. At the point when the educator posed an inquiry, he was typically welcomed with poker-confronted gazes, as in the past. Be that as it may, when he drew nearer, took a gander at an understudy, or pair of understudies, and rehashed the inquiry, the understudies normally attempted to reply. By and large, I noticed, the understudy instructor was giving significantly more consideration to the understudies, drawing nearer to them, and taking a gander at explicit understudies and attempting to make a superior association with them. Rather than posing inquiries with the inclination that they truly wouldn't have been addressed at any rate, as in the past, the educator put forth a more noteworthy attempt to convey the inquiries, and went about as though she expected to get reactions.

Likewise, close to the furthest limit of the educator's discussion on the exchange, two understudies, without inciting from the instructor, posed inquiries before the class. Albeit the inquiries were not related straightforwardly to the discourse, the way that the inquiries were posed before the whole class was viewed as a forward leap.

IX. CONCLUSION

There were a few regions where the consequences of this activity research were not as effective as trusted. For example, the students should have been provoked with eye to eye connection and a rehashed question from the instructor to address an inquiry, and when they didn't get something, they actually didn't intrude on the educator with an inquiry.

But some advancement was unquestionably made, particularly when the concise range between perceptions is thought of. The understudies associated with the educator by gesturing, some responded to the instructor's inquiries, and two, on their own introduction, even posed inquiries before the class. The unexpected symptom of the educator turning out to be more worried about the connection was an unforeseen pleasure and added to the improvement. There appears to have been some achievement in educating and reminding and afterward anticipating that the students should turn out to be more intelligent with the instructor.

X. REFLECTION

This action research project constrained both the instructor and the eyewitness to recall that English educators are showing a language additionally a culture, and this incorporates training the sociolinguistics.

An extra justification is the interest in this issue tended to here was the conviction that this was a typical issue. Teachers, frequently become disappointed with an absence of introductory achievement in getting an intelligent exchange with the class. This frequently drives them to botch an absence of knowledge of an absence of interest, and to instruct inside the understudies' socially moulded homeroom assumptions, rather than presenting the assumptions normally found in intuitive study halls in English While meaning to be more obliging to students, they are neglecting to give understudies a helpful sociolinguistic expertise, which understudies would almost certainly need and determine advantage. Some may think empowering the utilization of this understudy instructor connection normal in local English talking districts is socially presumptuous. However, in case it is presented in a touchy and sensible way, it really adds to a seriously satisfying English class. All things considered, most students don't read English only for etymological skill. They will likewise need to foster sociolinguistic capability for conveying in various circumstances in English talking nations, and this incorporates the homeroom.

A. List of Enclosures

1) 25 short sentences for dictation.
2) A story involving dialogues
3) Grammar items

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A Study on Environmental Behavior and General Mental Ability among Secondary School Students

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Abstract: The Environmental Behavior is the extent of which the individuals and adolescents are motivated to act or behave in a desirable way. The Environmental behavior is the specific and has a direction it is the what the individuals and adolescents intend to do in relation to the present environment and in saving it and it is particularly significant with environmental issues believed to be both major and imminent. Such as climate to reduce any one time or change resulting from global warming. The history of environmental education reveals a close connection between changing concerns about the environment and its associated problems and the way in which environment. Environmental quality strongly depends on human behavior patterns. In this context, the main purpose of the study was to examine the Environmental Behavior and General mental ability among secondary school students. The study also aimed to find out the correlation between the variables. The study has been carried on students of 9th standard in schools of Mysore city. The sample for the study consisted of 60 male and female students and data was collected by using tools, viz, RPM (Raven's standard progressive matrices) used to measure the level of General mental ability of the students. Environmental Behavior Scale to measure the level of Environmental Behavior among secondary school students. The result shown that, Majority (48.33%) of Secondary school students possess moderate level of General mental ability. It is also seen that only 25% and 26.66% of the Secondary school students possess low and high level of general mental ability respectively, majority (50%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 23.33% and 26.66% of the Secondary school students possess low and high level of Environmental Behaviour respectively, there is a significant difference between the Environmental Behaviour of male and female secondary school students, there is no significant difference between the general mental ability of male and female secondary school students, a Positive significant correlation is found between General Mental ability and Environmental Behaviour.

Keywords: Environmental Behaviour, General Mental Ability, Descriptive Survey Method.

Article History

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I. Introduction:

The consequence that human activities on the Environment is, becoming more important. By human activities are damaging surroundings and risks the lives of next generations. At this point there is no denying the fact that Environment is changing. Few studies were shown that this is happened and its effects on life around us. Anyhow many may be unaware of the specific issues that have led to these changes. Main present Environmental problems may consists of atmospheric conditions change, pollution, and environmental degradation. Environmental Behaviour includes adopting positive mindsets and aiming to reduce any negative effects on natural environment. Environmental education is a process that allow adolescents to analyze environmental problems and engage in solving problems of environment and take responsible decisions and develop positive Behaviour towards the environment and show pro Environmental behaviour require to have the general mental ability. Hence it is related to study the General Mental ability and its association with their environmental behavior. Environmental issues are dangerous effects on human activity on the biophysical environment. Protection of environment is a practice of protecting the Environment on the individual, in groups or government levels for the advantages of both the environment and humans. Environmental problems are harmful effects of the human activity on the physical environment. The quality of the environment is strongly depends on the Behaviour of the of the human patterns. Humans should overview the contribution and potential of environmental psychology for understanding and induces the pro environmental Behaviour. Human handle their environment will have an impact on the quality of life style of human itself .Loss of human Behaviour that affect on the environment causing global environmental destruction . Pro environmental Behaviour encourages children and people today to change their Behaviour in an effort to reduce the negative action on the environment. "Environmental Education as a continuous learning process that leads to an informed and involved citizenry having the innovative problem solving skills, scientific and social literacy, Ethical awareness and sensitivity

for the relationship between humans and the environment and commitment to engage in responsible individual and co-operative actions. By these, actions environmentally Educates the citizens will help to ensure an ecologically and economically stable Environment."-The Wisconsin Environmental Education Board.

2. Need and Importance of the study:

The way humans treat and manage their environment will have an impact on the quality of human life itself. lack of human behavior that is not cares about the environment, causing global environmental damage. It encourages people today change their behavior in an effort to reduce the negative effects of environmental damage. Environmental Behaviour is the extent of which the individuals are motivated to act or behave in the desirable way. It is specific and has a direction. Environmental Behaviour are what the individual intend to do in relation to the present environment and in saving it. The influence environmental destruction on modern life has been a globally critical problem. Industrialized countries deplete the environment by insatiable consumption of resources and excess production of garbage. Population growth in many developing countries puts damaging pressure on the planet. Therefore , I f individual want to manage earth must make environmentally educated to develop environment friendly Behaviour is any action of individual or group directed towards the remediation of environmental issues. Environmental education provides great opportunities for students to become engaged in the real-world problems that transcend classroom walls. They can, see the relevance of their classroom studies to complex environmental issues confronting our planet and they can obtain the skills they will need to be creative problem solvers and powerful advocates - MS. Campbell, and superintendent of San Mateo country schools.

Crush the indoor habit: Environmental education offers measures to the blocked-in lives of present generation, which is the preliminary to grow up indoors. Children who experience protecting the environment is the responsibility of everyone, hence environmental education cannot be confined to one group or society. Each individual must be ready for saving the environment. It must be a continuous and lifelong process. Above that environmental education must be practical so that teaching can be implemented directly. Preserving nature and environment will be much uncomplicated, if students were taught about deterioration of resources, pollution of environment, land sliding, depletion and extinction of plants and animals. The influence of Environmental destruction on modern life has been globally critical problems

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industrialized countries deplete the environment by insatiable consumption of waste Growth of population in many developing countries puts damaging pressure on the planet. Therefore if human wants to maintain earth, human must make people environmentally educated to develop environmentally friendly Behaviour. Environmentally friendly Behavior is any action of human directed towards the remediation of Environmental problems. Environmental education is a sort of investment that turns into a valuable asset over a period of time. Universities in India focus on teaching research and training in more than 20 universities different colleges and institutional courses in environmental engineering, conservation and manage environment, environmental health and social science are taught.

The ultimate goal of most studies on Environmental Behaviour is to provided information that can be Helpful in development positive Environmental impact of human activities and development of Pro environmental Behaviour like motivate adolescents to use low energy light bulbs, don't waste water, buy local fruits and vegetables which are not transfer by four wheelers, while shopping use own bags instead of plastic bags provided by super market.

To increase awareness of environment across the country the centre for environmental education (CEE) has been established in August 1984 with the help of the Ministry of Environment and Forests, Government of India. One of the duty the CEE is to put efforts to give due identification to the role of environmental Education. The CEE runs many educational programmes in this regard. Students must be encouraged to understand their surroundings and a framework for an action plan must be formulated. The environment is the need of the day. It must encourage social participation. Hence in a curriculum is a wise option to connect students with nature right from their childhood.

The environment is one of the very significant components for individuals. Interactions between human and environment that occur continuously would influence human behavior on the environment. Human mindset and behavior will determine the good condition of an environment the way human treat and protect their environment will have an impact on the quality of human life itself. In the lights of above, the researcher felt that it is essential to investigate the study on Environmental Behavior and General Mental Ability among secondary school students.

3. Operational definition of the key terms used in the study:

3.1 Environmental Behaviour: It is the means and ways by which student's reaction to different situations and are intentionally planned to facilitate with regard to Environment. It is

the extent to which the students are inspired to act or behave in a desirable way. It is specific and directional. Environmental Behavior is what the student intend to do in relation to conserve the environment and to solve environmental issues. Example:-Switch off the light when not in use, watering the plants and close a running tap etc. It is the extent to which the students are motivated to act or behave in a desirable way. It is specific and has a direction. Environmental Behavior is what the students intend to do in relation to the present Environment and in saving it.

3.2 Pro Environmental Behaviour: Pro-Environmental Behaviour is conscious search to reduce the negative impact of one's actions on nature and build world. It is an effort to reduce the negative environmental impacts caused by human activities. It depicts behaviour that minimizes negative reactions of the students towards the environment to develop positive reaction towards the environment like plant saplings, cleaning the school campus etc. Environmental quality strongly depends on students Behaviour pattern. The pro- Environmental behaviour is behaviour that a student mindfully selects in order to reduce the negative influence on the Environment.

3.3 Environmental Education: Environmental Education should be interdisciplinary and examine main Environmental problems from local, national and international point of view. It should use various educational methods to teach and learn about and from the Environment with stress on practical activities and firsthand experience. It is through this process of education that individual can be sharpened about Environmental issues. NCERT in India has been playing critical role in developing the curriculum of Environmental Education. It has specify that good Environmental Education at school stage of Education is not transformation of information and knowledge but it is all about developing Environmental sensitivity and awareness and Behavior by going out in nature and integrating outdoor Knowledge with classroom Environment. If this be the high ideal of Environmental Education then it is need to find out what is happening in classroom of our schools. Environmental Education is a processes that allow students to explore Environmental problems engage in problem solving and take action to improve the Environment. As a consequence students develop deeper understanding of Environmental issues and develop the skills to make informed and responsible decisions.

3.4 General mental ability: General mental ability is a word used to explain the degree at which an individual learns, understands instructions, solve problems. It is also called General intelligence is a construct developed in psychometric discoveries of cognitive abilities and

human intelligence. It is a variable that sum up positive correlation between different mental tasks reflecting the fact that an individual performance on one type of mental task tend to be comfortable to that person act on other kinds as cognitive tasks. The g factor targets a specific computes of general intelligence. The existence of the g factor was originally proposed by the psychologist Charles Spearman in the early years of the 20th century. He saw that student's performance ratings across seemingly unrelated in school subjects, were positively correlated and reasoned that these correlations reflected the influence of an underlying general mental ability that move into show on all types of mental tests.

3.5 Dimensions of Environmental Behavior: The following dimensions of environmental behaviour are considered in this study: Cognition, feeling, emotion, attitude, thinking, motivation, perception, attention, social knowledge, action related knowledge, Environmental concern, willingness to act Environmentally. If a student has to benefit from the environmental education provided in school and imbibe the environmental values and exhibit pro-environmental behavior he needs to posses the required mental ability. Hence it is relevant to study his general mental ability and its association with their Environmental Behavior.

4. Methodology:

Statement of the Problem:

The statement of the problem is "A study on Environmental Behaviour and General Mental ability among secondary school students"

5. Objectives of the study:

The following were the objectives of the study:

1) To study the level of Environmental Behaviour among secondary school students.
2) To study the level of General mental ability among secondary school students.
3) To examine whether there is significant difference between Environmental Behaviour of female and male secondary school students.
4) To examine whether there is significant difference between General mental ability of female and male secondary school students.
5) To examine whether there is a significant relationship between Environmental Behaviour and General mental ability of secondary school students.

6. Hypotheses of the study:

The following hypotheses were formulated in pursuance of the objectives of the study

1) There is no significant difference between the Environmental Behaviour of male and female secondary school students.

2) There is no significant difference between the General mental ability of male and female secondary school students.

3) There is no significant relationship between the Environmental Behaviour and General mental ability of secondary school students.

7. Variables of the study:

Following are the variables of the study:

Main Variables:

Environmental Behaviour

General mental ability

Background Variable: Gender.

8. Method of the study:

Descriptive Survey method was adopted for the study.

9. Sample of the study:

Random sampling technique has been adopted for selecting the sample of secondary schools of city of Mysore. Further 60 male and female students were selected through cluster sampling technique.

10. Tools used for collection of data:

The following tools have been used for the study and are shown in the table No.1.

Sl. No.	Variables	Tools used	Standardized/ Constructed by
01	General mental ability (GMA)	Raven's standard progressive matrices (RPM)	Raven J C
02	Environmental Behavior	Environmental Behaviour Scale	Investigator

Table No.1: Showing tools used for the study

11. Statistical techniques used for analysis of data:

The following statistical techniques have been used for analyze the hypothesis formulated in the study.

a) t –test

The t- test was used to find out significant difference between variables.

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b) Pearson product movement correlation:

The technique was used to find out the relationship between variables.

12. Analysis and interpretation of the data:

Percentage analysis was used as a statistical technique to analyse the level of analysis with respect to first and second objective which have been presented below.

Objective 1: To assess the level of general mental ability of Secondary school students.

Table No. 1: Table showing the percentage of Secondary school students possessing low, moderate and high level of general mental ability.

General mental ability	Score Limit	Secondary school students	
		Frequency	Percentage
Low	42.5	15	25
Moderate	43-52	29	48.33
High	53	16	26.66
Total		60	100%

Figure No.1 :Figure showing the percentage of Secondary school students possessing low, moderate and high levels of general mental ability.

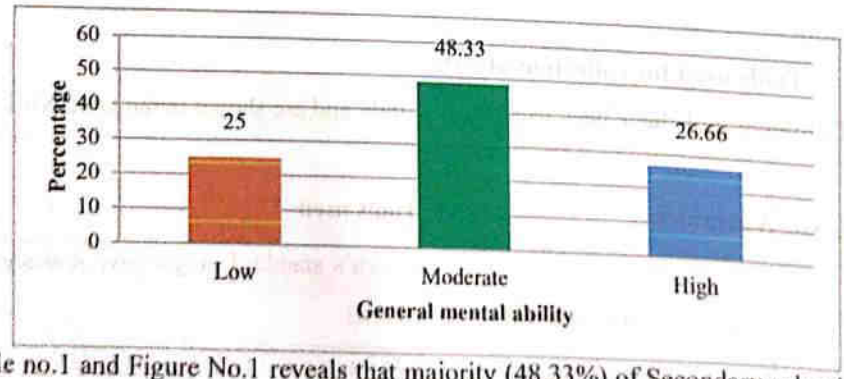

Table no.1 and Figure No.1 reveals that majority (48.33%) of Secondary school students possess moderate level of general mental ability. It is also seen that only 25% and 26.66% of the Secondary school students possess low and high level of general mental ability respectively.

Objective 2: To assess the level of Environmental Behaviour of Secondary school students.

Table No. 2: Table showing the percentage of Secondary school students possessing low, moderate and high level of Environmental Behaviour.

Environmental Behaviour	Score Limit	Secondary school students	
		Frequency	Percentage
Low	614.5	14	23.33
Moderate	615-663	30	50
High	664	16	26.66
Total		60	100%

Figure No.2 : Figure showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Behaviour.

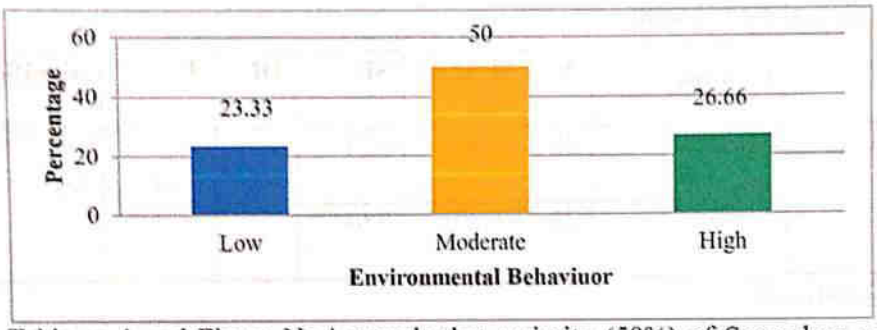

Table no.1 and Figure No.1 reveals that majority (50%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 23.33% and 26.66% of the Secondary school students possess low and high level of Environmental Behaviour respectively.

Hypothesis-1: To examine whether there is significant difference between Environmental Behaviour of female and male secondary school students.

t-Test was used to find the level of significant difference between male and female secondary school students with respect to Environmental Behaviour and General mental Ability.

Table No. 3: Showing mean SD and t-value of male and female secondary school students with respect to Environmental Behaviour.

	Groups	N	Mean	SD	Df	T	Significance
Gender	Male	35	645.40	56.42	58	3.296	**
	Female	25	603.08	42.96			

**: significant at 0.01 level

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Table No.3 shows that the obtained t value 3.296 is greater than the tabled t value 2.660 at 0.05 level. Hence, the null hypothesis Ho.1 is rejected and the alternate hypothesis stating that there is a significant difference between the Environmental Behaviour of male and female secondary school students is accepted. Since, the mean value of male (645.40) is greater than that of the mean value of female (603.08), it is concluded that male secondary school students possess more environmental Friendly behaviour.

Hypotheses-2: To examine whether there is significant difference between General mental ability of female and male secondary school students.

Table No. 4: showing mean, SD and t-value of male and female secondary schools students with respect to general mental ability.

	Groups	N	Mean	SD	Df	T	Significance
Gender	Male	35	46.97	6.71	58	0.405	NS
	Female	25	46.20	7.63			

NS: Not Significant

Table No.4 shows that the obtained t value 0.405 is lesser than the tabled t value 2.000 at 0.05 level, Hence, the null hypothesis Ho.2 is accepted and it is concluded that there is no significant difference between the general mental ability of male and female secondary school students is accepted.

Hypotheses:3 To examine whether there is a significant relationship between Environmental Behaviour and General mental ability of secondary school students.

Table-5: Showing the Number, Mean and 'r' value between general mental ability of Secondary school students and their Environmental behaviour.

Variables	N	Df	'r' value	Level of significance
Environmental behavior	60	58	0.07	NS
General mental ability				

NS: Not Significant

Table no- 5 shows that obtained 'r' value of 0.069 is lesser than table value of 0.250 at 0.05 level. Hence, the null hypothesis Ho-3 is accepted. It is concluded that there is a positive

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ENVIRONMENTAL ETHICS AND ENVIRONMENTAL BEHAVIOUR A CORELATIONAL STUDY AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT:

Environmental awareness is the initial step ultimately leading to the ability to carry on behavior. Ethics belongs to the realm of values. Environmental ethics consists of principles and values that a man as an individual and as a member of the society should follow so to conserve preserve and manage the environment. Environmental ethics says that one should base their behavior on a set of ethical values that guide a balanced approach toward the other living beings in nature. In this context the purpose of the study was to investigate the Environmental Ethics and Environmental Behavior. A co relational study among secondary school students. The study also aimed to find out the co relation between the variables of the study. The Study has been carried on students who were studying in 9th standard in school of Mysore city. The sample for the study consisted of 100 male and female students and data was collected using tools: Environmental Ethics scale and Environmental Behavioral Scale which have been used to measure the level of Environmental Ethics and Environmental Behavior among secondary school students. The result shows that majority (40%) of Secondary school student possess moderate level of general mental ability. It is also seen that only 20% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively. majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively, there is a significant difference between the Environmental Behaviour of male and female secondary school students, there is no significant difference between the Environmental Ethics of male and female secondary school students, a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior.

Keywords: Descriptive survey method, t test, Environmental ethics, Environmental Behavior, Environmental Education.

INTRODUCTION:

Environmental ethics is the sphere in the philosophy that studies the ideal relationships of human beings to and also values and moral status of the environment and its non human contents. Environmental ethics apply influence on a large range of disciplines involved Environmental law, Environmental sociology Ecology and Environmental geography. Environmental ethics study of the moral relationship between human beings and the natural environment. Main present environmental problems may include climate change, pollution, and environmental degeneration, resource depletion. The preservation movement campaign for protection of endangered species and protection of any ecologically valuable natural areas. Pollution is the release of dangerous materials into the environment and introduction of contaminants into the natural environment that cause adverse change. The causes of pollution are not just limited to the fossil fuels and carbon emissions. There are many other types of pollution including chemical pollution into the bodies of water and soil through improper disposal practices and agricultural activities and noise and light pollution produced by towns and urbanization as a result of growth of population Hence. In Environmental philosophy Environmental Ethics is an established field of practical philosophy which reconstructs the essential types of argumentation that can be made for protecting natural resources.

Need and importance of the study:

Environmental Ethics is an established field of practical philosophy which rebuild, the essential types of discussion that can be made for saving environment and the sustainable use of natural resources. Environmental Ethics is the basic characteristic of Environmental studies that Establishes the relationship between human and the earth. Environmental Ethics build on scientific understanding by bringing human values principles. Meeting the needs of global citizens. Economically, Ecologically, Culturally and more requires to understanding and creative problem solving. Environmental Education equips for the learner with the knowledge skills and motivation to address complex Environmental challenges in the 21st century. Environmental Education implies establishing proper Ecological equilibrium which entails proper use and consumption of resources in a supportable manner. It should enable children s to learn how Environment becomes hazardous. Population explosion and resource depletion could be the best topics to start such learning in School. It is Essential for the self-fulfillment and moral development of the child and the different food chain and the nature s ecological balance helps in carefully handling the problems like pollution menace, over exploitation of natural resources. Through knowledge of physical chemical biological and social process It provides the skills needed to get solution to Environmental problems. It encourages the development and application of scientific principle to solve Environmental problems This study helps to educate individual or children regarding their duties towards Environmental protection. It provides basic information about various Environmental problems like global climate change, toxic emissions and waste disposals. It provides knowledge about development and utilization of energy resources and importance of Environmental

stability in the contemporary culture. Environmental Ethics has produced around Environmental Philosophy. Many scientists have taken up the belief of the aspect of Environmental hazards, this giving rise to Environmental Ethics. Presently, Environmental Ethics, is become a major concern for mankind. The term Environmental awareness has a broad connection. It not only implies knowledge about Environment but also attitudes values and necessary skills to solve Environmental related problems. Moreover Environmental awareness is the first step ultimately leading to the ability to carry on behavior. Ethics belongs to the realm of values. Environmental Ethics includes the principles andvalues that a man as an individual and as a member of the society should follow so at to protect, preserves and manage the Environment thus Ethics has a direct relationship with human behavior mediated through the value system developed by students or individuals. In the light of the above the investigator was felt that it is necessary to investigate the Environmental Ethics and Environmental Behavior A co relational study among secondary school students.

3. OPERATIONAL DEFINITIONS OF KEY TERMS USED IN STUDY

3.1 Environmental Education:

Environmental education is a process to promote the awareness and understanding of the Environment and its relationship with students and their activities and it allow the students to explore Environmental Problems. Participate in problem solving and take action to upgrade the Environment.

3.2 Environmental Ethics:

It is about including the rights of non-humans and animals in our Ethical and moral values and things like water pollution, the depletion of natural resources, loss of biodiversity, destruction of Ecosystem and global climate changes all are the part of the Environmental Ethics debate. Ethical debate impacts on student's ability to solve Environmental issues because students have different viewpoints. Human values are the things that are important to students that they are use to Evaluate actions or Events.

3.3 Environmental Behavior:

Environmental Behavior is what the students intend to do in relation to the present Environment and in saving it. It is any action of the student or group of students towards the Environment or Environmental issues. It is the extent of which the students are inspired to act or behave in the desirable way.

Pro Environmental behavior:

Pro Environmental Behavior that consciously seeks to minimize the negative impacts of one's actions on the nature and build world. It decreases the negative influence of one's action caused by the individual operations. It reduces the negative action of the students towards the Environment and develops the positive attitudes in the students and reactions towards the Environment.

3.5. Dimensions of Environmental Ethics and Environmental Behavior considered in this study:

The dimensions of Environmental Ethics: Honesty, tolerance, Integrity, Responsibility, Truthfulness, Transparency, Cooperation, Punctuality, Patience, Justice, Loyalty, Determination right or wrong, True/False, Honor, Courage, Fairness, Enthusiasm, Acceptance, Empathy.

The dimensions of Environmental Behavior: Action Feeling, Emotion, Attitude, Cognition, Motivation thinking Perception Antecedent Consequences reaction skills Courage. If a student has to benefit from the Environmental Education provided in school and gain and perform pro environmental behavior, he need to develop required environmental ethics. Hence it is relevant to study the Environmental Ethics and Environmental Behavior a corelational study among secondary school students.

METHODOLOGY:

Statement of the Problem: The statement of the problem is, "Environmental Ethics and Environmental Behavior A co relational study among secondary school students.

Objectives of the Study:

The study has been undertaken the following objectives:

1. To study the level of Environmental Ethics among secondary school students.
2. To study the level of Environmental behavior among secondary school students.
3. To compare the Environmental Ethics of male and female secondary school students.
4. To compare the Environmental Behavior of male and female secondaryschool students.
5. To examine whether there is a significant co-relation betweenEnvironmental Ethics and Environmental Behavior among Secondary School Students.

Hypotheses of the study:

The following hypotheses were formulated in pursuance of the objectives of the study;

1. There is no significant difference between Environmental Ethics of Male and Female secondary school students.

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2. There is no significant difference between Environmental Behavior of male and female secondary school students.
3. There is no significant correlation between Environmental Ethics and Environmental Behavior among secondary school students.

Variables of the study:

The following are the variables of the study:

Main variables:

1. Environmental Ethics
2. Environmental Behavior

Back ground variable: Gender

Method of the study: Descriptive survey method has been adopted for the study.

Sample of the study: Random sampling technique has been adopted for selecting sample in Secondary Schools from the city of Mysore. Further 100 male and female students were selected through cluster sampling technique.

Tools used for the collection of data:

Sl.No	Variables	Tools used	Constructed By
1	Environmental Ethics	Environmental Ethics Scale	Investigator
2	Environmental Behavior	Environmental Behavior scale	Investigator

Statistical techniques used for the analysis of data:

The following statistical techniques have been used for analyze the hypotheses formulated in the study.

1. T-test has been used to find out the significant difference between the variables.
2. Pearson product movement correlation has been used to find out thecorrelation
3. Between variables

Analysis and interpretation of the data: Percentage analysis was used as a statistical technique to analyze the level of analysis with respect to first and second objective which have been presented below.

Objective 1: To assess the level of Environmental Ethics of Secondary school students.

Table No. 1: Table showing the percentage of Secondary school students possessing low, moderate and high level of Environmental Ethics.

Environmental Ethics	Score Limit	Secondary school students	
		Frequency	Percentage
Low	608	26	26
Moderate	609-662	49	49
High	623	25	25
Total		100	100%

Figure No.: Figure showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Ethics.

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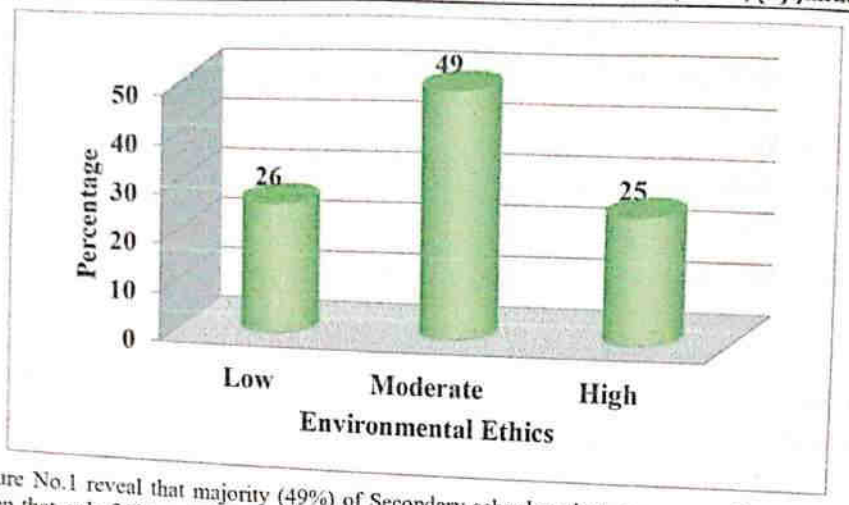

Table no.1 and Figure No.1 reveal that majority (49%) of Secondary school student possess, moderate level of general mental ability. It is also seen that only 26% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively.

Objective 2: To assess the level of Environmental Behaviour of Secondary school students.

Table No. 2: Table showing the percentage of Secondary school students, possessing low, moderate and high level of Environmental Behaviour.

Environmental Behaviour	Score Limit	Secondary school students	
		Frequency	Percentage
Low	176.75	25	25
Moderate	177-196	47	47
High	197	28	28
Total		100	100%

Figure No.2: Figure, showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Behaviour.

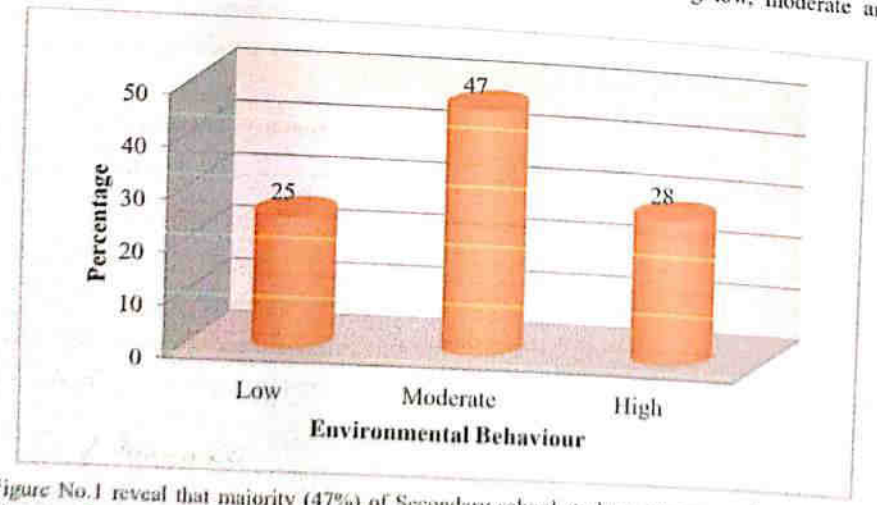

Table no.1 and Figure No.1 reveal that majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively.

Hypotheses-1: There is no significant difference between the Environmental Behaviour of male and female secondary school students.

Table No. 3: showing mean, SD, t-value of male and female with respect to Environmental Behaviour.

	Groups	N	Mean	SD	df	T	Significance
Gender	Male	50	202.08	14.00	98	11.938	0.01
	Female	50	175.42	7.85			

Table No.1 shows that the obtained 't' value 11.938 is greater than the tabled 't' value 2.626 at 0.01 level. Hence, the null hypothesis Ho.1 is rejected and the alternate hypothesis stating that there is a significant difference between the Environmental Behaviour of male and female secondary school students is accepted. Since, the mean value of male (202.08) is greater than that of the mean value of female (175.42), it is concluded that male secondary school students have scored higher in Environmental Behaviour.

Hypotheses-2: There is no significant difference between the Environmental Ethics of male and female secondary school students.

Table No. 4: showing mean, SD, t-value of male and female with respect to Environmental Ethics.

	Groups	N	Mean	SD	df	T	Significance
Gender	Male	50	628.14	60.00	98	0.395	NOT
	Female	50	624.06	41.65			

Table No.4 shows that the obtained 't' value 0.395 is lesser than the tabled 't' value 2.000 at 0.05 level. Therefore, the above stated null hypothesis is accepted and it is concluded that there is no significant difference between the Environmental Ethics of male and female secondary school students is accepted.

Hypotheses-3: There is no significant co-relation between Environmental Ethics of Secondary school students and their Environmental behaviour.

Table no- 5: Showing the Number, Mean 'r value between Environmental Ethics of Secondary school students and their Environmental behaviour.

Variables	N	Df	'r' value	Level of significance
Environmental behaviour	100	98	0.229	0.05
Environmental Ethics				

Table no-5 shows that obtained 'r' value of 0.229 is greater than table value at 0.05 level Hence, the null hypothesis Hypotheses-3 is rejected and the alternative hypothesis stating that there is a significant relationship between Environmental Ethics of Secondary school students and their Environmental behaviour. Therefore, it is concluded that there is a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior.

Findings of the study:

1. Majority (49%) of Secondary school student possess, moderate level of general mental ability. It is also seen that only 26% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively.
2. Majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively.
3. There is a significant difference between the Environmental Behaviour of male and female secondary school students
4. There is no significant difference between the Environmental Ethics of male and female secondary school students
5. There is a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior.

Educational implications of the study: Teachers need to develop Environmental Ethics and Environmental Behaviour by teaching concepts of Environmental Education using, activities like role play concept attainment models etc

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"CONTEMPORARY ISSUES DURING COVID-19 PANDEMIC: A MULTIDISCIPLINARY APPROACH"

Special Issue Editors

Prof. D.S. MUNEENDRA KUMAR

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ACHIEVEMENT OF HIGH SCHOOL STUDENTS IN COMPREHENSION AND SKILLS IN THE LEARNING OF MATHEMATICAL CONCEPTS – AN ANALYTICAL STUDY

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Abstract : *Mathematics is a key subject necessary to the promotion of economic development, particularly in developing countries; One way to address this issue is by taking cognisance of the learners' learning styles when teaching. Using the Dunn and Dunn model and the VARK model, the study on which this article is based explored the inter-relationships of Mathematics achievement and seven learning styles, as well as the learning styles of high and low achievers. The study recommends that teachers should create a positive learning environment at school, and use teaching methods that accommodate a variety of learning styles. Further research is needed to determine the impact of demographic variables on learning style preferences in Mathematics.*

Keywords: *learning style, Mathematics achievement, Mathematics teaching, High school*

Introduction

India has placed great emphasis on educating all its children, since independence. Seeking a more just and equitable society, the Constitution of India is committed to providing to all children, opportunities for developing their capabilities and maximizing their learning in their areas of interest. Providing mathematics education is an integral part of India's commitment to universalization of education. Mathematics is a part of our general education and all children have to study mathematics till class 10.

Universalization of education was not an easy task for India at the time of independence. Large regions in the country did not have schools, schools that existed lacked infrastructure and the commonly held perception was that school education is not useful for all. Since then various initiatives of the government have led to a remarkable improvement in access to schooling and various studies show that demand for good schooling is not restricted to only certain groups of people today (PROBE Team, 1999). Significantly, the 86th constitutional amendment declared education a fundamental right of every Indian child in 2002, and the Right to Free and Compulsory Education Act (RtE) in 2009 gave further teeth to the idea of every child being educated up to the age of 14 (i.e. elementary school level) by making it justifiable. Today, primary schools exist within a kilometer of every child and elementary schools, every three kilometers. Access to secondary schools however, may require children to travel up to ten kilometers. While considerable progress has been made in providing schooling facilities to all children, children's learning remains a tenuous area. Various studies undertaken by government and private agencies in primary and elementary classes are evidence of very poor learning levels among children in both Language and Mathematics (Education Initiatives, 2010; Pratham, 2005-2010; NCERT, 2008). Children have difficulty in 'reading texts with understanding' and 'expressing their thoughts in writing'. Understanding of

mathematics in primary classes is largely limited to 'procedural or rote-based learning' and in fact falling averages as we move from the primary to the elementary classes indicate an increase in the level of incomprehension for children (Education Initiatives, 2010).

Organization of secondary education in India

Education is a part of the federal framework of governance in India and so both the centre and the state governments enjoy authority in this area. The National Council for Education, Research and Training (NCERT) is the apex body for advising the central and state governments on school education. NCERT along with its state level counterparts- the State Councils of Education, Research and Training(SCERTs) are involved in various tasks like educational research, curriculum renewal, textbook creation, creation of supplementary material for children and teachers, pre- and in-service training and publications for teachers and children.

The country also has two national level boards of secondary education- the Central Board of Secondary Education (CBSE) and National Institute of Open Schooling (NIOS), the former being popular. All states of the country also have their own official boards of secondary education. Apart from these, one private board of secondary education also exists-the Council for the Indian School Certificate Examination (CISCE). More recently some international boards of secondary education are also coming into India. The secondary boards in India are in many cases responsible for the development of curricular expectations, syllabus and teaching-learning materials at the secondary level as well as reform in examination and evaluation practices. In a few instances they are also responsible for in-service teacher training.

In recent years, there has been an increase in the role of the NCERT and the SCERTs in processes of curriculum renewal and textbook development and boards are focusing on improving assessment processes and mechanisms.

It must be kept in mind that while there are official agencies like NCERT, SCERT and boards of secondary education that produce textbooks of mathematics, there are no restrictions on private publishers bringing out materials for these classes. There are many national and international publishing houses that bring out books; however, the expectation is that these be in line with the national and state curricular documents. Private schools largely form the market for these books.

The vision for mathematics education

The vision with which mathematics has been placed in the school curriculum has evolved over the years. In the 1950s and the 1960s, India developed its mathematics education as a step towards industrialization and scientific research. The Kothari Commission was set up for thinking comprehensively about education in India during this period and published its report in 1966. The report underlined the need for mathematics and science in school as well as in higher education; it emphasized the importance of children learning mathematics for the development of science and technology and for industrial growth. To quote from the report, "One of the outstanding characteristics of scientific culture is quantification. Mathematics, therefore, assumes a prominent position in modern education. Apart from its role in the physical sciences it is now playing an increasingly important part in the development of the biological sciences" (Government of India- Ministry of Education, 1966, p.181). The 1968 and 1986 National Policies of Education spoke in the same tone as the Kothari Commission report and the 1986 policy states that "mathematics should be visualized as the vehicle to train a child to think, reason, analyze and articulate logically. Apart from being a specific subject, it should be treated as a concomitant to any subject involving analysis and reasoning" (Government of India- Ministry of Human Resource Development, 1998, p.29).

The system of Nai Talim (New Education) that had emerged in the 1930s and 1940s from the thinking of various people like Dr. Zakir Hussain and Gandhi working towards building responsible, capable and educated Indians also realized the importance of mathematics. However, it viewed mathematics in terms of its use for the day-to-day requirements of people. The emphasis was on ensuring that calculations necessary for the survival of the child in the circumstances in which she was growing were learnt. The Zakir Hussain committee stated: "Knowledge of mathematics is an essential part of the curriculum. Every child is expected to work out the ordinary calculations required in the course of his craft work or his personal and community concerns and activities." In this sense, the Kothari Commission widened this very concrete, tangible and narrow purpose of teaching mathematics.

Respecting the distribution of the areas of jurisdiction between the centre and state governments on matters of education, the National Policy of Education, 1986 clearly states that "the national system of education will be based on a national curricular framework which contains a common core along with the other components that are flexible". The national curriculum framework brought out by the NCERT in 2000 gave some idea of the content in the syllabus and the kind of teaching process to be followed.

It felt that the teaching-learning process must heed the context of the child and their 'zone of proximal development' and learners should be able to relate the mathematics in their textbooks to their life experiences. This led to the idea of the mathematics lab and use of more and more concrete illustrations and activities in classrooms of mathematics. Under central government supported schemes, teachers and teacher educators made a lot of effort to develop activities and games that would somehow be linked to the teaching of mathematics.

The period of the 1990s and early 2000s was also the period when Minimum Learning Levels (MLL) formed the basis for the curriculum and textbooks and NCF 2000 also asked for their proper implementation. The idea of MLL arose from the need to provide equitable education to all children across India. It itemized learning of language, mathematics and environmental studies in the primary classes into small chunks/ competencies that all children were expected to achieve. Assessment and evaluation was also based on these small chunks. To be measurable these competencies had to be in the form of observable behaviour demonstrated by the child when she received the requisite inputs. This formulation of MLL also paid no heed to the time and space that children needed for concept building. There was a great deal of opposition to this and various alternative formulations were built. These included work by some organizations outside the government framework, some of them being partnerships with public institutions, like Eklavya in Madhya Pradesh, Homi Bhabha Centre for Science Education in Maharashtra, Vidya Bhawan Society in Rajasthan, Suvidya in Karnataka, School Mathematics Program of the Centre for Science Education and Communication of Delhi University, etc. These organizations had worked directly with various government schools and developed their own curriculum, syllabus and textbooks in this process. The experiences and ideas of these organizations have helped in giving shape to the National Curriculum Framework 2005. In fact, the upper primary textbooks produced by the Delhi state in 2000 were also a partnership between SCERT, Delhi and Vidya Bhawan Society, Rajasthan.

In the exercise undertaken by Delhi SCERT, many conceptual areas were re-organized and books made less loaded, complicated calculations eschewed and many areas elaborated. Topics such as surds, complicated proofs, stocks and shares, dividend calculations, income and sales tax were not included. The textbooks also attempted to use language and pictures as devices to communicate mathematics and were based on the argument that a book for the student should be at the level of her comprehension. Another important change initiated was the creation of a complete mathematics book instead of a textbook divided into sections. This

subsequently led to spiraling and developing interrelationships between various mathematics concepts. There was, however, no consensus on removing relatively tedious algebraic expressions, fractional number calculations, theorems and definitions in geometry, etc. There was a fear that the state syllabus would lag behind that of other states across the country. It was difficult for many to accept that it was pointless to load the program with tricks and algorithms to solve particular problems or for the child to do tedious algorithmic manipulations with numbers, algebraic quantities or geometric figures.

All this was part of the wisdom that fed into the emergence of the next National Curriculum Framework in 2005.

Challenges on the road ahead

The vision of mathematics education in NCF 2005 demands changes from the system and schools. It demands a change in the syllabi and textbooks and a change in classroom teaching and assessment. As we have discussed earlier, processes for the former have been initiated and stand at different levels of maturity in different states. However, the latter remains a formidable challenge. An appreciation of what NCF 2005 is saying requires extending the horizons of schools and linking them to the outside world and a different relationship between teachers and children including providing children with opportunities to explore, extend their mind and argue their stance. All these are very hard to achieve. There is little appreciation or acceptance of these principles in society, and among teachers and teacher educators, who are themselves struggling with their limitations in mathematical ability. Also there is little conviction that equitable learning is possible. The belief systems and prejudices about gender, caste, economic status and even cultural practices make mathematics teachers build classrooms differently from those expected in the NCF.

The biggest challenge for us is to change this attitude of teachers, parents and others to mathematics and why and how it should be taught. For most people "why mathematics education" still revolves around mathematics for calculations. Generally, the teacher believes that mathematics is about knowing solutions to problems and not about being able to understand what the concept means and about being able to think of ways of solving problems. The emphasis is on the 'correct answer' rather than on thinking of a variety of ways to approach the solution. Teaching, therefore, gets restricted to sharing solutions with students from either the textbooks or guide books, which offer short cuts and memory devices to children and are used widely especially in the higher classes. Teachers teach in a manner that is entirely de-linked from the experiences of children and participation by children is minimal. There is often even confusion between 'demonstration through concrete examples' and 'the proof of statements'. For the students, the classrooms largely consist remembering the defi nitions of mathematical ideas, axioms, postulates and solutions to problems or theorems and their proofs. Mathematics classroom, therefore, tends to become uninteresting for students. For most teachers, making mathematics interesting and vibrant is not possible because they themselves are often afraid of mathematics and consider it a subject for the privileged few who are capable and intelligent. 'Activity based mathematics teaching' and 'child centered' teaching are the buzz words, open to multiple interpretations and often get restricted to use of concrete materials for a few concepts in primary classes. Mathematics classrooms, in spite of NCF and the recent textbooks of NCERT remain didactic and assessments test calculations, algorithms, definitions and answers to 'difficult questions'.

Teachers who teach mathematics at the elementary and the secondary level are supposed to be graduates or post graduates in mathematics with a degree/diploma for teaching. In many cases, however, teachers with such qualifications are not available to teach mathematics. Mathematics is taught by teachers who are not very confident of their

mathematics. Even in cases where mathematics graduates or post graduates teach the subject their conceptual understanding may be inadequate. Besides, their understanding of the nature of mathematics and attitude to it and its learning are very different from what is underlined in the NCF 2005. The lack of ability of teachers in mathematics is probably the result of their preparation at the school and the college level. It is also because of the inadequate time for pre-service training and the way classroom teaching for pre-service teacher education takes place. Given the large number of teachers in schools and the lack of avenues of for continuing their learning most teachers also do not remain in touch with what they have learnt. There is a strong need for such processes to be initiated that would enable teachers to become more confident and to continue to engage with them. There are, however, insufficiently many institutions and individuals capable of creating and implementing a process that would enable teachers to learn more mathematics and be more confident of their ability. In the Indian context, the lack of this institutional capacity to help teachers learn more mathematical concepts and more about mathematics is the biggest challenge. In India's effort towards universalization of mathematics education, these remain the most critical barriers. They affect the confidence and learning of children much more than the syllabus, textbooks, assessment and everything else put together.

A number of studies and experiences show that many barriers to schooling still exist. These include barriers for the girl child who is not allowed to go to the school after she has reached a certain age, generally the age of puberty. Many schools do not have boundary walls (52%) and separate toilets for girls (41%), and this takes schooling a step further away (NUEPA. 2009). The situation for the secondary classes is worse as the schools are farther from their homes and concerns about the security of girls, forces them to give up schooling. Another factor preventing girls from coming to school is the absence of women teachers in the higher classes. Access is not the only problem for girls and the general societal belief (also shared by teachers) is that the study of abstract ideas does not benefi t girls and also that a girl's life priorities do not require her to take on anything as hard as mathematics and science. Frequently heard statements could be that "X is just like a boy, she is so good in mathematics". This attitude adds to the belief already implanted in them that they cannot learn mathematics.

There are also very strong prejudices about poor children and children from deprived social backgrounds. Some time ago almost all children in school were from the so called upper castes. The situation has changed today but a majority of mathematics teachers are still from the higher castes. Their belief is that the poor and lower caste children are not meant to learn mathematics and any sign of their disability is proof of their belief. It may not be hard to appreciate that such attitudes would also be present in children. Children from privileged backgrounds start with this advantage and that initial advantage is further strengthened by the belief of the system that only children from certain backgrounds can do abstract learning. This belief is in contrast to the commitment that India is bound to educate all its children and wants to teach mathematics to all children.

The NCF entails an expectation of a classroom that is interactive and inclusive and a teacher development program that not only builds the capability of the teachers for all this but also motivates them for this through mechanisms of sharing and scaffolding. At present various mechanisms for building the capabilities and interests of teachers are being evolved and include restructuring of pre-service courses of teacher education, strengthening of in-service training as well as strengthening of decentralized (cluster and block level) structures, seeking linkages between colleges of higher education and departments of education and teacher training colleges, etc. Attempts are also being made to reach ideas to the teachers through the use of ICT.

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Remedial Instructional Programme for Teaching Addition of Fractions to Children with Mathematical Disability (CwMD) In Inclusive Schools

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Abstract

The article explains the different types of error committed and difficulties exhibited by Children with Mathematical Disability (CwMD). The authors made an attempt to know different types of errors committed and difficulties exhibited by the participants while doing the addition of fractions. The study aims in developing the remedial instructional programme for CwMD in fractions related to (addition of fractions). The effectiveness of the programme has been studied and results indicated that the intervention provided was effective in improving the performance of participants from pre-test to post-test. The study has implications for teaching multiplication of fractions in inclusive schools.

Key words: Remedial Instructional Programme, Mathematical Disability, Inclusive Education.

Introduction

Learning fractions is difficult for children in general and especially difficult for children with Mathematical Disability (CwMD).). Fractions are well known to be difficult to learn. Fraction sense "refers to a person's general understanding of fractions and operations along with the ability and inclination to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for handling fractions and operations" (McIntosh et al., 1992, p. 3). However, children encounter fractions as the most complicated mathematical concepts in primary and even in their middle years in school. Moreover, fractions play a key role in mathematics, since they are involved in probabilistic, proportional and algebraic reasoning. Fractions are critical component of mathematics understanding and a gateway for too many sought after occupations. Fractions are an essential foundational skill for future mathematics success (NMAP, 2008). Children with mathematics difficulties (MD) lag behind in numerous aspects of fraction knowledge, including comparing and ordering fractions, estimating fraction on a number line, performing fraction arithmetic calculations, and solving word problems involving fractions (Bailey et al., 2015; Cawley, Parmer, Yan, & Miller, 1996; Hecht & Vagi, 2010; Mazzocco & Devlin,

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2008; Siegler & Pyke, 2013). Fractions are well-known to constitute a stumbling block for primary school children (Behr et al., 1983; Moss and Case, 1999; Grégoire and Meert, 2005; Charalambous and Pitta-Pantazi, 2007). Understanding difficulties in learning fractions seems absolutely crucial as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly & Hunting, 1996) especially when dealing with quantities in numerator and denominator. Pitkethly and Hunting (1996) posited that students view these two quantities as two separate entities of whole numbers instead of part-whole conceptualizations.

The importance of fractions extends beyond the school years. Fractions are essential foundational skill for future mathematics success (NMAP, 2008). The importance of fractions makes it a major topic in elementary and middle school curricula. According to Common Core State Standard Initiative (CCSSI, 2010), students should develop understanding in fraction in Grade 3 and Grade 4 , they should gain competence in fraction and word problems from Grade 4 to Grade 6and they should be able to apply fraction to problem solving ratios and proportions of Grade 6 and Grade 7.

Objectives

1. To analyze the type of errors committed by CwMD in mathematics studying in Grade –VI and VII while attempting items relating to Addition of Fractions w.r.t different criterion measures of Grade V, VI and VII.
2. To plan out the remedial instructional Programme in Addition of Fractions for CwMD studying in the Grade VI and VII w.r.t different criterion measures of Grade – V, VI and VII.

Methodology

The methodology related to the participants, tools and techniques method of collection and analysis of data are discussed in this section.

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria. A total of 21 participants with CwMD were considered as the sample for the study.

Table -1

Performance of the participants in the criterion measures pertaining to Fractions (Addition of fraction) of Grade- V, VI, and VII.

Sl. No	Grade	CRITERION MEASURE	M	PA	NM
1	V	Find the sum of the given fractions	40.47	40.13	19.4
2	VI	Addition of fractions (having same denominator)	--	----	100
3	VII	Addition of fraction	33.33	---	66.67

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Table -02

Errors noticed in while doing the task in Fractions related to Addition by CwMD

Sl. No	Errors	Example	Probable Reasons
1	Conceptual error Procedural Error committed	To find the sum of the given fraction. Example 7/9 + 3/9 = 10/18	Does not know when there is a common denominator it should be taken directly and by not adding it. Does not know that when denominators are same common denominator should be considered. Lack of Procedural Knowledge
	Did not attempt	3/10 + 6/10 +7/10 3 ¼ + 4/5 + 2/3	Does not know how to do the mathematical operation i.e. addition. Confusion prevailed while adding the fractions when numerators are different and denominator are same. Does not know to add the fractions when the denominators are different.
	Conceptual Error committed Procedural Error committed	5/6 +1/3 + 5/2 + 6/3 5+1+5+ 6 ---------- = 17 6+3+2+3 ---- 14	1. Adds the numerator 2. Adds the denominator. 3. Does not know to take LCM when the denominators are not same. 4.Does not have the conceptual understanding 5.Does not have the Procedural Knowledge.

Analysis was done to identify the types of error committed and the difficulties experience by the participants and the probable reasons for the errors/difficulties.

Planning and Preparing the Remedial Instructional Programme

Based on the errors committed and difficulties exhibited by CwMD, the general principles suggested by various researchers a remedial instructional programme to teach Addition of Fractions was developed.

Some of the general principles to learn Fractions are

1. Readiness skill for learning fractions to be emphasized.

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2. Teaching the same concept in different ways or representations.
3. Make use of simple vocabulary while teaching,
4. To foster the cognitive development.
5. Teaching should have direct impact on child's perception in learning.
6. Multisensory approach to be used while teaching.

Specific principles to teach Addition of Fractions

1. To compensate for short-term memory performance cues should be used to remember steps while doing Addition of Fractions.
2. The terms and the symbols of addition of Fractions to be used frequently for better retention and better performance.
3. Activities should be drawn such that a child finds interest in learning.

Main features of the Remedial Programme.

Keeping the above principles in mind the remedial instructional programme to teach addition of fractions to CwMD, was developed. Some of the main features of the programme are

1. The programme is designed in such a way that it caters the needs of the majority of children who have problem in learning the concept of addition of Fractions.
2. Each lesson has specifically designed instructional objectives.
3. Activities are arranged in sequential order.
4. The present learning activities were linked to the previous activities.
5. Achieving the objective of the previous class is a pre-requisite skill to go to the next lesson.
6. Concepts were taught using the concrete materials. Slowly, it was shifted to semi-concrete and finally the abstract form of addition of Fractions with different denominators was used.
7. Lessons were short requiring 20 min covering a specific concept.

SAMPLE LESSON

The addition of fraction teaches us to add two or more fractions with same denominators and to take LCM different denominators are considered in addition of fractions. The addition of fractions depends on two major conditions.

a) Same denominator.
b) Different denominator.

Addition of Fraction:

General Objective: To enable the children to understand the concept and procedure adopted in addition of fraction by taking common denominator and different denominators.

Specific Objective:

a) The pupil will be able to identify fractions having common denominator and fractions having different denominator.
b) The pupil will be able to recognize fractions with same denominators and fractions having

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Teaching-Learning aids used:

1. Mathematics Table used.
2. Charts related to addition of fractions with common denominator and different denominator used
3. Writing board and color chalk used different denominators.

Addition of Fractions with same denominator

If the denominators of two or more fractions are same then we can directly add the numerator keeping the denominator common.

Example 1: General form of Addition of Fraction when the denominator are same.

1. a/b + c/b --→ (The denominators are same, consider once, it is common denominator, here b is common denominator, consider it once)

$$= \frac{a+c}{b}$$ → (Add the numerator) → (Common denominator)

Example 2:

Add the fractions 4/6 + 7/6

4/6 + 7/6 → [Look at the numerator, add them]

$$= \frac{4+7}{6}$$ → [Add the numerator] → (Look, at the denominator they are same, take the common denom

Follow the below steps to add the fractions with same denominator.

- Add the numerator together, keeping the denominator common.
- Writing the simplified fraction

Example 3: Addition of fractions with different denominators.

[(9/6) + (3/4)]

Method-01:

Step -01: Cross multiply the left numerator with the right denominator and right numerator with the left denominator).[Cross multiplication done representing through the arrows using color chalk].

Step-02: Multiply the denominators, they are different. (There is no common denominator). [Asked students whether the denominators considered are same or different]

Step -03: Take LCM of the denominator

Step-04: Finally add the numerator and the denominator.

1. Add the given two fractions [(9/6) + (3/4)].

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$$= \frac{[(9x4) + (3x6)]}{(6x4)}$$

$$= \frac{[36 + 18]}{24}$$

$$= \frac{54}{24}$$

6	6, 4
	1, 4
4	1, 1

L C M 6x4=

6x1=6	4x1=4
6x2=12	4x2=8
6x3=18	4x3=12
6x4=24	4x4=16
6x5=30	4x5=20
6x6=36	4x6=24
6x7=42	4x7=28
6x8=48	4x8=32
6x9= 54	4x9=36
6x10=60	4x10=40

II

Method:

6, 4
1, 4
1, 1

6

[(9/6) + (3/4)]

4

Step 1: Consider each of the fractions separately and multiply with the L C M

LCM 6x4=

24

a) $\frac{9}{6} \times 24$ → (The denominator and the L C M has to be divided)

6)24(4
24

6x4=24

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$9x4 = 36 \rightarrow (1)$

Step 2: Consider the other fraction and multiply the numerator with the LCM or divide the denominator with LCM.

6x1=6	4x1=4
6x2=12	4x2=8
6x3=18	4x3=12
6x4=24	4x4=16
6x5=30	4x5=20
6x6=36	4x6=24
6x7=42	4x7=28
6x8=48	4x8=32
6x9= 54	4x9=36
6x10=60	4x10=40

b) $\frac{3}{4} \times 24 \rightarrow$ (The denominator and the L C M has to be divided)

$3 \times 6 = 18 \rightarrow (2)$

4)24(6
24

0

Step 3: Add the product of both the fractions
With the denominator

$$\frac{36+18}{24} = \frac{54}{24}$$

Table -3

Performance of the participants in the criterion measures pertaining to Fractions (Addition of fraction) of Grade- V, VI, and VII in Pre-Test and Post-Test.

Sl. No	Grade	CRITERION MEASURE	Pre-Test			Post-Test		
			M	PA	NM	M	PA	NM
1	V	Find the sum of the given fractions	40.47	40.13	19.4	90.47	9.53	--
2	VI	Addition of fractions (having same denominator)	--	----	100	47.61	47.63	4.76
3	VII	Addition of fraction	33.33	---	66.67	100	--	--

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Teachers should be trained in methods to teach CwMD and other children who face difficulties in learning mathematics.

Addition of fraction having same denominator was found to be most difficult in the pre-test and mastery was seen at 47.61% in the post-test and partial achievers at 47.63% .

7. Addition of fraction was seen to have 100% mastery in the post-test from 66.66% of non mastery in the pre-test of Grade VII.

Implications of the study

1. Since the programme developed to teach Addition of fraction to CwMD, this programme can be used for any children who are having difficulty in understanding the addition of fractions due to various other reasons in upper primary schools.

2. As factions are found to be difficult for most of the normal children also. So, the remedial strategies suggested here can be made use to teach n the regular classrooms so that it will be helpful to the normal children.

3. Children with Mathematical disability (CwMD), can overcome their problem if the specific deficits are identified and faulty strategies adopted to do the operations are rectified.

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Effectiveness of a Remedial Instructional Programme in Attaining Mastery in Fractions among Children with Mathematical Disability (CWMD) in Grades VI and VII

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Abstract

The article explains the different type of errors committed and difficulties exhibited by Children with Mathematical Disability (CwMD). The authors made an attempt to know different type of errors committed and difficulties exhibited by the participants while doing the addition of fractions. The study aims in developing the remedial instructional programme for CwMD in fractions related to (addition of fractions). The effectiveness of the programme has been studied and results indicated that the intervention provided was effective in improving the performance of participants from pre-test to post-test. The study has implications for teaching multiplication of fractions in inclusive schools.

Key words:, Mathematical Disability, Difficulties in Learning Fractions, Effectiveness of Remedial Instructional Programme in Mathematics for CwMD.

Introduction

Learning fractions is difficult for children in general and especially difficult for children with Mathematical Disability (CwMD). Fractions are well known to be difficult to learn. Fraction sense "refers to a person's general understanding of fractions and operations along with the ability and inclination to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for handling fractions and operations" (McIntosh et al., 1992, p. 3). However, children encounter fractions as the most complicated mathematical concepts in primary and even in their middle years in school. Moreover, fractions play a key role in mathematics, since they are involved in probabilistic, proportional and algebraic reasoning. Fractions are critical component of mathematics understanding and a gateway for too many sought after occupations. Fractions are an essential foundational skill for future mathematics success (NMAP, 2008). Fractions are well-known to constitute a stumbling block for primary school children (Behr et al.,1983; Moss and Case, 1999; Grégoire and Meert, 2005; Charalambous and Pitta-Pantazi, 2007). Understanding difficulties in learning fractions seems absolutely crucial

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as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly & Hunting, 1996) especially when dealing with quantities in numerator and denominator. Pitkethly and Hunting (1996) posited that students view these two quantities as two separate entities of whole numbers instead of part-whole conceptualizations.

The importance of fractions extends beyond the school years. Fractions are essential foundational skill for future mathematics success (NMAP, 2008). The importance of fractions makes it a major topic in elementary and middle school curricula. According to Common Core State Standard Initiative (CCSSI, 2010), students should develop understanding in fraction in Grade 3 onwards. Children with mathematics difficulties (MD) lag behind in numerous aspects of fraction knowledge, including comparing and ordering fractions, estimating fraction on a number line, performing fraction arithmetic calculations, and solving word problems involving fractions (Bailey et al., 2015; Cawley, Parmer, Yan, & Miller, 1996; Hecht & Vagi, 2010; Mazzocco & Devlin, 2008; Siegler & Pyke, 2013). Fractions instruction in the United States had predominately relied on teaching part-whole understanding (Fuchs, Sterba, Fuchs, & Malone, 2016c; Ni & Zhou, 2005: Thompson & Saldanha, 2003). Part-whole understanding refers to conceptualizing fractions as representing one or more equal parts of an object or set of objects. More recent studies reveal that strong whole-number knowledge supports fractions learning (e.g., Namkung et al., 2018; Resnick et al., 2016; Rinne, Ye, & Jordan, 2017). Students with a strong foundation in whole-number magnitude understanding had more accurate fraction magnitude understanding than those who did not (Resnick et al., 2016). Hence, there is a need to develop knowledge and competencies in Whole numbers before attempting to improve the same in Fractions. It is also essential to understand the specific difficulties experienced by the Children with Mathematical Disability (CwMD) in fractions and also the type of errors committed by them. Remedial programme should be planned on the basis of the difficulties and errors. In order to train the teachers in providing Remedial Instruct to CwMD, there is a need to have evidence based programmes. The studies relating to Remedial Instructional Programmes conducted in India on CwMD mainly focused on Whole numbers. Hence,the need for the study.

Objectives

1. To analyze the types of errors committed in Fractions by CwMD studying in Grades –VI and VII.
2. To find out the Effectiveness of a Remedial Instructional Programme in Attaining Mastery in different criterion measures pertaining to Fractions among Children with Mathematical Disability (CWMD).

Methodology

The methodology related to method of collection and analyses of data are discussed in this section.

as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly

fractions learning (e.g., Namkung et al., 2018; Resnick et al., 2016; Rinne, Ye, & Jordan, 2017). Students with a strong foundation in whole-number magnitude understanding had more accurate fraction magnitude understanding than those who

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria.

Table -1

Details of the participants

Type of School	Grade	Number of children included in the study
Government	VI	6
Private Aided	VI	3
Government	VII	6
Private Aided	VII	6
		21

Brief Description of the Tools

Though the participants were from Grades VI and VII the Diagnostic Tests in Mathematics for the Grades I-IV, V, VI, and VII were administered to the participants in order to understand their specific difficulties in different criterion measures of all the 7 Grades. A brief account of the tools used in the study is given below.

The Arithmetic Diagnostic Test (ADT) was developed by Ramaa S (1994, 2015) is used as a means to identify the difficulties and to diagnose the errors made by the children in arithmetic. This test is not the disability specific test. The test could be administered to any children studying in the grades I-IV. The test intends to diagnose the specific difficulties encountered by children of primary schools of grade I-IV while doing the arithmetic sum. The test is developed in such a way that the items are appropriate to the different grades of the primary school stage, cumulative and varies from each other at the minimal difference level

The Mathematics Diagnostics Test developed by Nair Prithi Govindhan, 2015, was used in the study. The test intends to assess the performance level of children in mathematics studying in the Grade –V. The test intends to diagnose specific difficulties exhibited and errors committed by the children of Grade V. The test covers almost all the areas of mathematics of Grade V.

The Mathematics Diagnostic Tests for the Grade –VI and VII were developed by the investigator to know the performance level of children in mathematics studying in the grade VI and VII. The test intends to diagnose the errors committed and specific difficulties exhibited by children in solving the mathematical operations. The test covers almost all the areas of Arithmetic, Algebra and Geometry in mathematics of the grades VI and VII of Karnataka state board Text book of Kannada medium.

Collection of the Data

The data relating to difficulties and errors were collected by administering the tests to the participants in small groups of 2 to 3 children in two sessions of about 60 min in order to avoid the fatigue factor. The children were given sufficient time.

The scoring was done with reference to each of the criterion measures of the total tests. However, in the article the data related to addition of Fractions is only discussed.

In order to collect the data related to the effectiveness of a Remedial Instructional Programme in attaining mastery in fractions among Children with Mathematical Disability the experiment was conducted with Pre-Test and

The data was analyzed qualitatively. The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the specific difficulties in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) .

In order to achieve the objective no.2 that is :To find out the Effectiveness of a Remedial Instructional Programme in Attaining Mastery in different criterion measures pertaining to Fractions among Children with Mathematical Disability (CWMD) an experiment was conducted with a single subject pretest post test design . This phase involved two stages:

1. Preparation of the remedial instruction programme
2. Evaluation of the remedial instruction programme

Preparation of Remedial Instructional Programme.

The remedial instructional programme was planned and prepared on the basis of the difficulties exhibited by the participants and the errors committed in the criterion measures on all the 4 diagnostic tests. In the programme. the principles suggested by various investigators such as Myklebust in Gearheart (1973), Rozario and Kapur (1992), Otto & Smith (1980), Ray (2001),Stewart and Kluwin (2001) and Westwood (2004)), National Council of Teachers of Mathematics (2007), Lin, Liu, Chen, Liou, Chang, Wu and Yuan (2012) were incooperated. The remedial programme aimed at mastery in all the criterion measures pertaining to the components of the mathematics the grades I-VII: Number concept, Addition of whole numbers, Subtraction of whole numbers, Multiplication of whole numbers, Division of whole numbers and fractions pertaining to grade I-IV and to ascertain the percentage of children with mathematical disability in grade V exhibiting difficulties in various criterion measures of mathematics namely Number concept, Addition of whole number, fractions and decimals, Subtraction of whole number, fractions and decimals, Multiplication of whole numbers and fractions, division of whole numbers and fractions, percentage and geometry pertaining to grade-V.and to ascertain the percentage of children with mathematical disability in grade VI and VII exhibiting difficulties in various criterion measures of mathematics namely Number concept, Addition of whole number, integers, rational numbers, fractions and decimals, Subtraction of whole number, integers, rational numbers,

fractions and decimals, Multiplication of whole number, integers, fractions and decimals, division of whole numbers, integers, rational numbers, fractions and decimals, Introduction to Algebra, Algebraic expressions, exponentials, Factorization, Ratio and Proportion, Percentage, Simple Interest, Profit and Loss and geometry pertaining to VI and VII. However, in this article details regarding fractions only included..

An experiment was conducted on 21 children with mathematical disability to meet one of the objectives of finding out the effectiveness of the remedial instructional programmme with single subject pre-test and post-test design as the difficulties and errors of the participants in different criterion measures were varied considerably.

Analysis and Interpretation of the Data

The data was analyzed qualitatively.

Analyzing the difficulties of the participants in various criterion measures pertaining to fractions

The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the errors committed in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) . The participants with partial achievers (PA) commit varied error patterns in addition of fractions, such errors committed by the participants are listed with the type of error committed, probable reasons for committing such errors are discussed in the section below and followed by designing the Remedial Instructional Programme in Addition of Fraction for CwMD.

Table -1

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions in Mathematics Diagnostic Test(N= 21)

Sl. No	Grade	N	Criterion Measures	No. of Items	Max. Score	M	PA	NM
1	I-IV	21	Reading/Writing the Fractions	6	6	----`	42	47.61
	I-IV	21	Addition of Fraction	2	2	19.04	14.3	66.66
2	V	21	Find the sum of the given fractions	4	4		40.13	59.4
3	VI	21	Addition of fractions (having same denominator)	2	2	--	----	100
4	VII	12	Addition of fraction(having different denominator)	2	2	----	33.33	66.67

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Table No 2

Difficulties of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09)

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fraction having same denominator

Case No	Grade I-IV		Grade V	Grade VI	Status of performance		
	CM-1	CM-2	CM-3	CM-4	Mastery	Partial achievement	Non Mastery
1	NM	NM	NM	NM	0	0	4
2	NM	M	NM	NM	1	0	3
3	NM	NM	NM	NM	0	1	4
4	NM	NM	NM	NM	0	1	4
5	NM	NM	PA	NM	0	1	3
6	NM	PA	NM	NM	0	1	3
7	NM	NM	NM	NM	0	0	4
8	NM	NM	NM	NM	0	0	4
9	NM	NM	PA	NM	0	1	3

Table No 3

Difficulties of the participants of Grade VII in the criterion measures pertaining to Addition of Fractions (N=12)

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fractions with same denominator CM-5 Addition of Fraction with different denominator

Case No	Grade I-IV	Grade IV	Grade V	Grade VI	Grade VII	Status of performance		
	CM-1	CM-2	CM-3	CM-4	CM-5	Mastery	Partial achievement	Non Mastery
111	PA	M	PA	NM	PA	1	3	1
	NM	NM	NM	NM	NM	0	1	4
	NM	NM	PA	NM	NM	0	1	4

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	NM	NM	NM	NM	PA	0	1	4
	PA	NM	NM	NM	NM	0	1	4
	NM	M	NM	NM	NM	1	0	4
	PA	NM	PA	NM	NM	0	2	3
	PA	NM	PA	NM	PA	0	3	2
	PA	NM	NM	NM	NM	0	1	4
	PA	NM	NM	NM	NM	0	2	3
	PA	NM	PA	NM	NM	0	2	3
	PA	NM	PA	NM	NM	0	2	3

From the Table No 2 and 3, it can be understood clearly that none of the participants had mastery in all the criterion measures pertaining to addition of fraction measured in the study. The numbers of criterion measures partially achieved are also significantly less in most of the cases. Even if a few steps were correct in any item of each criterion measures the participants given quarter or half marks, thus belonging to the category of Partial achievers.

Analysis of the Errors

The errors were analyzed qualitatively. Examples for some types of errors and the explanation are given in the Table 3

Table 5

Examples for Errors committed in different criterion measures pertaining to addition of Fractions, and Explanation (N=21).

Sl. No	Criterion Measure	Example	Explanation
1.	Reading the Fractions	**Problem:** Read 51/2 **Response** = a)Read as five and two b) Read as five one two	Does not have the factual

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2.	Writing the Fractions	To write the given fraction in words **Problem:** 7 ¾ **Response** = Seven three Four **Problem:** ¾ **Response** = Writes it as three four (Instead of writing it as three fourth or three by four).	Knowledge about reading and writing fractions
3.	Addition of Fractions	To add the given Fractions **Problem:** 1 ½ + ½ **Response** = Writes the fraction as 1 only.	a) Does not have the conceptual understanding in adding the fractions.
4.		**Problem :** ¾+ ¼ **Response** = Writes it as 4/8 (Adds the denominator)	b) Does not know to convert the mixed fraction to improper fraction. c) When the denominator is common should consider only once.
5.	Addition of the fractions with same denominator	To find the sum of the given fraction. **Problem:** 7/9 + 3/9 **Response** = 10/18	Does not know when there is a common denominator only numerators have to be added and denominator to be retained as it is.

6.	Addition of the fractions with different denominator	**Problem:**5/6 +1/3 + 5/2 + 6/3 **Response** 5+1+5+ 6 ---------- = 17 6+3+2+3 ---- 14	Adds the numerator Adds the denominator. Does not know to take LCM when the denominators are different.

Effectiveness of the Remedial Instructional programme in attaining mastery, by the participants in the criterion measures pertaining to addition of Fraction

The percentage of the participants who were masters(M), partial achievers(PA) and Non masters(NM) in the criterion measures pertaining to Addition of fraction in Pre-Test and Post-Test were computed and the details are given in the Table 4

Table -6

Percentage of the participants who were masters(M), partial achievers(PA) and Non masters(NM) in the criterion measures pertaining to Addition of fraction in Pre-Test and Post-Test.

Sl. No	Grade	CRITERION MEASURE	Max. Score	Pre-Test			Post-Test		
				M	PA	NM	M	PA	NM
1	I-IV	Reading/Writing the Fractions	6	`----	42	47.61	95.5	5.5	-
2	I-IV	Addition of Fractions	2	19.04	14.3	66.66	95	5.0	
3	V	Find the sum of the given fractions	4	---	40.13	59.4	90.47	9.53	--
4	VI	Addition of fractions (With same denominator)	2	--	----	100	66.5	23.5	--
5	VII	addition of fraction (with different denominator)	2	----	33.33	66.67	100	--	--

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: Addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fraction having same denominator.

Table No 7

Comparison of the performance of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09)

Case No	Grade I-IV				Grade V		Grade VI	
	CM-1		CM-2		CM-3		CM-4	
	Pretest	Post Test	Pretest	Post Test	Pretest	Post Test	Pretest	Post Test
1	NM	M	NM	M	NM	M	NM	M
2	NM	M	NM	M	NM	M	NM	PA
3	NM	M	NM	M	NM	M	NM	M
4	NM	M	NM	M	NM	PA	NM	M
5	NM	M	NM	M	PA	M	NM	PA
6	NM	M	PA	M	NM	M	NM	M
7	NM	M	NM	M	NM	PA	NM	M
8	NM	M	NM	M	NM	M	NM	M
9	NM	M	NM	M	PA	M	NM	PA

Table No 8

Comparison of the performance of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09).

Case No	Grade I-IV		Grade IV		Grade V		Grade VI		Grade VII	
	CM-1		CM-2		CM-3		CM-4		CM-5	
	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
111	PA	M	NM	M	PA	M	NM	M	PA	M
	NM	M	PA	M	NM	M	NM	M	NM	M
	NM	M	NM	M	PA	M	NM	M	NM	M
	NM	M	NM	M	NM	M	NM	PA	PA	M
	PA	M	NM	M	NM	M	NM	M	NM	M
	PA	M	PA	M	NM	M	NM	M	PA	M
	PA	M	NM	M	PA	M	NM	M	NM	M
	PA	M	NM	M	PA	M	NM	M	PA	M
	PA	M	NM	M	NM	M	NM	PA	NM	M
	PA	M	NM	M	NM	M	NM	M	PA	M
	PA	M	NM	M	PA	M	NM	M	NM	M
	PA	M	NM	M	PA	M	NM	M	NM	M

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CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fractions with same denominator CM-5: Addition of Fraction with different denominator

Major Findings

From the analysis of the data the following observations were made

1. It was observed that majority of the participants of Grade VI and VII exhibited non-mastery in (more than 50%) in all the criterion pertaining to addition of Fractions. In reading and writing the Fractions difficulty was exhibited by 48% of the participants.
2. Only one of the participants of Grade VI and two participants of Grade VII attained mastery only in Addition of Fractions of Grade (I-IV). In all the criterion measures all the participants had difficulty.
3. The error analysis relieved that majority of the participants lacked the knowledge and procedure of addition of Fractions. A few participants had difficulty even in reading and writing the Fractions.
4. The Remedial Instructional programme was found to be effective in enabling the participants to attain mastery in the criterion measures of Addition of Fractions.
5. Majority of the participants of the Grade VI and VII have shown mastery at 95.5% in the criterion measures pertaining to reading and writing of Fractions and addition of Fractions of grade I-IV. This shows the effectiveness of the Remedial Instructional Programme .
6.. Majority of the participants of the Grade VI and VII have shown mastery at 90.47% in the criterion measures pertaining to Addition of Fraction of Grade V. This shows that the Remedial Instructional Programme was effective in improving the performance of the participants in attaining mastery.
7. More than 60% of the participants of the Grade VI and VII have shown mastery in the criterion measures pertaining to Addition of Fraction with same denominator of Grade VI. This shows that the Remedial Instructional Programme was effective in improving the performance of participants from Non-mastery to mastery.
8. All participants of Grade VII have shown 100% of mastery in the criterion measure pertaining to Addition of Fractions with different denominator. This shows that the Remedial Instructional Programme was effective in improving the performance of participants in attaining mastery.

Discussion

Fractions have been seen as numbers that have unique properties compared to whole numbers that students have learned before. The uniqueness of its nature has made it difficult to understand (Braithwaite et al., 2018).

Fractions have been one of the most difficult mathematical skills to master, for children with and without difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

The observations made in the present study supports the findings of the previous studies.

There are four things that students often do when answering addition of

fraction operation namely systematic errors, random errors, negligence errors and not knowing how to answer fraction questions (Braithwaite et al., 2018; Loc et al., 2017; Purnomo et al., 2019; Salleh et al., 2013; Saparwadi et al., 2017; Tian & Siegler, 2017). In the study it was observed all the four types of errors were committed by the participants, however negligence errors were less compare to other types.

Students with MD are also frequently reported to have difficulties solving word problems

(Zhang & Xin, 2012; Parmar, Frazita, & Cawley, 1996). Here, in addition to the conceptual

understanding of simple arithmetic problems, specific competencies are required. Word problems

have to be transformed into mathematical expressions (Montague & Applegate, 2000).

Procedural knowledge denotes the knowledge of calculation strategies and procedures,

understanding how and when to use them, and the mastery of the skills needed to apply them in a

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Learning the concept of fractions is one of the most difficult skills to master for elementary school students (Gaetano, 2014; Nurhani et al., 2018). Fractions are also seen to affect other mathematical knowledge such as algebra. This in turn will affect mathematic achievement. In the study also it was noticed that some participants committed difficulty even in reading and writing the Fractions.

Students find fractions in their daily life, they are not able to relate it to the fractions they learn in classroom situation (Keijzer, 2003). Secondly, students have the difficulty in understanding the meaning of the mathematical symbols of fractions (Thomson & Saldanha, 2003). Thus, it is understandable that students mix up the fractions as natural numbers when they add two fractions (Idris & Narayanan, 2011; Izsák, Tillema, & Tunç-Pekkan, 2008;). The findings of the study also support the above observations as majority of the participants had difficulty in adding the fractions with common denominator.

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14. Understanding and mastery of fractions is essential pre-
15. requisite knowledge for algebraic instruction (NMAP,
16. 2008). Underscoring the importance of such knowledge,
17. the CCSSM (NGAC & CCSSO, 2010) for Grades 3
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19. taught. Thus, it is clear that if they are to succeed in school
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One of the aspects that can improve students' understanding is through the use of effective teaching aids for teaching Fractions (Noh et al., 2016; Rohaeti et al., 2020). Therefore, innovation and transformation must be done through the development and construction of teaching aids. The use of teaching aids is very important so that teachers can explain things more accurately and clearly compared to oral explanations only. The remedial instructional programme also involved variety of learning experiences with appropriate teaching aids. Thus proved effective in enabling the participants attain mastery.

Further, Noh et al.,(2016); Rohaeti et al., (2020), justified that appropriate teaching aids can ensure the delivery of teaching and learning can be implemented more effectively. The need to develop these teaching aids is very significant as described by Jones et al. (2011) and McNeil and Jarvin (2007). The use of aids can change the teaching and learning methods of the teacher for the better and give internal motivation to students to learn something (Gaetano, 2014).

Conclusion

On the basis of the observations made in the study it can be understood that Children with Mathematical Disability (CwMD) in the upper primary schools face serious difficulties in addition of fractions and also commit errors in learning operations related to addition of fraction.

Through structured Remedial instructional programmes similar to the one planned and tried out in the study it is possible to enable the participants to attain mastery in the criterion measures of addition of Fractions at elementary level. The success of the programme is also due to the effective remedial instruction provided to the participants to master the concepts and procedures related to whole numbers prior to fractions. So, even if difficulties in Fractions noticed in the participants with CwMD, their difficulties in whole numbers have to be diagnosed and rectified. On the basis of the evidence based programmes tried out in the study teachers can to be trained.

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Specific Difficulties Exhibited by Children with Mathematical Disability (CWMD) in Arithmetic Learning Fractions at Elementary Level.

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Abstract

Competence with fractions is foundational to acquire more advanced mathematical skills. However, achieving competency with fractions is challenging for many students, especially for those with mathematics learning difficulties who often lack foundational skill with whole numbers. Difficulties exhibited in fractions prevent the child from enjoying the world of numbers. Thus in the present study the authors try to know the percentage of children with mathematical Disabilities of Grade VI and VII exhibiting difficulties in various criterion measures pertaining to Fraction. These participants were considered as Masters, Partial Achievers and Non-Masters based on the different criterion measures. The Major findings are discussed in the article.

Keywords: Specific Difficulties in Arithmetic and Mathematical Disability, Difficulties in Learning Fractions.

Introduction

Although many children encounter difficulties with mathematics in elementary school, much less research has been conducted in this area (Ginsburg, 1997). Thus weaknesses in the area of mathematics can impede educational opportunities for students (Rivera-Batiz, 1992). Children with mathematics difficulties often have problems in several areas of mathematical cognition. These include the ability to solve relatively complex story problems and retrieval of number facts (Jordan & Hanich, 2000; Russell & Ginsburg, 1984). fractions have been one of the most difficult mathematical skills to master, for children with and with-out difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001). Struggling learners in mathematics (students with learning disabilities [LD], mathematics learning disability (MLD), low-achievement in mathematics, and at-risk for failure in mathematics) are at an even greater disadvantage, as their performance in mathematics has

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traditionally lagged at least two grade levels below their peers (Wagner & Blackorby, 1996).

The National Mathematics Advisory Panel (NMAP, 2008 fractions have been one of the most difficult mathematical skills to master, for children with and with- out difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

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Struggling learners in mathematics (students with learning disabilities [LD], mathematics learning disability (MLD), low-achievement in mathematics, and at-risk for failure in mathematics) are at an even greater disadvantage, as their performance in mathematics has traditionally lagged at least two grade levels below their peers (Wagner & Blackorby, 1996)

Accumulating data from the National Assessment of Educational Progress (NAEP) also provide evidence for students' difficulties with fractions. According to the 2017 NAEP, only 32% of fourth graders correctly identified which fractions were greater than, less than, or equal to a benchmark fraction, ½ . In 2009 NAEP, only 25% of fourth graders correctly identified a fraction closest to ½.

Norton and Boyce (2013) and Siegler, Thompson and Schneider (2011) argued that fraction is very difficult to teach, most cognitively challenging and most essential for advanced mathematics.

Traditionally, difficulty with fractions has been attributed to fundamental differences between whole numbers and fractions. This can lead to whole-number bias, which refers to students' overgeneralization of whole number knowledge to fractions (DeWolf & Vosniadou, 2015; Ni & Zhou, 2005). This finding confirms the observation of Hackenberg and Lee (2015) that teaching fraction effectively requires using correct language and technical terms.

The present study intends to identify the specific difficulties in fractions faced by CwMD, the objective of analyzing the difficulties faced by CwMD in Mathematics Diagnostic test.

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Need and importance of the study

Math concepts such as fractions that students do not master in the early grades can go on to confuse them later on and to cause them a great deal of math anxiety. Fractions are often the first hurdle experienced by school learners while learning mathematics as it is one of the operation beyond basic skills of addition, subtraction, multiplication and division (Chinnappan 2006).The new research shows that students need to intuitively understand concepts rather than just to memorize language or symbols, as such rote memorization does not lead to long-term understanding. Many math teachers do not realize that the language of math can be confusing to students and that students must understand the concepts behind the language. They tend to learn addition and subtraction of fractions earlier and multiplication and especially division of fractions later. Fractions forms a building block for other mathematical skills and it is important that learners feel comfortable and confident in understanding of fractions. Researchers argue that children generally perform badly in fractions and that the knowledge of fractions is crucial for success (Booth, Newton & Twiss-Garrity 2014). Competence with fractions is foundational to acquiring more advanced mathematical skills. However, achieving competency with fractions is challenging for many students, especially for those with mathematics learning difficulties who often lack foundational skill with whole numbers. Teaching fractions is also challenging for many teachers as they often experience gaps in their own fractions knowledge. Jessica Namkung Lynn Fuchs

Objectives of the Study

1. To analyze the difficulties experienced by Children with Mathematical Disability (CwMD) of Grades -VI, VII in various criterion measures of the following components of Arithmetic in Grades V-VII:

a) Addition of fractions
b) Subtraction of fractions
c) Multiplication of fractions
d) Division of fractions

Methodology

The methodology related to the participants, tools and techniques method of collection and analysis of data are discussed in this section.

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria. The details of the participants are given below in the Table-1

Table -1

Details of the participants

Type of School	Total No of children in Grades VI and VII in the selected school.			Number of children Identified as CwMD in Grades VI and VII		Number of children included in the study
	Grade	No of Children				
Government	VI	134	234	11	17	6
Private Aided	VI	100		6		3
Government	VII	147	259	9	18	6
Private Aided	VII	112		9		6
		Total Strength 493		Total 35		21

It can be viewed from the above Table that an alarming 7% incidence of CwMD in upper primary school children,

Assessment Instruments and Method of Collection of Data

The data was collected by administering Mathematics Diagnostic Test developed by the investigator.

Brief Description of the Tools

The Mathematics Diagnostics Test developed by Nair Prithi Govindhan, 2015 was used in the study. The test intends to assess the performance level of children in mathematics studying in the Grade –V. The test intends to diagnose specific difficulties exhibited and errors committed by the children of Grade V. The test covers almost all the areas of mathematics of Grade V.

The Mathematics Diagnostic Tests for the Grade –VI and VII were developed by the investigator to know the performance level of children in mathematics studying in the grade VI and VII. The test intends to diagnose the errors committed and specific difficulties exhibited by children in solving the mathematical operations. The test covers almost all the areas of Arithmetic, Algebra and Geometry in mathematics of the grades VI and VII of Karnataka state board Text book of Kannada medium.

Collection of the Data

The data was collected by administering the tests to 21 children of Grades VI and VII who were identified as children with Mathematical Disability. The total tests were administered in small groups of 2 to 3 children in two sessions of about 60 min in order to avoid the fatigue factor. The children were given sufficient time.

The scoring was done with reference to each of the criterion measures of the total tests. However, in the article the data related to Fractions of all the 3 Grades are discussed.

Method of Analysis of Data

The data was analyzed qualitatively. The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the specific difficulties in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) .

Table 2:

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions of Mathematics Diagnostic Test of grade – V (N=21).

Sl. No	Criterion Measures Grade V	Max. Score	M	PA	NA
1	Find the sum of the given fractions	4	40.47	40.13	19.4
2	Writing the decimal form of the fraction (With 10 and 100 as denominator)	1	40.47	40.13	19.4
3	Selecting the correct equivalent fractions	4	34.52	51.2	14.28
4	Selecting the correct equivalent fractions	4	32.14	53.58	14.28
5	Write the missing fractions	1	28.58	0	71.42
6	Find the product of the given measurement	2	23.8	47.63	28.57
7	Find the quotient for the given fractions	2	21.42	59.54	19.04

Table 3:

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions of Mathematics Diagnostic Test of grade – VI (N=21)

Sl. No	Criterion Measures Grade VI	Max. Score	M	PA	NA
1	Writing the Prime Number	2	0	0	100
2	Writing the product of Prime Number	2	0	0	100
3	Writing the missing fraction	2	0	0	100
4	Match the following numbers with the correct factor	4	10.71	32.15	57.14
5	Finding the greatest common factors	2	0	0	100
6	Finding the LCM and HCF by factor method	2	0	0	100
7	Writing the improper fraction to Mixed fraction	2	0	0	100
8	Writing the mixed fraction to improper fraction	2	0	0	100
9	Selecting the correct equivalent fraction	2	0	0	100
10	Fill in the missing fraction	2	0	0	100

11	Using the > or < sign in fraction	2	0	0	100
12	Find the sum of the given fractions	2	0	0	100
13	Addition of fractions (having same denominator)	2	0	0	100
14	Subtraction of fractions (Having same denominator)	4	17.85	53.58	28.57
15	Problem-Solving	2	0	0	100

Table 4

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions in Pre-Test of Mathematics Diagnostic Test of grade (VII) (N=12).

Sl.No	Criterion Measure	Max. Score	Percentage of Masters	Percentage of Partial Achievers	Percentage of Non-Masters
1	Stating whether the given statement is True or False	3	100	0	0
2	Reducing the fractions to the lowest form	2	33.33	0	66.67
3	Addition of fraction	2	0	41.67	58.33
4	Writing the mixed fraction into inverse form	2	0	50	50
5	Identifying Positive and negative fractions	2	8.33	8.34	83.33
6	Classifying into proper, improper and mixed fraction	2	0	0	100
7	Reducing the fractions into lowest form	2	0	0	100
8	Converting the improper fraction to mixed fraction	2	0	0	100
9	Subtraction of fraction	2	0	0	100
10	Fundamental operations related to fractions	4	0	0	100
11	Problem Solving (Word Problem)	2	0	0	100
12	Dividing the whole number by the fraction (Simplification)	2	0	0	100
13	Multiplying fraction by fraction	2	0	0	100
14	Dividing the fraction by fraction	2	0	0	100
15	Writing in inverse fraction	2	0	0	100

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Major Findings of the study

From the analysis of the data the following observations were made

a. In almost all the criterion measures of Fractions considerable percentage of children experienced difficulties.
b. Majority of the participants were found to be partial achievers in attempting the items from the criterion measures pertaining to Fractions of Grade V, the percentage of mastery and non-mastery were less.
c. All participants showed difficulty in almost all the criterion measures pertaining to Fractions of Grade VI with 100% of Non-Mastery, except two of the criterion measures which showed 57.14% of Non-Mastery in matching the numbers with the correct factors and 53.58% of partial achievers in subtracting the fractions having the same denominator.
d. Participants exhibited difficulty in all most all the criterion measures pertaining to Fractions of Grade VII with 100% of Non-Mastery, except in three criterion measures of fractions where 100% of mastery is noticed while stating whether the given statement, exhibiting non-mastery with 58.33% in addition of fraction and 83.33% of non-mastery in identifying Positive and negative fractions.

Fractions have been one of the most difficult mathematical skills to master, for children with and without difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

The performance in mathematics has traditionally lagged at least two grade levels below their peers (Wagner & Blackorby, 1996). The National Mathematics Advisory Panel (NMAP, 2008).

The observations made in the present study supports the findings of the previous studies.

Conclusion

On the basis of the observations made in the study it can be understood Children with Mathematical Disability in the upper primary schools face serious difficulties. The Remedial instructional programmes have to be planned and tried out with systematic research. On the basis of such evidence based programmes teachers have to be trained.

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HIGH SCHOOL PUPILS PERCEPTION ON DIFFICULTIES IN LEARNING OF MATHEMATICAL CONCEPTS-AN ANALYTICAL STUDY

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Abstract

Most pupils find mathematics to be challenging and unfulfilling in their studies. Pupils often choose to discontinue their study of mathematics as soon as they can. However, mathematics is often regarded as vital and occupies a prominent position in the curricula in the majority of countries. Numerous facets of life and a wide range of professions utilise mathematical concepts. Therefore, Pupils' unfavourable attitudes may have a significant impact on their career decisions and ability to contribute to society at large. It has examined a group of Pupils (n = 547) from Karnataka, India, and compiled their opinions on their mathematical learning. Questionnaires were used as the study's primary data gathering instrument.The results reveal that Pupils in grades 9 and 10 in mathematics have a good attitude and a solid understanding of the material. It was observed that there were attitude disparities between what the Pupils expected and what really happened in the classroom while the Pupils were learning mathematics. This research offers suggestions for improving pupils' abilities to solve mathematical problems.

Keywords: Mathematics learning, challenges, perceptions, and field dependence

Introduction-

When examining mathematics education, Brown et al. (2008) discovered that many Pupils believe the subject to be challenging and avoid it whenever feasible. In contrast, mathematics is a very popular topic at all levels in schools and universities in the neighboring nation of Scotland (Scottish Qualifications Authority, undated). This shows that while mathematics may be regarded as difficult and unappealing in some nations, this is not universally true. Sadly, there isn't enough study on mathematics learning to determine whether the causes of the discrepancies can be identified.

One of mathematics' issues comes from the subject matter itself. One objective of math instruction is for pupils to be able to follow steps to get the right answers. The Pupils are urged to put the steps into practice as they work toward achieving this objective. As a result, the methods are learned and afterwards automated in learners' minds (Alenezi, 2008). While this may inspire confidence, it frequently overlooks the need for children to comprehend the why behind their actions. With limited chance to comprehend the meaning of the processes or how they may be used in real-world situations, mathematics can be reduced to a process of rehearsing methods until they are remembered. Almadani et al. (2012) conducted an intriguing study in which factor analysis was used to establish that memory abilities were crucial for performance on exams in arithmetic, with this general conclusion holding true for all academic courses. In certain subject areas, information may be learned, but in mathematics, it was the techniques that were being memorized.

Mathematics places significant intellectual demands on pupils by its very nature. It entails

steps that could seem abstract and unconnected to life. It has often been demonstrated that this exerts enormous demands on Pupils' limited working memory capacity (Reid, 2009). The brain's working memory aids in thinking, understanding, and problem-solving abilities in Pupils. It helps to govern understanding and has a limited capability for people.

The aim of this study is to investigate the degree of field dependence in high school Pupils' mathematical learning. According to Witkin and Goodenough (1981), a field dependent individual is one who is unable to separate an object from its environment. Field-Dependant people are able to accept the prevailing field and unsatisfactorily isolate an item from its context. An organized perceptual field may be readily "broken apart" by field-independent people, who can voluntarily isolate an object from its environment. Experienced math professors frequently hear Pupils comment that they are unsure of where to begin when presented with a mathematical issue. This is a typical indication of working memory issues caused by information overload, and it is at this point that knowledge of the learner trait known as field reliance becomes crucial.

Nearly every country in the world includes mathematics in its core curriculum. In India, math is regarded as a crucial subject for many occupations. Khan (2012) observed that mathematics is not often a subject that Pupils enjoy and that many Pupils choose to drop out as long as they are permitted. According to Ali (2011), it is inadequately taught in India. Teachers, however, are limited to what is prescribed for them to teach. Teachers are frequently compelled to adhere to the procedures outlined in textbooks. Procedures are remembered, rehearsed, and then assessed in formal exams. Credit is awarded for following procedures correctly, which results in the right responses (Mohammad, 2002; Amirali&Halai, 2010).A research done in India clearly demonstrated the superiority of a demanding curriculum created by school instructors over one that was imposed from without and created by people outside the classroom (Ali & Reid, 2012). Therefore, an improper curriculum might be a contributing factor to the issue in mathematics education.

Statement of the Problem

Although mathematics has numerous applications in life, because it is logical in nature and sometimes somewhat abstract, it can be difficult to make these applications practical and approachable to young learners. The current study's focus was "Attitude in Learning Mathematics: High School Pupils' Perceptions, Difficulties, and Field Dependency in their Mathematics Studies.

a. The views and attitudes of high school Pupils toward mathematics were the main goals of the study".
b. The hurdles and difficulties associated with performing mathematics.
c. The association between age and mathematical aptitude and field dependence.

Research Questions

These questions were the focus of this investigation.

a. How do high school pupils view their experiences learning mathematics in the classroom?
b. What challenges do the children have when learning mathematics?
c. What is the connection between kids' field dependence and their math prowess and age?

Significance of the Study

It has hopes to provide light on the solutions to the concrete math problems that Indian secondary school pupils typically encounter. Pupils will benefit from this study by developing their subject-matter mastery in mathematics at the secondary level. There appears to be a significant gap between what Pupils are expected to do and what really occurs in math classes. This study may make recommendations on the majority of secondary mathematics Pupils' lack of ability to solve mathematical problems. This project also plans to investigate why Indian Pupils' lack critical thinking and problem-solving skills, as well as why they are unable to apply their mathematical knowledge in unexpected contexts.

Research Methods and Sample

A quantitative study was conducted on high school Pupils' attitudes toward learning mathematics as well as their experiences in the classroom using a 45-item questionnaire. The questionnaire was created using topics from the literature to investigate the attitudes of high school Pupils about learning mathematics as well as their experiences in the classroom. Cronbach's Alpha, which was 0.94, assessed the internal consistency of 45 items. From Karnataka, India, 647 kids in the science group, ranging in age from 14 to 16, were chosen. In the sample, there were 58 percent pupils in the ninth grade and 42 percent in the tenth grade. There were 43 percent males and 57 percent females, 65 percent urban and 35 percent rural, and 35 percent public and 65 percent private school children. The percentage and chi-square tests were employed to analyse the data, which was acquired during school hours.

Results and discussion

This section presents the general image that may be drawn from the answer data. Perceptions, attitudes, and challenges are addressed in the replies, which are displayed as percentages.

Pupils' perceptions of learning mathematics

The first portion of the questionnaire's Table 1 asks Pupils how they view their mathematical learning.

Table1 Pupils' perceptions of learning mathematics

Statements	SA	A	N	DA	SDA
My lessons are fully understood by me.	44	46	6	3	1
I appreciate my professors' instructional techniques.	53	36	5	4	2
I really do understand how things work in class.	33	48	11	5	3
I dislike having to complete a lot of homework every day.	28	28	15	17	12
I detest household chores since I can't complete them on my own.	19	18	15	24	24
There is enough review in school for me to understand fully.	37	41	7	10	5
For me, taking classes is essential if you want to excel in arithmetic.	41	27	9	14	9
Near the exam, I often become anxious.	20	25	20	20	15
I find it difficult to review the full year's curriculum for the yearly exams.	15	35	10	20	20
I dislike short questions since I can't fully communicate my knowledge in them.	10	16	11	35	28

In math exams, I enjoy multiple-choice problems.	53	28	6	7	6
I am aware that the allotted time for the math paper is inadequate.	28	35	12	20	5
If I'm having trouble comprehending something new, I ask my teacher for assistance.	50	30	5	10	5
When I have trouble comprehending something new, I ask my tutor for assistance.	35	31	10	17	7
Pupils' improved math grades are the result of their own diligence.	51	28	9	6	6
I find it tough to comprehend a subject since I didn't grasp earlier concepts.	17	32	16	25	10
My comprehension is aided by teacher questions in class.	54	34	4	4	4
Only those textbook chapters that are crucial for passing the test are taught.	23	20	10	23	24

(Source: Field survey)

Inference

Table 1 demonstrates many favorable aspects, although in most situations, sizable minority does not concur with the majority viewpoints. This is consistent with the research of Alhmali (2007). who discovered a clear polarization of viewpoints on mathematics. The majority of individuals concurred that they generally comprehend their arithmetic lectures. They are content with the mathematics instruction methods employed and are aware of how to approach arithmetic problems. The research also demonstrates that the majority of participants concur that they want multiple-choice questions to be included in math exams. However, some subjects cause pupils to feel uneasy. Inevitably, Pupils do not want to work too hard and have a tendency to feel concerned as exams draw near. They also do not love studying for math exams.

AttitudeofPupilsinMathematics

What are the students' attitudes regarding their learning in mathematics, according to Table 2 from the second half of the questionnaire?

Students' attitude toward mathematics

Statements	High	Medium	Low
I enjoy mathematics.	50	25	25
I benefit from maths in my daily life.	48	32	20
Mathematics is a topic that I find intriguing	58	32	10
I like maths and I want to study it.	55	35	10
I think it's simple to grasp maths.	58	32	10
Knowing math will be beneficial to my profession.	62	28	10
I can generate thoughts thanks to mathematics.	50	30	20
My interest in maths is crucial.	68	22	10
Rules of mathematics cannot be disproven.	62	28	10

(Source: Field survey)

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Pupils Difficulties in Learning in Mathematics

The information in Table 3 answers queries about the students' struggles with arithmetic learning. Tables 3 and 4 list the themes related to math challenges.

Table3 Grade9thPupils'difficultiesinlearninginmathematics

Grade9, N =275	Easy	Moderate	Difficult	NotTaught
Determiners and matrices	40	30	15	15
Complex and real numbers	40	20	20	20
Logarithms	42	20	18	20
Using algebraic formulae and equations	30	25	25	20
Factorization	40	20	20	20
manipulating algebra	50	20	15	15
Inequalities and linear equations	50	20	15	15
Applications of the linear graph	42	28	10	20
Basics of coordinate geometry	38	32	20	10
symmetric triangles	50	20	15	15
Triangles and parallelograms	45	20	15	20
Bisectors of a line and an angle	50	25	20	05
Triangle's sides and angles	55	15	15	15
Average score	48	22	20	10

(Source: Field survey)

Table 4 Grade10thPupils difficulties in learning mathematics

Grade 10,N =272	Easy	Moderate	Difficult	NotTaught
quadratic formulas	55	20	15	10
Quadratic equations theory	48	22	20	10
Variations	55	25	10	10
incomplete equations	45	25	20	10
Systems and operations	55	30	10	5
simple statistics	50	20	15	15
Trigonometry	55	20	15	10
projection of a triangle's side	48	22	20	10
Circle's chords	55	25	15	5
A circle's tangent	45	25	18	12
Arcs and chords	65	25	5	5
Angle in a circle's section	55	20	15	10
Applied geometry	60	15	15	10
average rating	55	25	10	10

(Source: Field survey)

According to the tables above, Pupils seem to think that the majority of topics are simple and not too challenging. However, a logarithm is the most challenging for kids. Additionally, the replies indicated that parallelograms and triangles are challenging for children as well as the introduction to coordinate geometry. This is consistent with what Ali and Reid discovered (2013). The percentages of Pupils choosing "tough" are substantially greater than in the ninth grade. This pattern closely resembles that which Ali and Reid found (2012). Male and female student data were compared through the use of the chi-square statistic in the evaluation of the results.

Table 5 presents the findings. The majority of participants, according to the data, felt that they understood their arithmetic lectures.They also mentioned that they dislike doing homework since they lack the skills necessary to complete it on their own. The result illustrates how there are little possibilities in India's educational culture to gain greater field freedom. Boys and those attending urban schools tended to have greater levels of confidence in their ability to study mathematics in the total data. The chi-square contingency test was used to examine this, and it was discovered that the differences were significant.

Table 6 Area of school differences in the school mathematics learning

Items	Area	SD	D	N	A	SA	χ^2	df	p
lessonscompletely I understand	Urban	6	16	30	114	152	16.5	2	p <0.001*
	Rural	1	4	6	89	129			
Icannotexpressall short questionsbecause I do not like that	Urban	100	129	45	47	47	19.7	4	p <0.001*
	Rural	41	65	13	44	16			
In class Teacher question helpsmyunderstanding	Urban	21	17	24	133	183	11.7	2	p <0.01*
	Rural	6	12	3	44	104			

The majority of students from urban regions had good attitudes, according to the findings of the Chi square test on mathematics learning related area difference. The majority of urban students said that they fully comprehend their mathematical sessions.

Conclusion

The purpose of this study was to investigate how Pupils perceived math learning and challenges. The results demonstrate that pupils from private schools and metropolitan locations have different viewpoints from those from public schools and rural places. India's educational system is modeled around this, particularly in the public schools. The majority of pupils in India's public schools are from middle- or lower-class families who have lower earnings. They are forced to learn using restricted, outdated, and outdated materials since they lack numerous contemporary facilities. There is a prescribed mathematics textbook for every class in Indian schools. This recommended textbook serves as the only foundation for the test.Instead of imparting to the Pupils a complete understanding of the fundamentals of mathematics, the present teaching style places a great deal of emphasis on getting the Pupils to solve these exercises. As a result, children are currently taught mathematics via memorization of textbook material.

This survey demonstrates that the majority of respondents had favorable opinions on mathematics, with the majority saying that learning mathematics makes people happy. The kids had a positive perception of their mathematical learning. Pupils typically believe mathematics to be a tedious and challenging subject, which is somewhat in contrast to (Brown et al, 2008). The majority of Pupils demonstrated that they did not place as much emphasis on solving problems in class as they should on employing student-centered

approaches in mathematics education. Simply said, the kids' accomplishment in arithmetic is neither praised nor rewarded. Problems arise due to a lack of resources and development programmes for both Pupils and instructors (Memon, 2007; Halai, 1998). Pupils from remote schools in particular brought up the challenges in their mathematics learning experiences because of in experienced staff and insufficient resources (Memon, 2007; Anderson et al., 2005).

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PRESENT TRENDS OF ASSESSMENT

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Abstract

Consistent with 21st Century learning and the benefits brought on by better assessment tools, assessment is becoming more student-centric, offering educators the insights that will help them determine the best instructional next steps and how to make learning more personal for the individual student.

Trading the punitive elements of policies like No Child Left Behind for the growth mindset presented in the Every Student Succeeds Act (ESSA), states are now able and incensed to take advantage of alternatives to the expensive, high-stakes, end-of-level tests that have persisted for decades despite providing little benefit to the students.

Though a list of trends this may be, the growing practice of deliberate formative assessment is here to stay. When educators embed frequent, in-class assessments into daily instruction they're gathering the data they need to identify student levels of understanding, target intervention, and evaluate their instructional practices individually and across their teams.

Formative assessments, whether graded or ungraded, can and should be carried out in a variety of modalities (i.e. paper-and-pencil or online quizzes, verbal cues, informal observations by the teacher, etc), with each providing nuanced insights into student understanding that drive instruction. Teachers and students begin to view assessments as informative rather than punitive. Differentiated, ongoing assessments should address the varied levels of understanding that make up every classroom.

Key Words: Evaluation, Assessment, Teachers, Students, Innovative Methods, Level of understanding.

Introduction

Traditional grading approaches provide letter and/or number grades meant to show a student's overall academic standing, yet this offers students, teachers, and parents little to no insight into what the student has actually learned. When focused on what students actually know and don't know, teachers and stakeholders realize the need to identify deficiencies in a student's learning, using these insights to adjust instruction. Students can work to achieve mastery *prior* to moving on to more complicated skills and concepts. Progression is now based on understanding and readiness, rather than by some other schedule disconnected from the student's needs.

Among the shifting mindsets within K-12 education is the need for schools and districts to move from a culture of collecting data to one of using data. Formative and benchmark assessments provide data teachers can use, in the moment, to improve student outcomes. By upgrading the tech tools used in the assessment process, teachers can simplify and shorten the feedback loop, becoming increasingly accustomed to using data to drive their instruction.

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chers, schools, and entire districts find themselves using common platforms for gathering and using ative and benchmark assessment data, all aligned to common standards, such stakeholders are better able more willing) to collaborate around assessment data to support resource sharing, instructional best ctices, and larger learning trends.

With the unacceptable results of high-stakes testing persisting each year, ESSA offered states much-needed relief with the opportunity to replace end-of-level tests with alternative, 'innovative assessments.'

Among the alternatives being developed, breakthroughs in machine learning have allowed psychometric models (i.e. valid and reliable) that reduce assessment seat times and improve the quality of actionable data. These models can do far more to improve student growth while requiring much less of the students, from a testing standpoint. It's a win across the board, but most importantly for the students and their academic growth.

For many, the word "assessment" translates into multiple choice questions or writing for hours in a crowded exam hall – it is something very defined and has a certain place in our education or career. The huge advancements in computer-based testing are now redefining the possibilities of assessment, particularly in terms of what can be tested, how and when. These advancements mean that there are many more applications for both summative and formative testing, applications that even a couple of years ago would not have been possible.

Based on working with a wide and varied client base, here are the top five trends we've identified that are changing how assessment is delivered:

- 1. Movement away from traditional assessment delivery methods.
- 2. The end of the road for pen and paper.
- 3. Much more engaging and effective assessment.
- 4. Increasing levels of automation.
- 5. Assessments are much more candidate centric.

The use of professional remote invigilation, which recreates the exam hall experience in an online environment, means there is a move away from the use of traditional assessment delivery methods, such as running exams in a test centre. Remote invigilation (also known as online proctoring) means that a secure exam can be run from any location as long as there is an internet connection. This gives a great deal of flexibility to candidates, who can sit their exam at a time and place that suits them, rather than spend time and incur costs associated with taking time off and travelling to a test centre.

Live remote invigilation happens in real-time. This means that for the duration of an exam, an invigilator watches the candidate using video, audio and remote screenshare. The session is recorded and can be reviewed at a later stage if required. Any infringements can be raised as they happen e.g. if the candidate keeps looking away from the screen, the candidate will be advised to stop this behaviour. If infringements are severe e.g. the candidate takes a phone call or someone else comes into the room, the exam may be immediately stopped.

For organisations, the benefits of remote invigilation are numerous, such as a significantly reduced administration overhead, greater security and the ability to cater for candidates in any country worldwide. Exams can also be offered with greater frequency, so instead of one long test available once or twice a year, there may be multiple shorter tests run closer to the period of tuition.

...t is the gathering of information in the form of data. Students' conceptual knowledge and skill ...e measured and assigned a grade in the form of a number or letter. Concepts are what students ...bout a topic, and skills are what students can do. An evaluation is then made as a way to judge ...t achievement. Administrators also equate student assessment as a method of measuring teacher ...ntability.

...dvantage

The benefits of using effective assessment for learning include:

- Improved relationships between teachers and students.
- Improved attainment and achievement.
- Improved confidence, resilience, and self-esteem amongst learners.
- Improved classroom culture and teaching and learning environments.

Disadvantages

Assessments may have a negative effect on student motivation, particularly for students performing below grade level. Careless implementation of assessments may have negative consequences, especially when the needs of special education students are not considered. Using only a written formal assessment does not provide an overall picture of student achievement. Students that perform better with oral and visual skills or who display superior creativity are at a disadvantage. Basing teacher effectiveness on standardized test scores may encourage teachers to narrow the curriculum to teach to the test. While it is unclear whether alternative assessments are effective, what is clear is that this debate will not be going away any time soon.

Conclusion

Assessments should be an integrated part of learning and development and demonstrate an individual's ability to apply knowledge - rather than just a measure of knowledge at a given time. Using online exam software opens up a suite of useful tools to simplify creation, delivery and marking of a range of assessment types. The trends towards flexible delivery, engaging assessments, automation and a candidate-centric focus are helping organisations move to a model where assessments are far more effective, and where the candidate experience is both positive and engaging.

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HIGH SCHOOL STUDENTS PERCEPTION ON DIFFICULTIES IN LEARNING OF MATHEMATICAL CONCEPTS – AN ANALYTICAL STUDY

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HIGH SCHOOL STUDENTS PERCEPTION ON DIFFICULTIES IN LEARNING OF MATHEMATICAL CONCEPTS – AN ANALYTICAL STUDY

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Abstract

Mathematics holds a relevant and unique place in the school curriculum as it is important for a better living of the individual. But, it is known that most of the students are considering mathematics as difficult. The factors that make mathematics difficult for students to learn included difficulty in remembering the content learned in the previous classes, rapid forgetting of the learned material and the difficulty in understanding mathematics concepts. Further analysis revealed that students who feel mathematics highly difficult tends to believe that they lacks in learning strategies. Such students have lack of self efficacy and feel more difficulty in understanding mathematics. Students who feel Mathematics as highly difficult tends to forget it faster. Conversely students who feel mathematics as fairly easy reports their teachers teaching them well and understanding the concepts quickly. It was noted that the students who feel Mathematics as highly difficult tends to leave the task with little effort than those who feel the subject easy. According to teachers, students' lack of effort and prerequisites are the major reasons for mathematics being a difficult subject for students. Reluctance to seek help from others, inattention in the classroom and students' lack of motivation were also perceived to contribute toward difficulty in learning mathematics. Teachers reported also that, lack of relevant prerequisites, difficulty in speedy grasping of the concepts and more number of students in a classroom are causing difficulty in teaching mathematics. The findings indicate the need for teachers to realize the importance of making school mathematics interesting for students to take effort in learning it. The result is discussed in relation to students' beliefs and study strategies.

Keywords: Mathematics Learning, Teaching, Self-Efficacy, Learning Strategy, Mathematics Difficulty, Learner Beliefs, Teacher Beliefs.

Introduction

Mathematics emerged as a subject of study along with civilisation. In the present scenario mathematics is absolutely necessary subject for living. This importance is evident in school curriculum and in the importance given to mathematics education.

Learning of mathematics results in both cognitive as well as affective outcomes. To learn anything both experience and practice are necessary. There are several types of learning like motor learning, verbal learning, concept learning, discrimination learning and problem solving. Most of the learning in mathematics belongs to the categories of concept learning, principle learning or problem solving. As these types of learning are higher order learning processes cognitive activity and effort from the part of learner is essential. Role of effort in the process of learning is pointed in the initial theories of learning itself. When we consider the cognitive part of mathematics learning, it goes through a higher

cognitive processing because Mathematics learning requires higher cognitive processes especially because of interrelated and abstract nature of mathematics content and processes.

Factors affecting Mathematics Learning

Learning in particular mathematics learning is complex type of performance in human cognition. It is affected by many factors like short term memory, long term memory, ability to memorize mathematical facts, visual and spatial perceptual abilities. The degree of influence of these factors may be relative. Previous researches identified many reasons for students' difficulties in learning mathematics. There are cognitive, affective and environmental factors contributing to differences in students' learning of mathematics.

Educational psychologists had studied the relation of mathematics learning with certain cognitive factors. Mathematics is found affected by intelligence, working memory and processing speed. Murayama, Pekrun, Lichtenfeld and vom Hofe (2013) found that intelligence is strongly related to achievement in starting stage but motivation and use of cognitive strategies predicted the growth of achievement. In determining a student's achievement, their attitude is rather important than inability to study. Students like and dislike towards mathematics as well as their belief about efficacy are influencing their learning as well.

Factors external to the learner also are known to influence learning mathematics. Mbugua, Kibet, Muthaa and Nkonke (2012) reported the findings of Chepchieng (1995) that achievement of secondary school students is strongly related to the availability of quality textbooks. And they found under staffing, inadequate teaching or learning material, lackof motivation and poor attitudes by both teachers and students are some major factors contributing to poor performance in mathematics education. Parental involvement and help from other family members has shown significant improvement in students' achievement.

Significance of present study

A subject like mathematics, having a cumulative nature, can't be taught without relevant prior knowledge. It differs from other school subjects for many reasons like its abstract nature, demand of higher cognitive process and engagement and perseverance from learner. It is found that as the students move to higher grades, due to reasons including their lack of previous knowledge they are getting worse in mathematics.

Difficulty in learning mathematics is found as a common and significant problem throughout the school years. As per Annual Status of Education Report (ASER, 2014), 50% of standard fifth students not achieved even the standards of grade two and 44% of eighth standard students not achieved even basic skills in the arithmetic. Also they reported a worrying pan Indian trend that students' arithmetic skill has been dropping since 2010. In 2010, percentage of eighth standard students who could do division of three digits by one digit was 68.3%, but in 2014 it fell down to 44.1%. That is close to half of population still not have basic skills; and even it is falling. From this point the authors felt a necessity to study the causes that make mathematics learning difficult for students. For taking further action to improve students' mathematics learning, it is necessary to analyze the causes. This study is analyzing students' affective beliefs and teachers' perception regarding students' difficulties in mathematics instead of analyzing the content mastery of relevant prior knowledge. Teachers were probed through semi structured interview about possible reasons for students' difficulties in learning mathematics and then teacher cited reasons were used to probe into student perceptions.

Discussion

Students' report and teachers' perception indicate that the major cause for mathematics being difficult for students is lack of previous knowledge. Without relevant previous knowledge it is difficult and even impossible to learn mathematics in the higher classes. And, as per content and structure of existing curriculum, teachers have been reporting that it is hard to allow more time for renewing previous knowledge. However it is meaningless to teach seventy five percentages of students who lack the basics about newer contents. Teaching students without prior knowledge promotes mechanical or rote learning. Gradually students tend to believe that they are not fit to learn mathematics or they would not able to learn mathematics. Here students attributing failure or backwardness in mathematics to an internal, stable and uncontrollable cause, but actually it were an internal controllable reason. So teachers should spend some more time for making relevant prerequisites and to make them aware that problem lies with their learning strategy. Otherwise difficulty becomes progressive and as they move on to higher class students' achievement in mathematics will go down.

Learning of mathematics is comparable to construction of a complex structure; knowledge of basics determines the students' meaningful understanding of mathematics. So whatever barriers may be there it is important to strengthen essential basics. Also as per cognitive load theory, during problem solving subject need to first identify the categories of problem and the required moves. If the subject lacks in particular schema they would have immense difficulty in solving problem, and the cognitive load will be high; larger the supporting schema, better the learning would be.

Students feel that reason for lack of previous knowledge is the rapid forgetting of learned material. Generally, cause for forgetting is the absence of deep processing of the material or improper coding. Deeper learning strategies promote deeper processing and hence long term memory. But majority of the students are following strategies like just memorizing equations or repeating the class notes. Students are approaching different portions as different, and not connecting the new with existing. Unstructured knowledge is susceptible to forgetting; to be successful in mathematics students need to create a rich, integrated knowledge structure.

Hay Meber (2000) reports that students' progress is highly influenced by teacher quality and effectiveness rather than other classroom, school and student factors. Present study found that teacher effectiveness can be a relevant factor in making mathematics easy for those who felt mathematics as an easy subject; but those who feel mathematics as a difficult subject, did not attribute it to teaching. This finding resonates with that of Haimowitz (1989) who observed that insufficient or inadequate instruction is not the cause of most failures in the school, but active resistance by the learner is a reason. Hence teacher can only make mathematics learning easy to those students who felt mathematics as an easy subject, but not to those who felt mathematics as a difficult subject.

Affective variables are an integral part of cognitive development. Students' expectancy about the difficulty of mathematics should be given serious concern, because expectancy of the difficulty is found associated to many negative beliefs and thoughts, whereas positive expectancy had association with positive believes only. When considering students' motivational beliefs, many students lack self-efficacy for learning mathematics. Self efficacy, person's belief about his own ability to accomplish or succeed in a task, has found to significantly affect cognitive processes, motivational processes, affective processes and selection processes. When a student perceives himself as incapable to learn mathematics, s/he tends to leave situation or shunning effort when confronted with difficult problems.

Majority of students are following surface learning strategies like just repeating the class work and memorizing equations, most of the students are not trying to solve problems in textbook by

themselves. And teachers' report indicating that students possess less control over their learning in essence.

The most relevant reason observed by teachers for students' difficulties in learning mathematics is lack of sufficient effort by students, and they were not that much aware about the role of students' self-efficacy for learning mathematics.From this point it is relevant to discuss the reasons for less effort by students. Motivational research finds lack of self-efficacy and interest as major reasons for not taking effort. Thus foremost step for promoting students effort taking behavior is the enhancement of students' self efficacy and interest for learning mathematics.

Implications

- Before starting a new topic, the related previous content should be revised and mastered.
- Instruction should be designed in a manner that reduces cognitive load by prior development of relevant scheme.
- Knowledge should be well structured and connected to previous content to promote meaningful understanding and memory.
- Students' should be instructed to follow deeper learning strategies so as to improve understanding and memorization.
- Students should be given problems that promote metacognition instead of blind drill work.
- Students' self-efficacy, expectancy beliefs regarding mathematics to be finely tuned to– increase their effort.
- Provide clear the curricular goals to students and help them to set their own goals.
- Make students confident that ability can be improved through effort and effort is– important than ability

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IMPACT OF MULTIMEDIA APPROACH ON THE ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN SCIENCE

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ABSTRACT : *Science and Technology have played a crucial role in shaping the world we live in today. The integration of Science and Technology in education has transformed the way we teach and learn. It has opened up new possibilities for enhancing learning experiences and improving educational outcomes. The present study was carried out by the investigator to compare the effectiveness of the Multimedia approach and the Normally Practiced method of teaching on achievement in science among secondary school students. Multimedia Approach is one of the most important tools of ICT, which will provide a theoretical background to the student, enhanced by the use of different media such as sound, video, text, pictures and animations. These multimedia presentations aim at providing the students with a realistic description of the topic and enhance greatly their interest, retention and effective learning. The investigator experimented using MMA (Multi Media Approach) on experimental group and NPM(Normally Practiced Method) on control group after equating them using Pre-Test and Post-Test was administered on both groups to study the Impact of Multimedia Approach and Normally Practiced Method for comparative analysis.*

Keywords: *MMA, NPM, Achievement in Science.*

I. Introduction

In recent years, there has been a growing interest in the use of multimedia resources such as videos, animations, and simulations in the classroom, particularly in the field of science education. Multimedia resources offer a range of benefits for teaching and learning , including increased engagement, enhanced retention, and improved understanding of concepts. However, despite the potential benefits of multimedia, there is a need to assess the effectiveness of these resources in achieving learning outcomes, particularly in the field of science. This study aims to explore the impact of multimedia resources on the achievement of science among secondary school students. The study will investigate the effectiveness of using multimedia resources in the classroom and whether they can lead to improved learning outcomes, such as increased knowledge retention and improved academic performance.

Need and Importance of the Study

A multimedia approach is essential in teaching because multimedia resources such as videos, animations, and simulations can make learning more engaging and interactive. These resources can capture students attention and help them understand complex concepts in a fun and interesting way. Multimedia resources can also help to provide visual representations of abstract concepts and processes that are difficult to explain through words or static images. Visuals can help to improve retention and understanding of concepts , especially for visual learners, and multimedia resources can provide learning opportunities for students with different learning styles. Students can learn through auditory, visual and kin-esthetic modes which can help to improve learning outcomes and engagement. They can be accessed from various locations, providing students with the flexibility , to learn at their own pace and in their preferred environment. This can help to promote self-directed learning and increase motivation. Multimedia resources can provide authentic and real life experiences that cannot be replicated in the classroom. Multimedia approach is essential in the study because it captures students attention and make learning more engaging. This can help to increase student participation and motivation, leading to better

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learning outcomes. It promotes active learning by providing opportunities for students to interact with the material and accessed from anywhere, at any time, providing flexibility for both teachers and students. It enhances and supports teacher effectiveness by providing them with additional tools to teach difficult concepts in the learning process.

Teaching of science as the nature of science demands should have more scope for direct and purposeful learning experiences ultimately leads to promotion of rationality and scientific attitude among students. This demands for a shift from conventional method of learning to modernize experiential learning., that ignites multi-sensory perception. In the context of constructiveness for teacher can use varieties of methods, approaches and strategies that are supported with contextual usage of varieties of media. This termed "Multimedia Approach of Teaching Science".

II REVIEW OF RELATED STUDIES

Review related literature on the study of Impact of Multimedia Approach on the achievement in science among secondary school students in India

There have been several studies examining the impact of multimedia approach on the achievement in science among secondary school students in India. Below is a brief review of some of the relevant literature:

A study by **Singh and Agarwal (2014)** investigated the impact of Multimedia approaches on the achievement of Science among secondary school students in India. They found that Multimedia instruction significantly improved students understanding of science concepts and their ability to apply these concepts to real world situations.

Another study by **Chiryali and Mathew(2016)** examined the effect of multimedia-based teaching on the achievement of science among secondary school students in kerala, India. They found that students who received multimedia-based instruction had higher test scores and better understanding of science concepts compared to students who received traditional instruction.

A study by **Yadav and Yadav(2016)** investigated the impact of multimedia approaches on the achievement of science among secondary school students in Haryana, India. They found that multimedia instruction significantly improved students scores on science tests and increased their interest in science.

A study by **Nagaraju and AnilKumar(2018)** investigated the impact of multimedia approaches on the achievement of biology among secondary school students in Karnataka, India. They found that multimedia instruction significantly improved students test scores and increased their interest in biology.

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.

Kaur and Singh (2015) investigated the effect of multimedia approach on the development of scientific attitude among secondary school students in India. The study revealed that multimedia approach positively influenced the students' scientific attitude, which in turn enhanced their achievement in science.

Reddy and Jha (2017) conducted a study on the use of multimedia approach in teaching physics to secondary school students in India. The study showed that multimedia approach had a significant impact on the students' achievement in physics and helped develop a positive attitude towards the subject.

Kumar et al. (2018) investigated the effectiveness of multimedia approach in teaching biology to secondary school students in India. The study found that multimedia approach significantly improved the students' achievement in biology and helped develop a positive attitude towards the subject.

Overall, these studies suggest that the use of multimedia approaches in science instruction can improve student achievement and interest in science among secondary school students in India, However, it is important to note that the effectiveness of multimedia approaches may depend on several factors, such s the quality of the materials used and the instructional design.

III METHODOLGY

Statement of the Problem

The title of the study is **"Impact of Multimedia Approach on the Achievement of Secondary School Students in Science".**

Objectives of the study

1. To compare the achievement of Secondary students in Science, taught using MMA and NPM.

2 To find out the impact of MMA on the achievement of Secondary students in Science, in total.

3 To compare the achievement of Secondary Boys and Girls in Science , when taught using MMA.

4 To compare the Achievement of Secondary Boys taught using MMA and NPM.

5 To compare the Achievement of Secondary Girls taught using MMA and NPM.

Hypotheses of the study

The major hypotheses formulated for the study in Null form are:

1..There is no significant difference in the achievement of Secondary students in Science taught using MMA and NPM.

2. There is no significant impact of MMA on the achievement of Secondary students in Science.

3.There is no significant difference in the achievement of Boys and Girls taught using MMA.

4.There is no significant difference in the achievement of Secondary Boys taught using MMA and NPM.

5.There is no significant difference in the achievement of Secondary Girls taught using MMA and NPM.

Variables

The following variables are considered in the study:

1. Independent variable- Methods of Teaching science.: a)Multimedia Approach[MMA] b)Normally Practiced Method [NPM].
2. Dependent variable- Achievement in Science
3. Intervening variable – Gender[Boys and Girls]

Operational Definitions

MultiMedia approach

Multimedia approach is an approach of teaching in which different media are incorporated to make the teaching-learning process more effective, enthusiastic, inspirational, meaningful and interesting. It refers to the application and usage of diversified instruments, gadgets and electronic devices of multi-sensory perception, as well, advanced modes of curriculum transaction and evaluation, using internet, LCD, smart class, CAI, Virtual class room, Dry lab and other media in schools in the present study MMA includes..

In the present study, the Multimedia Approach [MMA] of teaching science includes using of .Projected materials included Text on Screen, Diagrams, Animated Pictures, Video Clips and Graphics Pictures. Related to physics, chemistry, biology , concepts of secondary science Visuals included Models, Specimens, Charts and Chalk board, Print Media included Work sheets, Books (text, reference), and Oral Media included Explaining, Questioning and Group Discussion on topics related to science .

NPM: Normally Practiced Method of teaching refers to the conventional or usually practiced methods of teaching-learning, which normally involve explaining the content by the teacher, followed by questioning and dictation of notes using chalk board and charts or models.

Achievement in Science

Achievement in Science refers to an increase in the Knowledge, Understanding, Application ,Attitude and Skills of students when they are taught Science. Normally achievement of students with respect to improvement in the levels of achieving aforesaid objectives in terms of scores gained in Science Test. In the present study achievement of Secondary students in science is measured in terms of scores gained by the students in pre and post test .

Gender: It refers to difference in students, as Boys and Girls based on Sex.

Population , Sample and Sampling Procedure: Population for the present study consists of two hundred 9th standard students studying in two selected Private Unaided Schools located in the city of Mysuru with English as the medium of instruction. . To draw this sample **"Stratified Proportionate Random Sampling Procedure " was employed.**

Experimental Design

Two Group –Pre-Test and Post Test design was employed

General Achievement Test in Science: In the beginning a general achievement test was administered on all the 240 students on four sections of two schools, finally after equating the scores gained, 200 students were selected for the study that included 100 from each school. 100 students of Nataraja English medium school were considered as experimental group and they were taught using MMA, on

the other hand 100 students of Vidya Vikas English medium school formed control group and were taught same lessons using NPM. Then post test was administered to find out whether any significant differences exist.

A General Science Achievement Test was administered in the beginning on all 240 students of two schools (NES and VVES) in order to select two equated groups of 100 students of each school. Further 100 students of Nataraja English Medium School [Experimental Group] and 100 students of Vidya Vikas Public School [Control Group] were administered with pre- test, so as to know their existing levels of Knowledge, Understanding, Application, Attitude and Skills related to a few selected Science concepts. This was followed by Experimental Group treatment given to Experimental Group, by teaching the concepts using MMA and the control Group using NPM.

Treatment

For the present study, Experimental Method of research was used by the researcher.

Two Group –Pre-Test and Post Test design was employed. Students of Experimental Group were exposed to teaching Physics, Chemistry and Biology of 9th standard science using MMA, on the other hand students of Control Group were taught the same concepts with NPM that included teaching of science using explanation followed by questioning and giving notes.

Tools used in the study

In order to obtain data on the variables considered in the study, the following tools were used.

1.Achievement test in Science for equating the groups

2.Achievement Test in Science (Pre-test)

3. Achievement test in Science (Post-test)

4. MM Package on selected concepts of science

5. All the achievement Tests in Science were developed by the researcher.
6. Multimedia Instructional Package in Science was also developed by the Researcher.

Procedure for Collecting Data

Achievement test in science for class 9th students was developed and administered by the researcher on both control group and experimental group to assess their achievement in science. Both the groups were taught for a period of six months. Controlled group was taught selected science concepts using NPM and students of Experimental group were taught the same concepts using MMA. Further the achievement test in science developed by the researcher was administered on both the groups to know their achievement in science after treatment. Scores obtained from both the groups in pretest and post test were compared and also the difference of achievement in science between control and experimental group were estimated using suitable statistical techniques.

Statistical Technique employed

Statistical Techniques such as Mean, SD, t-test and ANOVA were employed for Analysis and Interpretation of the Data.

III Analysis and Interpretation of Data

In order to test the Objectives, Hypotheses have been formulated and tested for their significance level, Appropriate Statistical Techniques i.e. Mean, Standard Deviation and t-test were computed for the gain scores of Experimental and Control group for measuring Achievement in Science.

Analysis of Gain in Achievement in Science

Comparison of Gain Scores of Experimental and Control group in Science.

Mean pre test scores on science achievement of experimental and control groups and results of Independent sample 't' test

Table 1

Mean pre-test and post-test scores on science achievement of students of experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.28	3.92	35.17	3.43	7.89
MMA	26.77	3.86	47.14	3.52	20.37
Total	27.03	3.89	41.16	6.93	14.03
Test statistics	Gain (overall) = F =2515.453; p=.001 Gain (groups) = F =490.576; p=.001				

In the case of science achievement scores, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 2515.453 was found to be highly significant at .001 level. In the pre-test the mean achievement scores was 27.03, which has been increased to 41.16, with an increase of 14.03 scores, which was found to be significant. Further, group wise comparison revealed that the experimental group had significantly increased its achievement scores (F=490.576; p=.001), where the gain is as much as 20.37 scores (pre-test 26.77; post-test 47.14), as against control group which has gained only 7.89 scores (pre-test 27.28; post-test 35.17). This clearly indicates the effectiveness of intervention in increasing the achievement in science.

Table 2

Mean pre-test and post-test scores on science achievement of students in the experimental group

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
MMA	26.77	3.86	47.14	3.52	20.37
Test statistics	Paired samples t = -37.55; p=.001				

Paired samples t revealed a significant increase in the scores of students under experimental group. An increase of 20.37 scores from pre-test (mean 26.77) to post-test (mean 47.14) was found to be highly significant (t= t = -37.55; p=.001).

Table 3

Mean pre-test and post-test scores on science achievement of boys and girls in the experimental group

Gender	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
Boys	27.20	3.87	47.36	3.82	20.16
Girls	26.34	3.84	46.92	3.21	20.58
Total	26.77	3.86	47.14	3.52	20.37
Test statistics	Gain (gender) = F =0.149; p=.701				

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Repeated measure ANOVA revealed a non-significant difference in the science achievement scores from pre- test to post- test situation. Both the genders gained equally after intervention (F=0.149; p=.701). Boys have gained a mean score of 20.16 whereas girls gained a mean score of 20.58, which were statistically almost the same.

Table 4: Mean pre-test and post-test scores on science achievement of boys in the experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.64	3.91	35.36	3.46	7.72
MMA	27.20	3.87	47.36	3.82	20.16
Total	27.42	3.88	41.36	7.04	13.94
Test statistics	Gain (overall) = F =1110.55; p=.001 Gain (groups) = F =221.102; p=.001				

In the case of science achievement scores of boys only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1110.55 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 27.42, which has been increased to 41.36, with an increase of 13.94 scores, which was found to be significant. Further, group wise comparison revealed that boys in the experimental group had significantly increased their achievement scores (F=221.102; p=.001), where the gain is as much as 20.16 scores (pre-test 27.2; post-test 47.36), as against control group which has gained only 7.72 scores (pre-test 27.64; post-test 35.36).

Table 5

Mean pre-test and post-test scores on science achievement of girls in the experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	26.92	3.94	34.98	3.43	8.06
MMA	26.34	3.84	46.92	3.21	20.58
Total	26.63	3.88	40.95	6.85	14.32
Test statistics	Gain (overall) = F =1414.723; p=.001 Gain (groups) = F =270.259; p=.001				

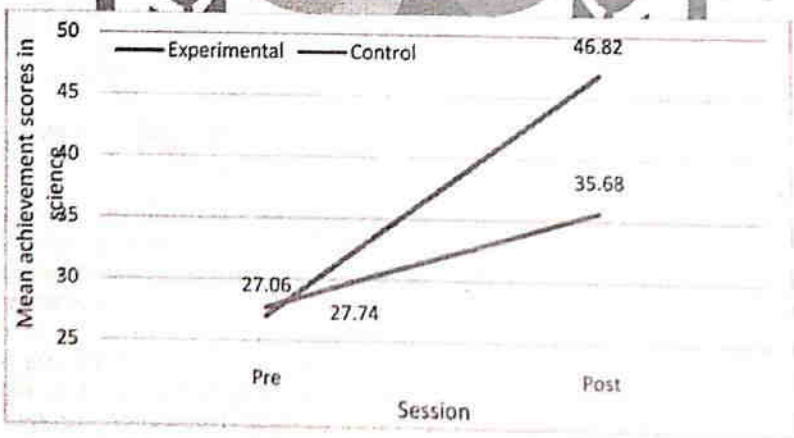
In the case of science achievement scores of girls only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1414.723 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 26.63, which has been increased to 40.95, with an increase of 14.32 scores, which was found to be significant. Further, group wise comparison revealed that Girls in the experimental group had significantly increased their achievement scores (F=270.259; p=.001), where the gain is as much as 20.58 scores (pre-test 26.34; post-test 46.92), as against control group which has gained only 8.06 scores (pre-test 26.92; post-test 34.98)

Descriptive Statistics

	Group	Mean $\bar{x}$	Std. Deviation (σ)	N
pre science total	NPM	26.9200	3.93747	50
	MMA	26.3400	3.83651	50
	Total	26.6300	3.87860	100
Post science total	NPM	34.9800	3.42553	50
	MMA	46.9200	3.21248	50
	Total	40.9500	6.84957	100

Graph

Mean pre test and post test scores on achievement in science of students in experimental and control groups



IV Major Findings of the Study

The major findings of the study were :

1. Comparison of Mean pre-test and post-test scores on science achievement of students in experimental and control groups, comparison of group revealed that the experimental group had significantly increased in achievement scores.. This clearly indicates the effectiveness of intervention of MMA in increasing the achievement in science.

2. Comparison of Mean pre-test and post- test scores on science achievement of students in the experimental group revealed that there is a significant increase in the scores of students of experimental group. The result implies that the multimedia approach is more effective on the achievement of science

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3. The Mean pre-test and post-test scores of Boys and Girls of experimental group have significantly higher scores as compared to control group.

4. The Comparison of Mean pre-test and post- test scores on science achievement of Boys in the experimental and control groups revealed that experimental group scored significantly higher as compared to control group.

5. The Comparison of Mean pre-test and post- test scores on science achievement of girls in the experimental and control group revealed that girls in the experimental group had significantly increased in their achievement scores.

Conclusion

The present study concludes that, MMA of teaching science proved to be better than the NPM in teaching of science, When the control group students were taught some concepts of science by the NPM and experimental group of students were taught by MMA. It was found that the achievement of experimental group was higher when in science compared to control group , experimental group was better. Therefore MMA of teaching science is more effective in fostering science achievement. Multimedia teaching approach was very significant with respect of achievement in science among both boys and girls.

The Impact of Multimedia on the achievement in science among secondary school students appeared to be positive. The use of multimedia, such as videos, animations and simulations, can enhance students understanding of science concepts with an increase in their motivation and their engagement in science learning.

Multimedia can provide students with visual and interactive representations of scientific phenomena that may be difficult to understand through conventional methods, such as lecture method.

Additionally, multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style.

However, it is important to note that the effectiveness of multimedia in science education depends on the quality of the multimedia materials, as well as how they are integrated into the curriculum transaction. Teachers must have appropriate training and support to effectively incorporate multimedia into their teaching practices.

Furthermore, whole multimedia can be a valuable tool in science education, it should not replace hands on, experiential learning opportunities, such as laboratory experiments and field based learning experiences. These types of activities can provide students with important skills, such as critical thinking and problem solving, that are essential for an enhanced in science.

Overall, the use of multimedia in science education can have a positive impact on the development of achievement in science among secondary school students, but it should be used in conjunction with other teaching strategies and implemented carefully and thoughtfully.

EDUCATIONAL IMPLICATIONS:

There are several educational implications that can be drawn from the study onthe impact of multimedia on the achievement of science among secondary school students in India.

1. **Incorporate multimedia into science curriculum:** The study suggests that multimedia can enhance students understanding of science concepts and increase their motivation and engagement in science learning. Therefore, education in India should incorporate multimedia, such as videos, animations and simulations, into their science curriculum to support student learning.
2. **Provide training to teacher:** Teachers should receive training on how to use effectively multimedia in their teaching practices. This includes selecting appropriate multimedia materials and integrating them into the curriculum in a meaningful way. Teacher training programs can be designed to help teachers become proficient in using multimedia and to promote effective teaching practices.
3. **Encourage hands on, experiential learning :** Whole multimedia can be a valuable tools. It should not replace hands on experiential learning opportunities. Therefore, educators in India should encourage laboratory experiments and field work, which can provide students with important skills, such as critical thinking and problem solving.
4. **Foster personalized learning experiences:** Multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style. Therefore, educators in India should design learning activities that enable students to personalize their learning experiences and get opportunities for self directed learning.
5. **Consider accessibility:** In India, access to technology and the Internet can be barrier to implementing multimedia in education. Therefore, educators should consider accessibility issues and ensure that all students have access to multimedia materials, regardless of their Socioeconomic background.

Overall, the study suggests that incorporating multimedia into science education in India can have a positive impact on students achievement. However, it is important to implement multimedia thoughtfully and carefully. While also providing opportunities for hand on experimental learning.

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IMPACT OF MULTIMEDIA APPROACH OF TEACHING SCIENCE ON THE DEVELOPMENT OF SCIENTIFIC ATTITUDE AMONG SECONDARY SCHOOL STUDENTS

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Abstract : *The process of teaching -learning can be made interesting, more effective and child-centered, when technology is made use appropriately. Many technology interface media like smart classrooms, blended leaning and multimedia approach are helping teachers and students in this regard. The aim of the present study was to investigate the impact of multimedia approach in teaching science on the development of scientific attitude among secondary school students. The main Objectives of the study have been to find out the effectiveness of Multimedia Approach(MMA) on the development of scientific attitude in teaching science. And to find out the effectiveness of Multimedia Approach of teaching Science on the development of Scientific Attitude among boys and girls. Sample for the present study two hundred students of 9th standard , 100 students of Vidya Vikas High School and 100 students of Nataraja English Medium school in the Mysuru city. Selected sample was divided into two groups - An Experimental group and a Control group. The experimental group received instruction through MultiMedia Approach (MMA), while the control group received the same through Normally Practiced Method (NPM). Test on Scientific Attitude was administered to assess the development of scientific attitude in both the groups before and after the intervention*

KEYWORDS: MMA, NPM, Secondary School Students, Scientific Attitude

I. INTRODUCTION

Science is an inevitable and integral part of secondary school curriculum, as it helps students to develop critical thinking, problem solving, and inquiry-based skills. Developing scientific attitude is an essential part of the science learning process, as it helps students develop a deeper understanding and appreciation of science. The use of multimedia resources can enhance the development of scientific attitude among secondary school students. Incorporating multimedia resources such as videos, animations, simulations, and interactive activities can create a more engaging and dynamic learning environment for students. This approach can help students to understand scientific concepts more easily, leading to improved comprehension and retention of information. By stimulating curiosity and encouraging inquiry, multimedia resources can help to promote a more active and reflective approach to learning, which is essential for developing scientific attitude.

Furthermore, the use of multimedia resources can facilitate collaboration among students, allowing them to work together to explore scientific concepts and solve problems. This can help to develop social skills as well as scientific skills. In total multimedia approach can create a more immersive and interactive learning experience, which can foster the development of scientific attitude among secondary school students. In conclusion, the use of multimedia resources in science education can help to promote the development of scientific attitude among secondary school students. By promoting engagement, improving comprehension, encouraging inquiry, and infusing collaboration, multimedia resources can help to create a more dynamic and effective teaching and learning process.

NEED AND IMPORTANCE OF THE STUDY

There are several reasons why studying the impact of multimedia approach on the development of scientific attitude among secondary school students is important.

Firstly, scientific attitude is essential for the progress and development of any society, and education plays a critical role in shaping such attitude. By examining the impact of multimedia approach on the development of scientific attitude, researchers can gain insights into how effectively teach science to students and promote a scientific mindset among them, using diversified multimedia resources.

Secondly, multimedia is becoming increasingly prevalent in education, particularly in science education, as it can enhance students engagement and comprehension of abstract scientific concepts. However, it is important to assess the effectiveness of this approach in developing scientific attitude, which encompasses not only knowledge but also critical thinking, curiosity, skepticism, and a willingness to learn, with more scope for enhancing science process skills.

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Thirdly, secondary school education is a critical period in students life as they are developing their identity and values, including their attitudes towards science. Therefore, understanding the impact of a multimedia approach on the development of scientific attitude among secondary school students can have long-term implications for their career choices with more scope for enhancing choices and contributions to society.

Finally, India is a rapidly developing country that has placed a strong emphasis on science education and innovation. As such, investigating the impact of multimedia approach on the development of scientific attitude among secondary school students in India can provide valuable insights for policy-makers and educators to improve the quality of science education in the country.

Overall, studying the impact of multimedia approach on the development of scientific attitude among secondary school students is essential for promoting a scientific mindset among students, improving the impact of science education, and contributing to the progress and development of the country.

Review of Related Studies

Review related literature on study on Impact of Multimedia Approach on the Development of Scientific Attitude Among Secondary School Students in India.

There have been several studies examining and below is a brief review of some of the relevant literature.

Singh and Bagwe (2017) Conducted a study on the relationship between scientific attitude and academic achievement among secondary school students in India. The study found a positive correlation between scientific attitude and academic achievement, suggesting, promoting a positive attitude towards science can lead to better academic performance.

Joshi and Pathak (2018) Conducted a study on the scientific attitude of secondary school students in India. The study found that students had a generally positive attitude towards science, but also identified areas of improvement, such as increasing student interest and engagement in science.

Rana and Rastogi (2015) a conducted study on the impact of multimedia on the development of scientific attitude among secondary school students in India. The study found that the use of multimedia had a positive effect on students attitude towards science, particularly among female students.

Malhotra and Bhattacharjee (2016) conducted a study on the influence of parental involvement on the scientific attitude of secondary school students in India. The study found that parental involvement, particularly in the form of discussions and activities related to science, had a positive impact on student's attitudes towards science.

Overall, these studies reveal that scientific attitude among secondary school students is influenced by a variety of factors, including academic achievement, interest and engagement in science, multimedia, and parental involvement. Further research is needed to better understand and factors that contribute to scientific attitude among secondary school students to develop effective strategies for promoting a positive attitude towards science.

I METHODOLOGY:

Statement of the Problem

The Title of the study is **"Impact of Multimedia Approach of Teaching Science on the Development of Scientific Attitude among Secondary School Students."**

Objectives of the study

1. To compare the Scientific Attitude of Secondary School students in Science, taught using MMA and NPM.
2. To find out the impact of MMA on the development of Scientific Attitude of Secondary School students in science in total.
3. To compare the development of Scientific Attitude of among Boys and Girls who were taught using MMA.
4. To compare the Scientific Attitude of Secondary Boys who were taught Science using MMA and NPM.
5. To compare the Scientific Attitude of Secondary Girls who were taught Science using MMA and NPM.

Hypothesis of the study

The major Hypotheses formulated for the study in Null form are:

1. There is no significant difference in the Scientific Attitude of Secondary school students who were taught using MMA and NPM.
2. There is no significant difference in the Impact of MMA on the Scientific Attitude of Secondary students in science.
3. There is no significant difference in the Scientific Attitude of Boys and Girls taught using MMA.
4. There is no significant difference in the Scientific Attitude of Secondary School students of Boys taught using MMA and NPM.
5. There is no significant difference in the Scientific Attitude of Secondary School of Girls taught using MMA and NPM.

Operational Definitions

Multimedia Approach: Multimedia approach is an approach of teaching in which different media are incorporated to make the teaching-learning process more effective, enthusiastic, inspirational, meaningful, and interesting. It refers to the application and usage of diversified instruments, gadgets and electronic devices of multi-sensory perception, as well, advanced modes of curriculum transaction and evaluation, using internet, LCD, smart class, CAI, Virtual classroom, Dry lab and other media. In the present study, multi-media approach(MMA) of teaching science includes using of projected materials like text on screen, diagrams, animated pictures, video clips and graphics pictures. Related to Physics, Chemistry, Biology; Concepts of secondary science visuals included models, specimens, charts and chalk board; print media included worksheets, book(text, reference) ; and oral media included explaining, questioning and group discussions on topics related to science.

NPM: Normally Practiced Method of teaching refers to the conventional or usually practiced methods of teaching-learning, which normally involve explaining the content by the teacher, followed by questioning and dictation of notes using chalk board and charts or Models.

Scientific Attitude: Scientific Attitude is defined as a way of looking into things that are governed by facts which are known as well as demonstrative. There are certain attitudes that should be considered to be a successful scientist. These are curiosity, careful judgments, open mindedness, critical mindedness, objectivity, rationality and intellectual honesty. Scientific Attitude refers to willingness to change opinion, desire for completeness of knowledge and acceptance of warranted generalizations. It's a way to look at everything rationally and with a Scientific mind set.

Gender: It refers to difference in students, as Boys and Girls based on sex.

Variables

The following variables are considered in the study

1 Independent Variables- Methods of Teaching Science -a) Multimedia Approach (MMA)

b)NPM

2. Dependent Variable- Scientific Attitude

3. Intervening Variable-Gender (Boys and Girls)

POPULATION AND SAMPLE: Population for the present study consists of 9th standard students studying in private unaided schools in the city of Mysore with English as the medium of instruction. The sample consists of 200 students of 9th standard studying in two private secondary schools with application of multimedia for teaching. To draw this sample **"Stratified Proportionate Random Sampling Procedure "** was employed .

Experimental Design: The study employs a "Two Group Pre-Test design" for carrying research.

Tools used in the Study

In order to obtain data on the variables considered in the study, the following tools were used.

1) Pre-Scientific Attitude Test*

2) MMP

3) Post-Scientific Attitude Test*

*** Developed by Dr.Benny Alexander , ISEC ,Bangalore.**

Procedure for collecting Data

Following steps were used in the data collection

Administration of the Scientific Attitude Pre-Test [SAT-1]

Teaching Science Concepts to control group with the Normally Practiced Method.

Teaching Science Concepts to the Experimental group using Multimedia Approach with Multimedia Package.

Administration of the post-test [SAT-II] to both the groups after Experimental Treatment.

Collected response were recorded accurately and subjected to analyze the data by using Statistical analysis.

Statistical Technique employed

Statistical Techniques such as Mean, SD, t-test, and ANOVA were employed for analysis and interpretation of the data.

Analysis and Interpretation of the data

Analysis of Gain in Scientific Attitude

Analysis of Gain in Attitude towards Science

Comparison of Gain Scores of Experimental and Control group in science.

Mean pre -test scores on Science Attitude of experimental and control groups and results of Independent sample 't' test

Table 1

Mean Pre- Test and Post -Test scores on science Attitude of students in experimental and control groups

Groups	Tests				Gain
	Pre- test		Post- test		
	Mean	S.D	Mean	S.D	
NPM	21.63	2.88	29.60	2.90	7.97
MMA	21.34	2.86	40.77	2.89	19.43
Total	21.49	2.87	35.19	6.30	13.70
Test statistics	Gain (overall) = F =5214.269 p=.001 Gain (groups) = F =912.14; p=.001				

In the case of attitude scores, irrespective of the groups, we find a significant increase in the attitude scores of the selected sample. The obtained F value of 5214.269 was found to be highly significant at .001 level. In the pre testing the mean attitude scores was 21.49, which has been increased to 35.19, with an increase of 13.70 scores, which was found to be significant. Further, group wise comparison revealed that experimental group had significantly increased its attitude scores (F=612.14; p=.001), where the gain is as much as 19.43 scores (Pre-Test 21.34; Post-Test 40.77), as against control group which has gained only 7.97 scores (Pre-Test 21.63; Post-Test 29.60). This clearly indicates the effectiveness of intervention in increasing the attitude towards science.

Table 2

Mean Pre-Test and Post- Test scores on science Attitude of students in the experimental group

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Groups	Tests				Gain
	Pre test		Post test		
	Mean	S.D	Mean	S.D	
MMA	21.34	2.86	40.77	2.89	19.43
Test statistics	Paired samples t = -51.77; p=.001				

Paired samples t revealed a significant increase in the attitude scores of students under experimental group. An increase of 19.43 scores from pre-Test (mean 21.34) to post test (mean 40.77) was found to be highly significant (t= -51.77; p=.001).

Table 3

Mean Pre-Test and Post-Test scores on science Attitude of boys and girls in the experimental group

Gender	Tests				Gain
	Pre test		Post test		
	Mean	S.D	Mean	S.D	
Boys	21.30	2.82	40.72	2.86	19.42
Girls	21.38	2.92	40.82	2.95	19.44
Total	21.34	2.86	40.77	2.89	19.43
Test statistics	Gain (gender) = F =0.001; p=.979				

Repeated measure ANOVA revealed a non-significant difference between the genders in the science attitude scores from pretest to post- test situation. Both the genders gained equally after intervention (F=0.001; p=.979). Boys have gained a mean score of 19.42 whereas girls gained a mean score of 19.44, which were statistically the same.

Table 4

Mean Pre-Test and Post -Test scores on science Attitude of boys in the experimental and control groups

Groups	Tests				Gain
	Pre- Test		Post- Test		
	Mean	S.D	Mean	S.D	
NPM	21.66	2.83	29.58	2.86	7.92
MMA	21.30	2.82	40.72	2.86	19.42
Total	21.48	2.82	35.15	6.28	13.67
Test statistics	Gain (overall) = F =2693.665; p=.001 Gain (groups) = F =476.587; p=.001				

In the case of science Attitude scores of boys only considered, irrespective of the groups, we find a significant increase in the attitude scores of the selected sample. The obtained F value of 2693.665 was found to be highly significant at .001 level. In the pre-testing the mean Attitude scores was 21.48, which has been increased to 35.15, with an increase of 13.67 scores, which was found to be significant. Further, group wise comparison revealed that boys in the experimental group had significantly increased their Attitude scores (F=476.587; p=.001), where the gain is as much as 19.42 scores (Pre-Test 21.30; Post -Test40.72), as against control group which has gained only 7.92 scores (Pre-Test21.66; Post-Test 29.58).

Table 5

Mean Pre-Test and Post- Test scores on science Attitude of girls in the experimental and control groups

Groups	Tests				Gain
	Pre- test		Post -test		
	Mean	S.D	Mean	S.D	
NPM	26.92	3.94	34.98	3.43	8.06
MMA	26.34	3.84	46.92	3.21	20.58
Total	26.63	3.88	40.95	6.85	14.32
Test statistics	Gain (overall) = F =2478.769; p=.001 Gain (groups) = F =428.714; p=.001				

In the case of science attitude towards science scores of girls only considered, irrespective of the groups, we find a significant increase in the Attitude scores of the selected sample. The obtained F value of 2478.769 was found to be highly significant at .001 level. In the pre testing the mean attitude scores was 26.63, which has been increased to 40.95, with an increase of 14.32 scores, which was found to be significant. Further, group wise comparison revealed that Girls in the experimental group had significantly increased their Attitude scores (F=428.714; p=.001), where the gain is as much as 20.58 scores (pre-test 26.34; post -test46.92), as against control group which has gained only 8.06 scores (pre-test 26.92; post -test 34.98)

FINDINGS OF THE STUDY

The study revealed that the use of multimedia approach in science teaching can be an effective way to develop scientific attitude among secondary school students. The study highlights the importance of incorporating multimedia in science education to enrich students learning experiences and attitudes towards science, and in turn promote the development of Scientific Attitude. These results could have important implications for science educators and curriculum developers, as they seek to improve the quality and effectiveness of science education and increase students interest in science.

1. In the pre-testing, the mean attitude score was increased which was found to be significant. Further group-wise comparison revealed that the experimental group had significantly increased its attitude scores. These findings clearly indicate the effectiveness of the intervention in increasing the Scientific Attitude. The results are important as a positive attitude towards science is known to be linked to better academic performance, and also to promote the development of Scientific Attitude.

2. The findings suggest that the intervention was effective in improving the Scientific Attitude scores of the students under the experimental group.

3. The findings suggest that the intervention was equally effective in improving Scientific Attitude scores for both boys and girls. This result is important as it suggests that interventions aimed at improving Scientific Attitude can benefit both genders equally.

4. The findings suggest that the intervention was effective in improving the Scientific Attitude scores of the participants, particularly among boys in the experimental group. The results is significant, as attitude towards science have been linked to better academic performance and increased interest in science related field, that in turn leads to promotion of development of Scientific Attitude.

CONCLUSIONS

Based on the present study the use of a multimedia approach in science teaching can have a positive impact on the development of scientific attitude among secondary school students.

Multimedia can increase students engagement and interest in science, leading to a more positive attitude towards science and enhance Scientific Attitude.

Multimedia resources can improve students understanding of scientific concepts by providing visual and interactive representations of complex ideas that in turn leads to Scientific Attitude.

The use of multimedia in science education can help to develop students critical thinking skills, as they are asked to analyze and evaluate scientific claims presented in multimedia resources.

The use of multimedia can increase accessibility to science education for students with disabilities.

Studies have shown that the use of multimedia can lead to improved academic performance in science and further increased Scientific Attitude.

However, it is important to note that the effectiveness of a multimedia approach may vary depending on the specific context and implementation. More research is needed to better understand how multimedia can be effectively used in science education to promote a positive scientific attitude among secondary school students. Overall, the use of multimedia in science education holds promise as a way to engage students and promote a positive attitude towards science.

EDUCATIONAL IMPLICATIONS

The use of multimedia approach in science education can have several educational implications for the development of scientific attitude among secondary school students. Here are some of the key implications:

Increased engagement: The use of multimedia, such as videos, animations, and interactive simulations, can help to increase students engagement and interest in science. This can lead to a more positive attitude toward science and a greater desire to learn more about scientific concepts.

Improved understanding: the use of multimedia can also help to improve students understanding of scientific concepts. Visual representations can help students to better visualize and understand complex ideas, while interactive simulations can help students to explore scientific phenomena in a more hands-on way.

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Enhanced critical thinking: The use of multimedia can also help to develop students critical thinking skills. For example, students may be asked to analyze and interpret data presented in a video or simulation, or to evaluate the credibility of scientific claims made in multimedia resource.

Increased accessibility: the use of multimedia can also increase accessibility to science education for students who may struggle with traditional text-based resources. For example, students with visual or auditory impairments may find it easier to engage with science content presented in a multimedia format.

Improved academic performance: Finally, the use of a multimedia approach in science education can have a positive impact on students academic performance. Studies have shown that the use of multimedia can improve students retention of scientific concepts and lead to better performance on assessments.

In total, the use of multimedia in science education can pose several educational implications can educational implications for the development of scientific attitude among secondary school students, including increased engagement, improved understanding, enhanced critical thinking, increased accessibility, and improved academic performance.

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Role Of Social Media In Teaching-Learning Process

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Abstract: The Role of social media in the teaching-learning process and how it has transformed the educational landscape. Social media has enabled collaboration, engagement, and access to information, making it easier for learners to connect with experts, peers, and mentors. The paper discusses the advantages of using social media for collaboration, promoting active learning, and developing essential skills such as communication and critical thinking. It also highlights the importance of engagement in the teaching-learning process and how social media can be used to make the learning experience more interactive and participatory. However, the paper also discusses some challenges and limitations of social media in the teaching-learning process, such as information overload, accuracy, and privacy concerns.

Keywords: Social Media, Teaching, Learning, Collaboration, Engagement, Access.

Introduction

Social media has revolutionized the way in which people interact and share information. With the emergence of social media, there has been a paradigm shift in the teaching-learning process. The integration of social media in education has opened up new possibilities for enhancing the quality of education. In this paper, we will explore the role of social media in teaching-learning process and how it has transformed the educational landscape.

Keywords: Social Media, Teaching, Learning, Collaboration, Engagement, Access.

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e of Social Media in Teaching-Learning Process

ocial media has brought about significant changes in the teaching-learning process. It has provided educators and learners with new opportunities for collaboration, engagement, and access to information. In this section, we will discuss how social media has transformed the teaching-learning process.

Collaboration

Collaboration is a process of working together with one or more people to achieve a common goal or objective. It involves sharing ideas, knowledge, and expertise to create something that is greater than the sum of its parts. Collaboration is an essential component of the teaching-learning process, as it enables learners to work together on projects, assignments, and discussions, and share their ideas and perspectives with one another.

Social media has provided an excellent platform for collaboration in the teaching-learning process. It has enabled learners to work together on projects, share ideas, and provide feedback to one another. Social media tools such as Facebook, Twitter, LinkedIn, and Instagram can be used to share knowledge, discuss ideas, and collaborate on assignments. These platforms enable learners to work together, regardless of their location or time zone.

One of the main advantages of using social media for collaboration is that it promotes active learning. When learners collaborate with one another, they are more likely to be engaged with the material and to learn actively. Collaboration can also help to develop essential skills such as communication, problem-solving, and critical thinking, which are valuable for learners both in and out of the classroom.

Social media has also provided learners with the opportunity to connect with experts and mentors in their field of study. This can help learners to build relationships and networks that can be valuable throughout their career. Learners can use social media to follow industry leaders, participate in online discussions, and connect with peers and mentors who can provide guidance and support.

Engagement

Engagement is a critical factor in the teaching-learning process. It is essential to keep learners motivated, interested, and focused on the learning goals. Social media has played a significant role in promoting engagement in the teaching-learning process. It has provided an opportunity for learners to interact with the content, instructors, and peers in a more interactive and participatory manner.

Social media platforms offer a variety of features that can be used to promote engagement in the teaching-learning process. For example, instructors can use social media to share multimedia content such as videos, images, and infographics that can make the learning experience more exciting and interactive. Learners can also use social media to create and

their own content, such as videos and podcasts, which can help to promote engagement and creativity.

Social media has also enabled instructors to provide personalized feedback and support to learners. Instructors can use social media platforms such as Twitter, Facebook, and Instagram to provide feedback on assignments, answer questions, and provide guidance to learners. This can help to promote engagement by providing learners with a sense of connection and support.

Another way social media can promote engagement is through gamification. Gamification involves the use of game design elements such as points, badges, and leader boards to make the learning experience more enjoyable and engaging. Social media platforms such as Facebook, Twitter, and Instagram offer a variety of gamification tools that can be used to make the learning experience more interactive and engaging.

Social media has also provided an opportunity for learners to collaborate and work together on projects. This can help to promote engagement by providing learners with a sense of community and shared responsibility. Learners can use social media platforms to collaborate on assignments, share ideas and feedback, and support one another.

Access

Access is an essential component of the teaching-learning process. It is critical to ensure that all learners have equal opportunities to access educational resources, regardless of their location or background. Social media has played a significant role in promoting access to educational resources, making it easier for learners to access content, communicate with instructors, and collaborate with peers.

Social media platforms have provided a wide range of opportunities for learners to access educational resources. For example, instructors can use social media platforms such as Facebook, Twitter, and Instagram to share links to online resources, such as articles, videos, and podcasts. This makes it easier for learners to access relevant content, regardless of their location or time zone.

Social media has also made it easier for learners to communicate with instructors and peers. Learners can use social media platforms to ask questions, share ideas, and provide feedback on assignments. This can help to promote engagement and collaboration, as learners can connect with one another and with instructors in a more interactive and participatory manner.

Another way social media has promoted access in the teaching-learning process is through online courses and webinars. Many educational institutions and organizations offer online courses and webinars on social media platforms such as Facebook, Twitter, and Instagram.

makes it easier for learners to access educational resources, regardless of their location schedule.

Social media has also provided an opportunity for learners to connect with experts and mentors in their field of study. This can help learners to access valuable resources and knowledge that can support their learning and career development. Learners can use social media to follow industry leaders, participate in online discussions, and connect with peers and mentors who can provide guidance and support.

Challenges and Limitations

1: Information Overload and Accuracy

One of the biggest challenges of social media in the teaching-learning process is information overload. With the vast amount of information available on social media, it can be difficult for learners to navigate and filter through the noise to find credible and accurate information. Moreover, social media is also plagued with fake news and misinformation, which can mislead learners and hamper their learning outcomes.

To mitigate this challenge, instructors must guide learners on how to evaluate the reliability and accuracy of information on social media. Learners must be equipped with critical thinking skills to evaluate sources and distinguish between credible and unreliable information. Instructors must also provide clear guidelines on the types of sources that are acceptable for research and academic purposes.

Challenge 2: Distraction and Time Management

Social media can be a significant source of distraction for learners, especially when it is not used appropriately. Social media can hinder concentration, reduce attention span, and impede the learning process. Additionally, learners can also get sucked into the never-ending cycle of social media, leading to poor time management and procrastination.

To address this challenge, instructors must provide clear guidelines on the appropriate use of social media in the learning process. Learners must be encouraged to use social media for educational purposes only and avoid using it during class hours. Instructors must also incorporate time management strategies in their teaching methods to help learners manage their time effectively.

Challenge 3: Privacy and Security Concerns

Privacy and security concerns are also significant challenges of social media in the teaching-learning process. With the increasing reliance on social media, learners may unknowingly share personal information, which can be accessed by unauthorized parties. Additionally, learners may also become victims of cyber bullying, harassment, and online threats.

Mitigate this challenge, instructors must educate learners on the importance of online privacy and security. Learners must be encouraged to use privacy settings and avoid sharing personal information on social media. Instructors must also create a safe and secure online learning environment that is free from harassment and cyber bullying.

Challenge 4: Unequal Access to Technology

Another significant challenge of social media in the teaching-learning process is unequal access to technology. Learners from low-income backgrounds may not have access to the necessary technology and equipment to participate in online learning. This can create a digital divide and limit the learning opportunities for certain learners.

To address this challenge, instructors must ensure that all learners have equal access to technology and equipment. This can be achieved by providing technology and equipment to learners who do not have access to it. Instructors can also adopt a hybrid approach to teaching, which combines online and offline learning, to ensure that all learners have equal learning opportunities.

Conclusion

Social media has had a significant impact on the teaching-learning process. It has provided a wide range of opportunities for learners to engage with educational content, collaborate with peers and experts, and access educational resources. One of the key benefits of social media in the teaching-learning process is collaboration. Social media platforms have enabled learners to work together on projects, share ideas, and provide feedback to one another. This has helped to promote engagement, creativity, and a sense of community among learners. Social media has also played a significant role in promoting engagement in the teaching-learning process. Social media platforms offer a variety of features that can be used to promote engagement, including multimedia content, personalized feedback, gamification, and collaboration tools. By harnessing the potential of social media for engagement, instructors can enhance the quality of education and improve learning outcomes. Access is another important aspect of the teaching-learning process, and social media has provided many opportunities for learners to access educational resources. Social media platforms have made it easier for learners to access relevant content, communicate with instructors and peers, and connect with experts and mentors in their field of study. However, social media also presents challenges and limitations in the teaching-learning process. These include issues such as privacy and security, information overload, and the potential for distraction. Instructors and learners must be mindful of these challenges and take steps to mitigate their impact.

Overall, social media has had a transformative impact on the teaching-learning process. By leveraging the potential of social media platforms for collaboration, engagement, and access, instructors can enhance the quality of education and improve learning

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EDUCATIONAL DEVELOPMENT AND SOCIAL WELFARE

Editors
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VENKATESHA .J.N

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EDUCATIONAL DEVELOPMENT AND SOCIAL WELFARE

VOLUME - VI

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Chapter – 59

THE CHALLENGES AND ISSUES OF TEACHER EDUCATION IN INDIA

Dr.LEELA.K.S
Assistant Professor, Sarada Vilas Teachers College, Mysore

Abstract

Teachers play a vital role in helping people to develop their talents and develop their potential for personal growth. They need to acquire a complex plethora of knowledge of skills needed for teachers and citizens of the world at large. The school teachers mediate between a fast-evolving world and the students who should keep their pace in progress. The success of student community depends entirely on quality of teacher. With the advent of quality reforms, the quality of teachers become the prerogative of policy makers, college and university heads espesially in teacher education colleges. This article aims at making an humble contribution to the on-going debate of challenges faced by teacher education.

Teacher Education and Higher Education

Throughout the world, Higher Education Institutions function in a dynamic environment. In India also, the institutions of higher education (HEIs) /teacher education (TEIs) are facing many challenges and are undergoing significant changes from time to time. There is a need to expand the system of higher education, the impact of technology on the educational delivery, the increasing private participation in higher education and the impact of globalization, have necessitated such marked changes in the Indian higher education scenario. These changes and the consequent shift in values should be taken into cognizance in order to enhance the standard of teacher education.

Higher Education invariably is concerned with quality maintenance and enhancement. It is self evident from the quotation "The destiny of the nation is shaped in the classroom" that the primary concern of teacher education is quality. Undoubtedly education plays a significant role in the nation's development and the quality of teachers and therefore great efforts were made and still are being made to improve the quality of teacher education.

There has been a great expansion of teacher education over the years. No doubt education plays a signnificant role in nation's development but the quality of education imparted is greatly determined by the quality of teachers and teaching.

One of the biggest challenges faced by developing countries is the lack of preparedness of the teachers to implement an effective approach to teaching in schools. If teachers are to become effective prac'itioners of knowledge by understanding and meeting the needs of learners then they must be educated to that extent. Yet another important issue in effective teaching is that teacher educators themselves are professionally unprepared and take the role of educating pre-service and in-service teachers about effective teaching practices. They need to update the teacher educators to offer an appropriate curriculum and to employ suitable pedagogies and to prepare them for excellence in teaching can be very challenging in countries where there are few academics that are themselves not trained in and lacking the necessary skills, knowledge and sentiments to undertake such a role. To overcome the problem of adjustment teacher educators are trained for effective teaching practices. Pre-service teacher education programs are to be organized for this purpose. Teachers are crucial in determining what happens in classrooms and there are those who would argue that the development of more effective classrooms requires teachers to cater to different student learning needs through the modification or differentiation of the curriculum. There is a perfect agreement of the need to reform initial education so that all sophomore teachers enter the profession better prepared to deal with diversity in their classrooms and also more aware that they will be working with adults as well as pupils. Most mainstream teachers do not believe that that they have the skills and knowledge to do this kind of work and that there is an army of 'experts' out there to deal with these students on a one-to one basis or in small more manageable groups. Factors Involved in Effective teaching

Though teachers have concerns about effective teaching and many surveys have found that teachers' attitudes towards effective teaching are not particularly positive,they express concerns about their lack of preparation for excellence and for teaching all learners. Teacher education emphasizes on teaching and training with reference to these aspects:

- Teaching strategies
- How children learn
- What children need to learn

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- Classroom organization and management
- Where to get help when necessary
- Identifying and assessing difficulties
- Assessing and monitoring children's learning
- The legislative and policy context
- Disability and special needs

It is important to point out that content knowledge is no doubt important, but it is insufficient to improve practice in schools because many teachers did not act upon this knowledge when they returned to the classroom. It was clear that there was a big gap between what teachers knew as a result of being on a course and what they did in their classrooms. In an attempt to bridge this gap, initiatives have been designed to link individual and institutional development. In other words 'doing' has become an essential element of professional learning and institutional development. The penultimate aim of teacher education is turning knowledge into useful 'doing'.

Changing attitudes is difficult, particularly for those teachers whose professional identities are secure. The traditional way of attempting to bring about developments in inclusion was to focus on improving teachers' knowledge and skills, but this did not always work.

For this purpose, The National Policy on Education (NPE 1986) and the subsequent Programme of Action (PoA 1992) laid great stress on the quality of education at every level. If the nation has to rise up its standards the teacher education should be at a high pedestal and make a lofty resolve in uplifting the quality of Higher Education. Ultimate aim of education is to build up the core values among the younger generation and to live up to them.

Core values in teacher education

- Contributing to National Development : Most of the Teacher Education Institutes have a remarkable capacity to adapt to changes, and at the same time pursue goals and objectives that they have set forth for themselves. Contributing to national development has always been the ultimate philosophical goal of education. The Teacher Education Institutes have a significant role in human resource development and capacity building of individuals, to cater to the needs of the economy, society and the country as a whole, thereby contributing to the development of the nation. Serving the cause of social justice, ensuring equity, and increasing access to higher education are a few ways by which Teacher Education Institutes can contribute to the national development.
- Fostering Global Competencies among Students : The spiralling developments at the global level also warrant that skill development of students should be on par with their counterparts elsewhere. With liberalization and globalization of economic activities, the need to develop skilled human resources of a high calibre, is imperative. Consequently, the demand for internationally – acceptable standards in higher standard of teacher education is evident.
- Inculcating a Value System among Students : Though skill development is crucial to the success of students in the job market, skills are of less value in the absence of appropriate value systems. Teacher education institutes have to shoulder the responsibility of inculcating the desirable value systems amongst the students. In a country like India, with cultural pluralities and diversities, it is essential that students imbibe the appropriate values commensurate with social, cultural, economic and environmental realities, at the local, national and universal levels. Whatever be the pluralities and diversities that exist in the country, there is no scope for debate about inculcating the core universal values like truth and righteousness apart from other values emphasised in the various policy documents of the country. The seeds of values sown in the early stages of education, mostly aimed at cooperation and mutual understanding, have to be retreated and reemphasized at the teacher education institutions, through appropriate learning experiences and opportunities.
- Promoting Use of Technology : Most of the significant developments that one can observe today, can be attributed to the impact of Science and Technology. While the advantages of using modern tools and technological innovations in the day-to-day-life are well recognized, the corresponding changes in the use of new technologies, for teaching – learning and governance of TEIs, leave much to be desired. Technological advancement and innovations in educational transactions have to be undertaken by all TEIs, to make a visible impact on academic development as well as administration.
- Quest for Excellence : Although contributing to nation-building and skill development of students, institutions should also demonstrate a drive to develop themselves into centres of excellence. Excellence in all that they do, will contribute to the overall development of

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the system of teacher education of the country as a whole. This 'Quest for Excellence' could start with the assessment or even earlier, by the identification of the strengths and weaknesses in the teaching and learning processes as carried out by the institution. The institution may feel free to expand or modify the Core Values in conformity with the goals and mission of the institution.

Curricular Design helps in systematic organisation and delivery of lectures which paves the way for academic flexibility and enables teachers to cater to the diversified needs of students thus bringing flexibility in teaching-learning process thereby enhancing teacher quality.

Some of the other issues and challenges of teacher education are -Evaluation Processes and Reforms Promotion of Research, Research and Publication output, Consultancy and Extension Activities.

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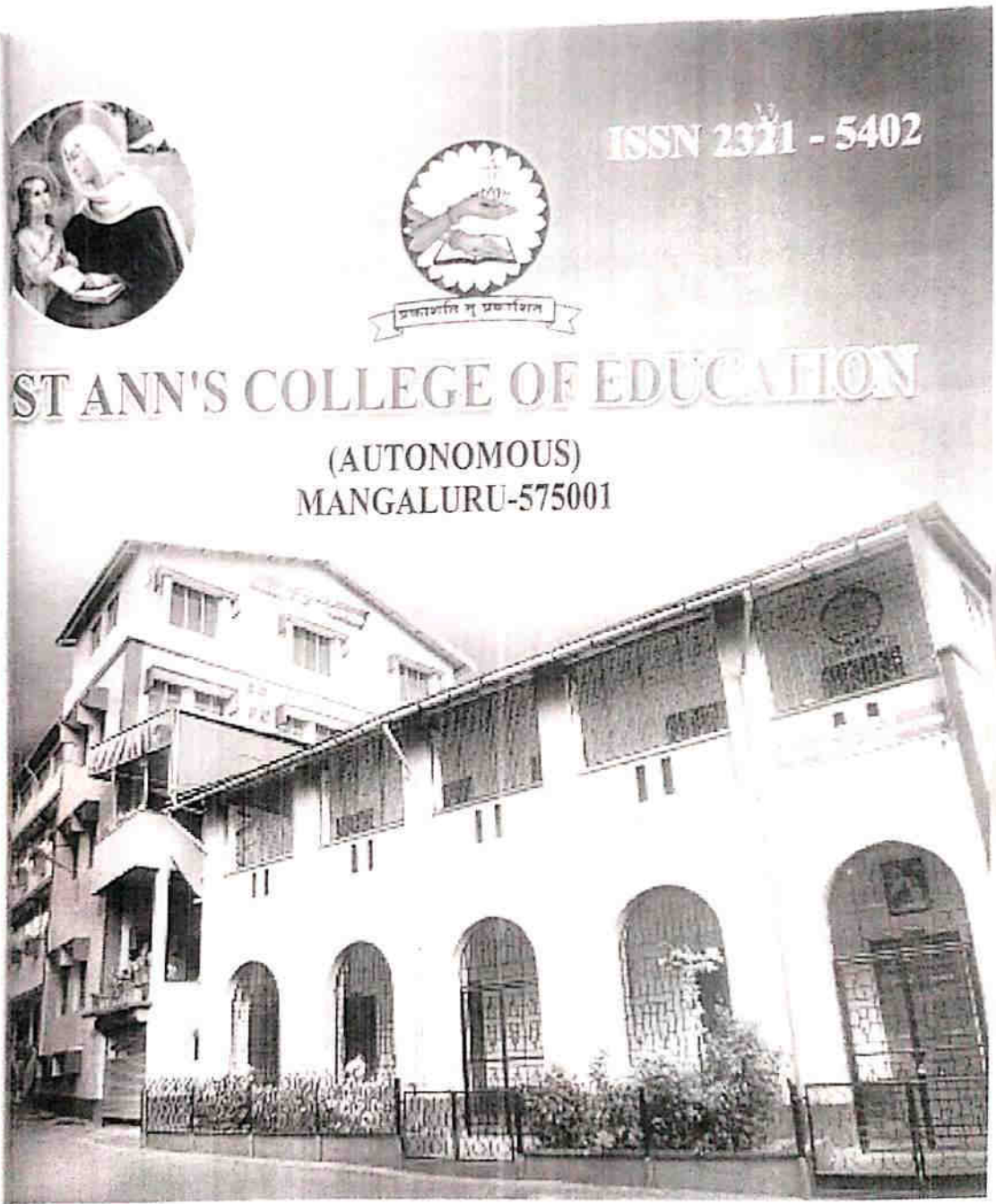

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IMPORTANCE AND USES OF ICT IN THE TEACHING LEARNING SCENARIO

Karthik P. S*
Dr Praveena K. B**

Abstract

John Dewey 1916, States that, Education is a social process - " A process of living & not a preparation for future living". India is in a transition phase with respect to Education, Science & Technology etc. in the 21st century. Life has got entangled with technology. The technological innovations have paved way for new ways of learning, evolution & growth. The digital literacy& culture has influence the way of people live, work, play & learn. Individuals with lack of computer skills or digital culture are in a handicapped situation. UNESCO has made integrating ICT into education as a part of its efforts to ensure equity & access to education. This paper explains the common educational applications of ICT which comprises of usage of computer based learning with laptops, tablets, class-room learning with interactive smart board, E-readers, flipped class-rooms, usage of internet, video-conferencing, etc. It also sheds light on SAKSHAT - a one stop educational portal, the ministry of human resource development, need & importance of ICT, its advantages & disadvantages for the today's generation.

Key Words: Computer, Internet, smart board, video-conferencing, "SAKSHAT".

Introduction

Education is a process of inviting truth and possibility, of encouraging and giving time to discovery. It is as John Dewey (1916) put it, a social process – 'a process of living and not a preparation for future living'. In this view educators look to act with people rather than them. Their task is to educe, to bring out or develop potential. Such education is:

- *Deliberate and hopeful.* It is learning we set out to make happen in the belief that people can 'bemore';
- *Informed, respectful and wise.* A process of inviting truth and possibility
- *Grounded in a desire that at all may flourish and share in life.* It is a cooperative and inclusive activity that looks to help people to live their lives as well as they can.

Importance of education in India comes from the very roots of our history. India is a country that has had scholars in each field. The very culture of our country relies heavily upon a sound education system which has always helped in producing the best minds, which are today spread across the globe. As time passes by, changes take place and this is precisely the case study of even Indian way of education. Today, India is in a transition phase where education is no exception. In order to maintain a strong balance during the time of changes, it is imperative that institutions come out with innovations. Modern Teaching Methodology Education system in our country is provided by the government as well as private bodies. And as we have stepped more towards globalised

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environment, technology has started to play a crucial role towards simplifying the education system, where private institutions are gaining momentum. Going back a bit in time, we used to have blackboards and chalks for classrooms, whereas today, things have changed. White boards, markers, projectors, screens and presentations are the tools of the modern day education. The young ones today, begin learning right at the age of 4/5 by fiddling with their parents' smart phones and tablets. The findings observed make it clear that digital education is indeed a revolution both inside and outside the classroom. The internet has something for everyone, making every mindset of any age satisfactory and every solution to a problem clear.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO), a division of the United Nations, has made integrating ICT into education part of its efforts to ensure equity and access to education. The following, taken directly from a UNESCO publication on educational ICT, explains the organization's position on the initiative. Information and Communication Technology can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration. UNESCO takes a holistic and comprehensive approach to promoting ICT in education. Access, inclusion and quality are among the main challenges they can address. The Organization's Intersectral Platform for ICT in education focuses on these issues through the joint work of three of its sectors: Communication & Information, Education and Science. Information and communication technology (ICT) can complement, enrich and transform education for the better. As the lead United Nations Organization for education, UNESCO guides international efforts to help countries understand the role such technology can play to accelerate progress toward Sustainable Development Goal 4 (SDG4), a vision captured in the Qingdao Declaration.

UNESCO shares knowledge about the many ways technology can facilitate universal access to education, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improve education administration and governance. The Organization scans the world for evidence of successful ICT in education practices, whether in low-resource primary schools, universities in high-income countries, or vocational centres – to formulate policy guidance. Through capacity-building activities, technical advice, publications, fieldworks, and international conferences such as the International Conference on Artificial Intelligence and Education and Mobile LearningWeek, and fieldwork, UNESCO helps governments and other stakeholders leverage technology for learning. Computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, impacting the construction and distribution of knowledge and power [illegible]. Graduates who are less

familiar with digital culture are increasingly at a disadvantage in the national and global economy. Digital literacy - the skills of searching for, discerning, and producing information, as well as the critical use of new media for full participation in society has thus become an important consideration for curriculum frameworks.

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of tele communications and computers, as well as necessary enterprise software, middleware, storage, and audio-visual systems, that enable users to access, store, transmit, and manipulate information.

The term *ICT* is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution, and management. ICT is an umbrella term that includes any communication device, encompassing radio, television, cell phones, computer and network hardware, satellite systems and so on, as well as the various services and appliance with them such as video conferencing and distance learning.

ICT is a broad subject and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. Theoretical differences between interpersonal-communication technologies and mass-communication technologies have been identified by the philosopher Piyush Mathur.

Importance & Uses of ICT in the teaching learning

Computer-based learning: Computer-based learning is one of the modules of school communication tool that helps students to enhance their learning skills through computer aided education. It imparts computer knowledge in students and enables them to obtain large amounts of information from various websites. After two decades of introducing computers to schools, education has been revolutionized ever since then. It reduces time spent on mechanical tasks such as rewriting, producing graphs and increases the scope of searching. It not only helps in finding information but also in organizing information making it easier to share with others.

- **One laptop per child:** Less expensive laptops have been designed for use in school on a 1:1 basis with features like lower power consumption, a low cost operating system, and special re- programming and mesh network functions. Despite efforts to reduce costs, however, providing one laptop per child may be too costly for some developing countries.
- **Tablets:** Tablets are small personal computers with a touch screen, allowing input without a keyboard or mouse. Inexpensive learning software

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can be downloaded into tablets, making them a versatile tool for learning. The most effective apps develop higher order thinking skills and provide creative and individualized options for students to express their understandings.

Classroom Learning: With the introduction of ICT in education, classroom learning is one attribute that makes learning experiential and experimental to students. Students can listen to the instructor or teacher, receive visual cues through Powerpoint images, handouts or whiteboard lists and participate actively. This helps in immediate interaction and students have opportunities to ask questions and participate in live discussions. This school communication software module further benefits in building and maintaining personal and professional relationships as classrooms offer greater personal contact with other students and teachers.

- **Interactive White Boards or Smart Boards:** Interactive white boards allow projected computer images to be displayed, manipulated, dragged, clicked, or copied. Simultaneously, handwritten notes can be taken on the board and saved for later use. Interactive white boards are associated with whole-class instruction rather than student-centred activities. Student engagement is generally higher when ICT is available for student use throughout the classroom.
- **E-readers:** E-readers are electronic devices that can hold hundreds of books in digital form, and they are increasingly utilized in the delivery of reading material. Students-both skilled readers and not so skilled readers. Those have positive responses to the use of e-readers for independent reading. Features of e-readers that can contribute to positive use include their portability and long battery life, response to text, and the ability to define unknown words. Additionally, many classic book titles are available for free in e-book form.
- **Flipped Classrooms:** The Flipped Classroom model, involving lecture and practice at home via computer-guided instruction and interactive learning activities in class, can allow for an expanded curriculum. Student perceptions about Flipped Classrooms are mixed, but generally positive, as they prefer the cooperative learning activities in class over lecture.
- **Internet:** Internet tools like Email, social networks, newsgroups and video transmission have connected the world and made it global village . Students can now communicate using emails and social networking groups that provide knowledge based information. Distance learning, online learning is also enabled through the internet. Students can learn online and also talk to experts online. Notes, readings, tutorials, assignments can be received by students from anywhere. The Internet provides major information in texts, audios, videos and graphics which can be

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accessed by the individual. Online learning allows students to interact with each other and faculty to interact with students.

- Video Conferencing: This is yet another medium of communication wherein students can communicate with other students or instructors online. It enables students to become active participants in their own learning. Video Conferencing is a powerful communication tool that has the potential to change the way we deliver information to students. It is just one of the today's integrative technologies that empower students to prepare for a betterfuture.

ICT in Educational Portal

Realising the importance of Information and Communication Technology (ICT) the Ministry of Human Resource Development as per the Mission Document, ICT is the tool in education available to enhance the current enrolment rate in Higher Education, at present 15 percent to 30 percent by the end of the 11th Plan period.

The Ministry also launched a web portal named "SAKSHAT" a 'One Stop Education Portal'. The high quality e-content once developed will be uploaded on SAKSHAT in all disciplines and subjects. Several projects are in the completion stage and are expected to change the way teaching and learning is done in India.The case in point is the project, "Developing suitable pedagogical methods for various classes, intellectual calibres and research in e-learning," anchored by IIT Kharagpur. Faculties from all the IITs and several NITs are participating in this curriculum development project.

The National Mission on Education through Information and Communication Technology (ICT) has, under its aegis, created Virtual Labs, Open Source and Access Tools,Virtual Conference Tools, Talk to Teacher programs, a Non-Invasive Blood Glucometer and also for simulated lab experiments, a Di. Electric frequency shift application development of resonator for low cost oscillators. The National Mission on Education through Information and Communication Technology (ICT) has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in providing high quality personalized and interactive knowledge modules over the internet/ intranet for all the learners in Higher Education Institutions in any time any where mode. This is expected to be a major intervention in enhancing the Gross Enrolment Ratio (GER) in Higher Education by 5 percentage points during the XI Five Year Plan period and in ensuring access and equity in Higher Education.

The Mission has two major components content generation and connectivity along with provision for access devices for institutions and learners. It seeks to bridge the digital divide, i.e., the gap in the skills to use computing devices for the purpose of teaching and learning among urban and rural teachers/learners in Higher Education domain and empower those, who have hitherto remained untouched by

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the digital revolution and have not been able to join the mainstream of the knowledge economy. It plans to focus on appropriate pedagogy for e-learning, providing facility of performing experiments through virtual laboratories, on-line testing and certification, on-line availability of teachers to guide and mentor learners, utilization of available Education Satellite (EduSAT) and Direct to Home (DTH) platforms, training and empowerment of teachers to effectively use the new method of teaching learning. On the one hand, the Mission would create high quality e-content for the target groups and on the other, it would simultaneously seek to extend computer infrastructure and connectivity to over 18000 colleges in the country including each of the departments of nearly 400 universities/deemed universities and institutions of national importance. The peer group assisted content development would utilise the Wikipedia type of collaborative platform under the supervision of a content advisory committee responsible for vetting the content. Interactivity and problem solving approach would be addressed through "Talk to a Teacher" segment.

Characteristics that make ICT in education a prominent teaching/ communication tool.

- variety of services can be accessed
- reliable and provides interactive learning experiences.
- Very flexible and provides comfortable learning.
- motivates and creates interest among students to learn.
- facilitates communication and promotes creativity.
- provides access to the digital library where information can be retrieved and stored beyond textbooks.

Advantages of ICT in Education

Every way of our life is affected by information and communication technology. We were searching for the advanced way of learning and teaching. ICT has made it easier for us. The new technologies have given us the modern ways of learning and teaching.There are lots of advantages of information and communication technology. Let us discuss some advantages:

Learn from Internet

Nowadays, if a student learns his lesson from internet, he will search it on the internet. He will get the tons of result. From there he can easily solve his problem.

Read e-books

There are lots of ebooks on the internet. You will find many ebooks on every topic on the internet. Just go to the browser and search which topic you want to know.

No need for the library

A student can read any types of books without going to any library. So you can have a cup of tea on your hand and get the book from online and read it on your tablet, phone or computer.

Social Media is the storehouse of knowledge

Nowadays people spend more and

more time on social media than study. But there are lots of opportunities to use social media in a proper way. It will help the students and they will learn out of traditional ways. YouTube has created channels where they teach several students.

Multimedia classes

Multimedia classes are more interesting than the traditional way of teaching. A student can easily understand any topic when he will practically observe the topic properly. A teacher can easily describe the topic by using a computer and a projector. So the effectiveness of ICT in the education sector is much higher than a lot of things.

- Enhanced group collaboration made possible via ICT.
- New educational approaches can be used.
- It can provide speedy dissemination of education to target disadvantaged groups.
- It offers the combination of education while balancing family and worklife.
- It enhances the international dimension of educational services.

Conclusion

ICT is a broad subject and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. Its variety of services that can be accessed, reliable and provides interactive learning experiences, very flexible and provides comfortable learning, motivates and creates interest among students to learn, facilitates communication and promotes creativity, provides access to the digital library where information can be retrieved and stored beyond textbooks. Realising the importance of Information and Communication Technology (ICT) the Ministry of Human Resource Development as per the Mission Document, ICT is the tool in education available to enhance the current enrolment rate in Higher Education, at present 15 percent to 30 percent by the end of the 11th Plan period.The Ministry also launched a web portal named SAKSHATH a 'One Stop Education Portal'. There are many interesting ways of teaching using ICT, if we make the best use of it, then the advantages dominate the disadvantages.

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3.2.1 Research papers/articles published by Dr. Leela. K.S

Sl. No	Title of paper	Name of authors	Name of journal	Year of publication	ISBN/ISSN No.	Link
1	Challenges & Issues of Teacher education in India	Dr. Leela. K.S	6th International Multidisciplinary Conference on "Educational Development and social welfare"	27th January 2018	-	-
2	"Improving teacher student interaction in the English medium classroom-An action research report"	Dr. Leela. K.S	IJRASET	Volume 9 Issue VIII August 2021	ISSN No.2321-9653	Paper ID IJRASET37206

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2018

6th International Multidisciplinary Conference on
EDUCATIONAL DEVELOPMENT AND SOCIAL WELFARE

This is to certify that

Dr. LEELA.K.S
Assistant Professor, Sarada Vilas Teachers College, Mysore

has presented the paper on

The Challenges And Issues Of Teacher Education In India

in one-day International Multidisciplinary Conference on "**Educational Development and Social Welfare**" jointly organised by St. Philomena First Grade College, Hassan, India, Oriental Research Institute, University of Mysore, State Planning Board, Naresuan University and Development Research Foundation, Mysore, India on 27th January 2018 at St. Philomena First Grade College, Hassan, Karnataka, India and we appreciate your active participation in the Conference.

Leela.K.S
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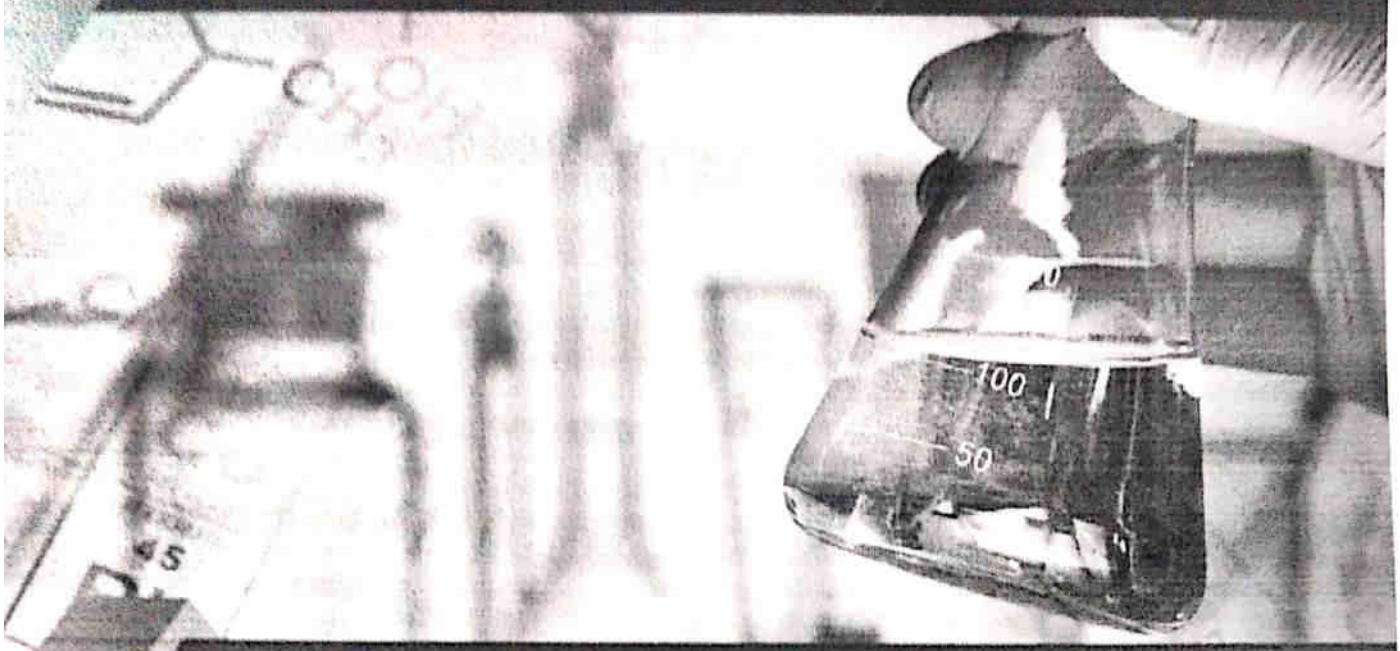

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Improving Teacher-Student Interaction in the English Classroom: An Action Research Report

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Abstract: ***It is a common scene in many of the secondary school classrooms where a teacher does not encounter a participatory class. Especially in English classrooms students find it tough to converse fluently in English and this is a great inhibitory factor for the teacher to bring out her fullest efficiency. The present study aims to bridge this gap by making students feel comfortable and less inhibited inside classroom. This study aims to develop a congenial environment by instilling confidence by interactive methods and thus making students respond more in classroom. The student teacher who taught carried this out efficiently and was patient enough to deal with various nuances of learning .She was adept enough to steer with the learning variations of students and motivate them. This study establishes the fact that the manoeuvring ability of teacher makes a difference in the classroom. The untiring enthusiasm of pupil teacher was the key factor in successful interactive session.***

I. INTRODUCTION

A common problem for English teachers in India is dealing with a passive class, where students with regional language as their mother tongue are unresponsive and avoid interaction with the teacher. This is particularly obvious when an teacher looks for communication in an instructional class discourse, like posing inquiries to the class overall, expecting no less than one student to react. This can be a disappointing interaction for them both- student and teacher. Clearly, there will be times when no student can respond to a teacher's inquiry, however regularly students don't answer regardless of whether they comprehend the inquiry, know the appropriate response and can deliver the appropriate response. Moreover, students can frequently be exceptionally hesitant to give criticism or ask the teacher an inquiry before the class. An undesirable distance is kept up with by pupils in light of their failure to react uninhibitedly. This action research project endeavoured to investigate this issue and looked to make a more intuitive instructor class exchange in English students of eighth class.

II. ACTION RESEARCH DEFINED

Action research is worried about attempting to working on one explicit point in a teacher's procedure in a specific classroom utilizing experimental estimation. Teacher-initiated classroom research looks forward to expand the teacher's comprehension of classroom instruction and learning and to achieve enhancement in study hall rehearses. Action research typically involves small-scale investigative project in the teacher's own classrooms. This normally incorporates having an observer gather information and with the teacher fostering an activity intend to achieve the ideal change, follow up on the arrangement, and afterward notice the impact of the arrangement in the study hall.

III. CLASS DESCRIPTION

The class noticed was a gathering of 23 sophomores at a private organization by name "Gopalaswamy High School". The objective of this particular class is to show the understudies fundamental English discussion, perusing, talking, tuning in and composing abilities. It is also to teach the students basic English conversation, reading, speaking, listening and writing skills. Their English ability level ranged from upper beginner to intermediate. During the observation period, the students appeared motivated and attentive, and they seemed to be enjoying the class.

IV. PROBLEM IDENTIFICATION

The students, as a class, didn't react wiiliingly to the educator's inquiries and didn't take part in class conversations. Students usually never asked the instructor inquiries outside one-on-one circumstances. Subsequently the instructor got minimal oral criticism. As per the educator, the majority of the students sat gazing directly ahead utilizing negligible looks, motions and verbal expressions. What she needed was for the students to be more illustrative, expressive and all the more obviously open in their dynamic collaboration. She needed the students to pose inquiries, offer remarks and to react with gestures and shakes of the head, with hints of arrangement or hints of comprehension and furthermore, she needed them to be both responsive and proactive and display plain conduct which made her showing more cognisant.

V. PRELIMINARY INVESTIGATION

It was seen that the student teacher's class during the main seven day stretch of the training in-instructing, in the initial 45 minutes, the class went through a moderate level interaction/participation. Students were reluctant to talk- later they communicated that they couldn't settle on the right selection of words. The understudies initially tuned in with their books close, on the other hand with the books open. Then, they did a correspondence practice comprising of 25 short sentences dependent on the discourse. The student teacher then, at that point discussed the sociolinguistic and sentence structure points of the activity and proceeded to test for comprehension. At the point when student teacher posed inquiries to assess their understanding they liked to stay quiet and lethargic. This constructed a bridge in their further advancement and hindered their open propensities.

The student teacher posed a couple of different inquiries which additionally drew no reaction or response from the students The understudies then, at that point needed to respond to certain inquiries regarding the discussion in their book. A large portion of the understudies appeared to experience little difficulty doing this, and in case there were any inquiries, they promptly asked the understudy sitting close to them.

The second 50% of the class was committed to match work utilizing the expressions and jargon from the discourse. The student appeared to partake in this, and generally attempted to make their own discourse. The educator strolled about the room keeping an eye on the advancement of each pair. The class environment was extraordinarily not quite the same as the primary portion of the class, with gab and incidental chuckling filling the air. The understudies addressed a large portion of the educator's inquiries with cheerful readiness, and some even posed their own inquiries.

VI. HYPOTHESIS

Since the students appeared for the most part to comprehend the educator's inquiries, it was felt that there was something different that held the understudies back from reacting intentionally in the class-instructor exchanges. Since most understudies are educated to tune in and not to scrutinize an educator in class, they have almost no involvement with 'in-class' connection with the instructor, like addressing or remarking or giving criticism. Understudies are generally educated to be peaceful and deferentially pay attention to the teacher.

By showing the students that class cooperation with the English teacher isn't just worthy, yet ordinary, helpful and advantageous, it was accepted that the students would turn out to be more intelligent with the pupil teacher's class collaboration.

VII. PLAN INTERVENTION

Following the speculation, two stages were taken to execute the arrangement:

First, on the accompanying class, the instructor clarified about "rules" for posing inquiries in class in English. The instructor made an activity out of it and made students recite the passage for all to hear to the class and clarified a couple of troublesome words and invested extra energy developing the content. The "rules" were extrapolated from a cultural point were as per the following:

The unique "rules" about how students should act in the homeroom. In certain subjects, students are required to tune in and just the educator should talk in class. Be that as it may, in English class, it is acceptable and imperative to respond to the educator's inquiries and ponder with inquiries of their own. It implies that you are intrigued and focusing. In English, it is your obligation to pose inquiries in the event that you don't comprehend.

The educator proceeded to say that in the event that they actually felt awkward posing and noting inquiries, they needed to essentially gesture or shake their head as a reaction to the instructor's inquiries.

Secondly, the instructor helped the understudies to remember the "rules" toward the start of each resulting class and further urged them to turn out to be more dynamic in the class when the educator was talking.

Students were motivated at each stage with praises and oral rewards such that they felt a high level of energy and confidence to participate and interact with each other Students who were actively interacting felt motivated and even those who were not interactive also felt involved. This paved a smooth way for a highly encouraging atmosphere and majority of them felt energised and this reduced their hesitation level.

VIII. OUTCOME

In the fourth seven day stretch of the training in instructing, the class was noticed once more in a keen manner. An exercise like the past one was introduced. Toward the start, the understudy educator helped the class to remember the "rules." The educator started discussing the discourse, making syntax, use and sociolinguistic focuses, sprinkled with inquiries concerning the section and the teacher's clarifications. This continued for around twenty minutes and included general appreciation check questions, for example, 'do you comprehend?' and 'are you OK?' just as explicit inquiries regarding the exchange.

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Concerning comprehension questions, the greater part of the students gestured accordingly and a couple of addressed 'yes' to these inquiries. Also, it was accepted that they did, truth be told, comprehend.

With the particular inquiries, notwithstanding, something sudden occurred. At the point when the educator posed an inquiry, he was typically welcomed with poker-confronted gazes, as in the past. Be that as it may, when he drew nearer, took a gander at an understudy, or pair of understudies, and rehashed the inquiry, the understudies normally attempted to reply. By and large, I noticed, the understudy instructor was giving significantly more consideration to the understudies, drawing nearer to them, and taking a gander at explicit understudies and attempting to make a superior association with them. Rather than posing inquiries with the inclination that they truly wouldn't have been addressed at any rate, as in the past, the educator put forth a more noteworthy attempt to convey the inquiries, and went about as though she expected to get reactions.

Likewise, close to the furthest limit of the educator's discussion on the exchange, two understudies, without inciting from the instructor, posed inquiries before the class. Albeit the inquiries were not related straightforwardly to the discourse, the way that the inquiries were posed before the whole class was viewed as a forward leap.

IX. CONCLUSION

There were a few regions where the consequences of this activity research were not as effective as trusted. For example, the students should have been provoked with eye to eye connection and a rehashed question from the instructor to address an inquiry, and when they didn't get something, they actually didn't intrude on the educator with an inquiry.

But some advancement was unquestionably made, particularly when the concise range between perceptions is thought of. The understudies associated with the educator by gesturing, some responded to the instructor's inquiries, and two, on their own introduction, even posed inquiries before the class. The unexpected symptom of the educator turning out to be more worried about the connection was an unforeseen pleasure and added to the improvement. There appears to have been some achievement in educating and reminding and afterward anticipating that the students should turn out to be more intelligent with the instructor.

X. REFLECTION

This action research project constrained both the instructor and the eyewitness to recall that English educators are showing a language additionally a culture, and this incorporates training the sociolinguistics.

An extra justification is the interest in this issue tended to here was the conviction that this was a typical issue. Teachers, frequently become disappointed with an absence of introductory achievement in getting an intelligent exchange with the class. This frequently drives them to botch an absence of knowledge of an absence of interest, and to instruct inside the understudies' socially moulded homeroom assumptions, rather than presenting the assumptions normally found in intuitive study halls in English While meaning to be more obliging to students, they are neglecting to give understudies a helpful sociolinguistic expertise, which understudies would almost certainly need and determine advantage. Some may think empowering the utilization of this understudy instructor connection normal in local English talking districts is socially presumptuous. However, in case it is presented in a touchy and sensible way, it really adds to a seriously satisfying English class. All things considered, most students don't read English only for etymological skill. They will likewise need to foster sociolinguistic capability for conveying in various circumstances in English talking nations, and this incorporates the homeroom.

A. List of Enclosures

1) 25 short sentences for dictation.
2) A story involving dialogues
3) Grammar items

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A Study on Environmental Behavior and General Mental Ability among Secondary School Students

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Abstract: The Environmental Behavior is the extent of which the individuals and adolescents are motivated to act or behave in a desirable way. The Environmental behavior is the specific and has a direction it is the what the individuals and adolescents intend to do in relation to the present environment and in saving it and it is particularly significant with environmental issues believed to be both major and imminent. Such as climate to reduce any one time or change resulting from global warming. The history of environmental education reveals a close connection between changing concerns about the environment and its associated problems and the way in which environment. Environmental quality strongly depends on human behavior patterns. In this context, the main purpose of the study was to examine the Environmental Behavior and General mental ability among secondary school students. The study also aimed to find out the correlation between the variables. The study has been carried on students of 9th standard in schools of Mysore city. The sample for the study consisted of 60 male and female students and data was collected by using tools, viz, RPM (Raven's standard progressive matrices) used to measure the level of General mental ability of the students. Environmental Behavior Scale to measure the level of Environmental Behavior among secondary school students. The result shown that, Majority (48.33%) of Secondary school students possess moderate level of General mental ability. It is also seen that only 25% and 26.66% of the Secondary school students possess low and high level of general mental ability respectively, majority (50%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 23.33% and 26.66% of the Secondary school students possess low and high level of Environmental Behaviour respectively, there is a significant difference between the Environmental Behaviour of male and female secondary school students, there is no significant difference between the general mental ability of male and female secondary school students, a Positive significant correlation is found between General Mental ability and Environmental Behaviour.

Keywords: Environmental Behaviour, General Mental Ability, Descriptive Survey Method.

Article History

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I. Introduction:

The consequence that human activities on the Environment is, becoming more important. By human activities are damaging surroundings and risks the lives of next generations. At this point there is no denying the fact that Environment is changing. Few studies were shown that this is happened and its effects on life around us. Anyhow many may be unaware of the specific issues that have led to these changes. Main present Environmental problems may consists of atmospheric conditions change, pollution, and environmental degradation. Environmental Behaviour includes adopting positive mindsets and aiming to reduce any negative effects on natural environment. Environmental education is a process that allow adolescents to analyze environmental problems and engage in solving problems of environment and take responsible decisions and develop positive Behaviour towards the environment and show pro Environmental behaviour require to have the general mental ability. Hence it is related to study the General Mental ability and its association with their environmental behavior. Environmental issues are dangerous effects on human activity on the biophysical environment. Protection of environment is a practice of protecting the Environment on the individual, in groups or government levels for the advantages of both the environment and humans. Environmental problems are harmful effects of the human activity on the physical environment. The quality of the environment is strongly depends on the Behaviour of the of the human patterns. Humans should overview the contribution and potential of environmental psychology for understanding and induces the pro environmental Behaviour. Human handle their environment will have an impact on the quality of life style of human itself .Loss of human Behaviour that affect on the environment causing global environmental destruction . Pro environmental Behaviour encourages children and people today to change their Behaviour in an effort to reduce the negative action on the environment. "Environmental Education as a continuous learning process that leads to an informed and involved citizenry having the innovative problem solving skills, scientific and social literacy, Ethical awareness and sensitivity

for the relationship between humans and the environment and commitment to engage in responsible individual and co-operative actions. By these, actions environmentally Educates the citizens will help to ensure an ecologically and economically stable Environment."-The Wisconsin Environmental Education Board.

2. Need and Importance of the study:

The way humans treat and manage their environment will have an impact on the quality of human life itself. lack of human behavior that is not cares about the environment, causing global environmental damage. It encourages people today change their behavior in an effort to reduce the negative effects of environmental damage. Environmental Behaviour is the extent of which the individuals are motivated to act or behave in the desirable way. It is specific and has a direction. Environmental Behaviour are what the individual intend to do in relation to the present environment and in saving it. The influence environmental destruction on modern life has been a globally critical problem. Industrialized countries deplete the environment by insatiable consumption of resources and excess production of garbage. Population growth in many developing countries puts damaging pressure on the planet. Therefore , I f individual want to manage earth must make environmentally educated to develop environment friendly Behaviour is any action of individual or group directed towards the remediation of environmental issues. Environmental education provides great opportunities for students to become engaged in the real-world problems that transcend classroom walls. They can, see the relevance of their classroom studies to complex environmental issues confronting our planet and they can obtain the skills they will need to be creative problem solvers and powerful advocates - MS. Campbell, and superintendent of San Mateo country schools.

Crush the indoor habit: Environmental education offers measures to the blocked-in lives of present generation, which is the preliminary to grow up indoors. Children who experience protecting the environment is the responsibility of everyone, hence environmental education cannot be confined to one group or society. Each individual must be ready for saving the environment. It must be a continuous and lifelong process. Above that environmental education must be practical so that teaching can be implemented directly. Preserving nature and environment will be much uncomplicated, if students were taught about deterioration of resources, pollution of environment, land sliding, depletion and extinction of plants and animals. The influence of Environmental destruction on modern life has been globally critical problems

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industrialized countries deplete the environment by insatiable consumption of waste Growth of population in many developing countries puts damaging pressure on the planet. Therefore if human wants to maintain earth, human must make people environmentally educated to develop environmentally friendly Behaviour. Environmentally friendly Behavior is any action of human directed towards the remediation of Environmental problems. Environmental education is a sort of investment that turns into a valuable asset over a period of time. Universities in India focus on teaching research and training in more than 20 universities different colleges and institutional courses in environmental engineering, conservation and manage environment, environmental health and social science are taught.

The ultimate goal of most studies on Environmental Behaviour is to provided information that can be Helpful in development positive Environmental impact of human activities and development of Pro environmental Behaviour like motivate adolescents to use low energy light bulbs, don't waste water, buy local fruits and vegetables which are not transfer by four wheelers, while shopping use own bags instead of plastic bags provided by super market.

To increase awareness of environment across the country the centre for environmental education (CEE) has been established in August 1984 with the help of the Ministry of Environment and Forests, Government of India. One of the duty the CEE is to put efforts to give due identification to the role of environmental Education. The CEE runs many educational programmes in this regard. Students must be encouraged to understand their surroundings and a framework for an action plan must be formulated. The environment is the need of the day. It must encourage social participation. Hence in a curriculum is a wise option to connect students with nature right from their childhood.

The environment is one of the very significant components for individuals. Interactions between human and environment that occur continuously would influence human behavior on the environment. Human mindset and behavior will determine the good condition of an environment the way human treat and protect their environment will have an impact on the quality of human life itself. In the lights of above, the researcher felt that it is essential to investigate the study on Environmental Behavior and General Mental Ability among secondary school students.

3. Operational definition of the key terms used in the study:

3.1 Environmental Behaviour: It is the means and ways by which student's reaction to different situations and are intentionally planned to facilitate with regard to Environment. It is

the extent to which the students are inspired to act or behave in a desirable way. It is specific and directional. Environmental Behavior is what the student intend to do in relation to conserve the environment and to solve environmental issues. Example:-Switch off the light when not in use, watering the plants and close a running tap etc. It is the extent to which the students are motivated to act or behave in a desirable way. It is specific and has a direction. Environmental Behavior is what the students intend to do in relation to the present Environment and in saving it.

3.2 Pro Environmental Behaviour: Pro-Environmental Behaviour is conscious search to reduce the negative impact of one's actions on nature and build world. It is an effort to reduce the negative environmental impacts caused by human activities. It depicts behaviour that minimizes negative reactions of the students towards the environment to develop positive reaction towards the environment like plant saplings, cleaning the school campus etc. Environmental quality strongly depends on students Behaviour pattern. The pro- Environmental behaviour is behaviour that a student mindfully selects in order to reduce the negative influence on the Environment.

3.3 Environmental Education: Environmental Education should be interdisciplinary and examine main Environmental problems from local, national and international point of view. It should use various educational methods to teach and learn about and from the Environment with stress on practical activities and firsthand experience. It is through this process of education that individual can be sharpened about Environmental issues. NCERT in India has been playing critical role in developing the curriculum of Environmental Education. It has specify that good Environmental Education at school stage of Education is not transformation of information and knowledge but it is all about developing Environmental sensitivity and awareness and Behavior by going out in nature and integrating outdoor Knowledge with classroom Environment. If this be the high ideal of Environmental Education then it is need to find out what is happening in classroom of our schools. Environmental Education is a processes that allow students to explore Environmental problems engage in problem solving and take action to improve the Environment. As a consequence students develop deeper understanding of Environmental issues and develop the skills to make informed and responsible decisions.

3.4 General mental ability: General mental ability is a word used to explain the degree at which an individual learns, understands instructions, solve problems. It is also called General intelligence is a construct developed in psychometric discoveries of cognitive abilities and

human intelligence. It is a variable that sum up positive correlation between different mental tasks reflecting the fact that an individual performance on one type of mental task tend to be comfortable to that person act on other kinds as cognitive tasks. The g factor targets a specific computes of general intelligence. The existence of the g factor was originally proposed by the psychologist Charles Spearman in the early years of the 20th century. He saw that student's performance ratings across seemingly unrelated in school subjects, were positively correlated and reasoned that these correlations reflected the influence of an underlying general mental ability that move into show on all types of mental tests.

3.5 Dimensions of Environmental Behavior: The following dimensions of environmental behaviour are considered in this study: Cognition, feeling, emotion, attitude, thinking, motivation, perception, attention, social knowledge, action related knowledge, Environmental concern, willingness to act Environmentally. If a student has to benefit from the environmental education provided in school and imbibe the environmental values and exhibit pro-environmental behavior he needs to posses the required mental ability. Hence it is relevant to study his general mental ability and its association with their Environmental Behavior.

4. Methodology:

Statement of the Problem:

The statement of the problem is "A study on Environmental Behaviour and General Mental ability among secondary school students"

5. Objectives of the study:

The following were the objectives of the study:

1) To study the level of Environmental Behaviour among secondary school students.
2) To study the level of General mental ability among secondary school students.
3) To examine whether there is significant difference between Environmental Behaviour of female and male secondary school students.
4) To examine whether there is significant difference between General mental ability of female and male secondary school students.
5) To examine whether there is a significant relationship between Environmental Behaviour and General mental ability of secondary school students.

6. Hypotheses of the study:

The following hypotheses were formulated in pursuance of the objectives of the study

1) There is no significant difference between the Environmental Behaviour of male and female secondary school students.

2) There is no significant difference between the General mental ability of male and female secondary school students.

3) There is no significant relationship between the Environmental Behaviour and General mental ability of secondary school students.

7. Variables of the study:

Following are the variables of the study:

Main Variables:

Environmental Behaviour

General mental ability

Background Variable: Gender.

8. Method of the study:

Descriptive Survey method was adopted for the study.

9. Sample of the study:

Random sampling technique has been adopted for selecting the sample of secondary schools of city of Mysore. Further 60 male and female students were selected through cluster sampling technique.

10. Tools used for collection of data:

The following tools have been used for the study and are shown in the table No.1.

Sl. No.	Variables	Tools used	Standardized/ Constructed by
01	General mental ability (GMA)	Raven's standard progressive matrices (RPM)	Raven J C
02	Environmental Behavior	Environmental Behaviour Scale	Investigator

Table No.1: Showing tools used for the study

11. Statistical techniques used for analysis of data:

The following statistical techniques have been used for analyze the hypothesis formulated in the study.

a) t –test

The t- test was used to find out significant difference between variables.

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b) Pearson product movement correlation:

The technique was used to find out the relationship between variables.

12. Analysis and interpretation of the data:

Percentage analysis was used as a statistical technique to analyse the level of analysis with respect to first and second objective which have been presented below.

Objective 1: To assess the level of general mental ability of Secondary school students.

Table No. 1: Table showing the percentage of Secondary school students possessing low, moderate and high level of general mental ability.

General mental ability	Score Limit	Secondary school students	
		Frequency	Percentage
Low	42.5	15	25
Moderate	43-52	29	48.33
High	53	16	26.66
Total		60	100%

Figure No.1 :Figure showing the percentage of Secondary school students possessing low, moderate and high levels of general mental ability.

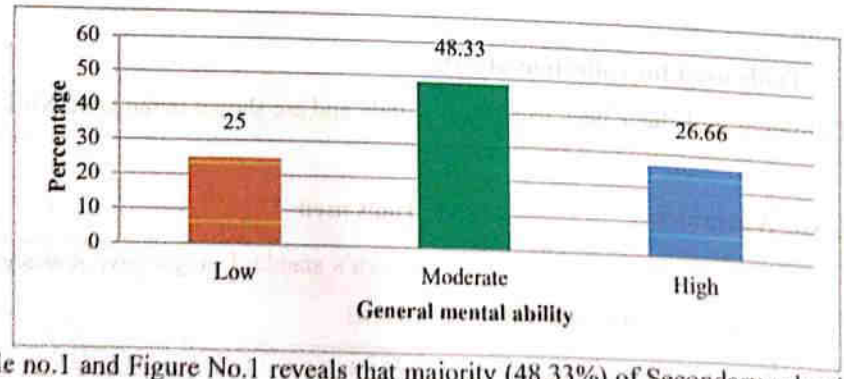

Table no.1 and Figure No.1 reveals that majority (48.33%) of Secondary school students possess moderate level of general mental ability. It is also seen that only 25% and 26.66% of the Secondary school students possess low and high level of general mental ability respectively.

Objective 2: To assess the level of Environmental Behaviour of Secondary school students.

Table No. 2: Table showing the percentage of Secondary school students possessing low, moderate and high level of Environmental Behaviour.

Environmental Behaviour	Score Limit	Secondary school students	
		Frequency	Percentage
Low	614.5	14	23.33
Moderate	615-663	30	50
High	664	16	26.66
Total		60	100%

Figure No.2 : Figure showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Behaviour.

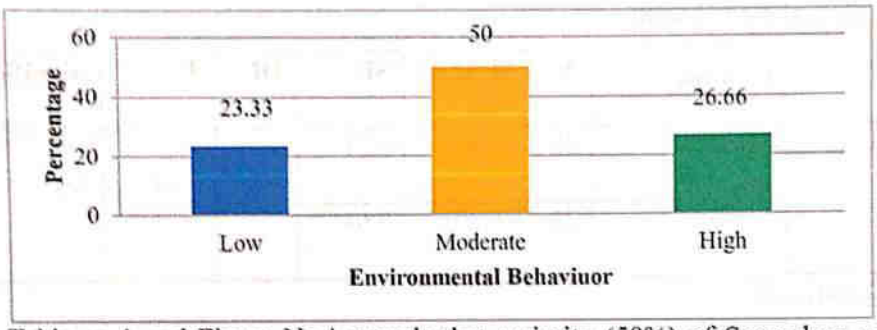

Table no.1 and Figure No.1 reveals that majority (50%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 23.33% and 26.66% of the Secondary school students possess low and high level of Environmental Behaviour respectively.

Hypothesis-1: To examine whether there is significant difference between Environmental Behaviour of female and male secondary school students.

t-Test was used to find the level of significant difference between male and female secondary school students with respect to Environmental Behaviour and General mental Ability.

Table No. 3: Showing mean SD and t-value of male and female secondary school students with respect to Environmental Behaviour.

	Groups	N	Mean	SD	Df	T	Significance
Gender	Male	35	645.40	56.42	58	3.296	**
	Female	25	603.08	42.96			

**: significant at 0.01 level

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Table No.3 shows that the obtained t value 3.296 is greater than the tabled t value 2.660 at 0.05 level. Hence, the null hypothesis Ho.1 is rejected and the alternate hypothesis stating that there is a significant difference between the Environmental Behaviour of male and female secondary school students is accepted. Since, the mean value of male (645.40) is greater than that of the mean value of female (603.08), it is concluded that male secondary school students possess more environmental Friendly behaviour.

Hypotheses-2: To examine whether there is significant difference between General mental ability of female and male secondary school students.

Table No. 4: showing mean, SD and t-value of male and female secondary schools students with respect to general mental ability.

	Groups	N	Mean	SD	Df	T	Significance
Gender	Male	35	46.97	6.71	58	0.405	NS
	Female	25	46.20	7.63			

NS: Not Significant

Table No.4 shows that the obtained t value 0.405 is lesser than the tabled t value 2.000 at 0.05 level, Hence, the null hypothesis Ho.2 is accepted and it is concluded that there is no significant difference between the general mental ability of male and female secondary school students is accepted.

Hypotheses:3 To examine whether there is a significant relationship between Environmental Behaviour and General mental ability of secondary school students.

Table-5: Showing the Number, Mean and 'r' value between general mental ability of Secondary school students and their Environmental behaviour.

Variables	N	Df	'r' value	Level of significance
Environmental behavior	60	58	0.07	NS
General mental ability				

NS: Not Significant

Table no- 5 shows that obtained 'r' value of 0.069 is lesser than table value of 0.250 at 0.05 level. Hence, the null hypothesis Ho-3 is accepted. It is concluded that there is a positive

Table No.3 shows that the obtained t value 3.296 is greater than the tabled t value 2.660 at 0.05 level. Hence, the null hypothesis Ho.1 is rejected and the alternate hypothesis stating that there is a significant difference between the Environmental Behaviour of male and female secondary school students is accepted. Since, the mean value of male (645.40) is greater than that of the mean value of female (603.08), it is concluded that male secondary school students possess more environmental Friendly behaviour.

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	Female	25	46.20	7.63			

NS: Not Significant

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ENVIRONMENTAL ETHICS AND ENVIRONMENTAL BEHAVIOUR A CORELATIONAL STUDY AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT:

Environmental awareness is the initial step ultimately leading to the ability to carry on behavior. Ethics belongs to the realm of values. Environmental ethics consists of principles and values that a man as an individual and as a member of the society should follow so as to conserve, preserve and manage the environment. Environmental ethics says that one should base their behavior on a set of ethical values that guide an informed approach toward the other living beings in nature. In this context the purpose of the study was to investigate the Environmental Ethics and Environmental Behavior. A co relational study among secondary school students. The study also aimed to find out the co relation between the variables of the study. The Study has been carried on students who were studying in 9th standard in school of Mysore city. The sample for the study consisted of 100 male and female students and data was collected using tools: Environmental Ethics scale and Environmental Behavioral Scale which have been used to measure the level of Environmental Ethics and Environmental Behavior among secondary school students. The results shows that majority (40%) of Secondary school student possess moderate level of general mental ability. It is also seen that only 26% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively, majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively, there is a significant difference between the Environmental Behaviour of male and female secondary school students, there is no significant difference between the Environmental Ethics of male and female secondary school students, a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior

Keywords: Descriptive survey method, t test, Environmental ethics, Environmental Behavior, Environmental Education.

INTRODUCTION:

Environmental ethics is the sphere in the philosophy that studies the ideal relationships of human beings to and also values and moral status of the environment and its non human contents. Environmental ethics apply influence on a large range of disciplines involved Environmental law, Environmental sociology Ecology and Environmental geography. Environmental ethics stress on the moral relationship between human beings and the natural environment. Main present environmental problems may include climate change, pollution, and environmental degeneration, resource depletion. The preservation movement campaign for protection of endangered species and protection of any ecologically valuable natural areas. Pollution is the release of dangerous materials into the environment and introduction of contaminants into the natural environment that cause adverse change. The causes of pollution are not just limited to the fossil fuels and carbon emissions. There are many other types of pollution including chemical pollution into the bodies of water and soil through improper disposal practices and agricultural activities and noise and light pollution produced by towns and urbanization as a result of growth of population Hence. In Environmental philosophy Environmental Ethics is an established field of practical philosophy which reconstructs the essential types of argumentation that can be made for protecting natural resources.

Need and importance of the study:

Environmental Ethics is an established field of practical philosophy which rebuild, the essential types of discussion that can be made for saving environment and the sustainable use of natural resources. Environmental Ethics is the basic characteristic of Environmental studies that Establishes the relationship between human and the earth. Environmental Ethics build on scientific understanding by bringing human values principles. Meeting the needs of global citizens. Economically, Ecologically, Culturally and [illegible] to understanding and creative problem solving. Environmental Education equips for the learner with the knowledge skills and motivation to address complex Environmental challenges in the 21st century. Environmental Education implies establishing proper Ecological equilibrium which entails proper use and consumption of resources in a supportable manner. It should enable children s to learn how Environment becomes hazardous. Population explosion and resource depletion could be the best topics to start such learning in School. It is Essential for the self-fulfillment and moral development of the child and the different food chain and the nature s ecological balance helps in carefully handling the problems like pollution menace, over exploitation of natural resources. Through knowledge of physical chemical biological and social process It provides the skills needed to get solution to Environmental problems. It encourages the development and application of scientific principle to solve Environmental problems This study helps to educate individual or children regarding their duties towards Environmental protection. It provides basic information about various Environmental problems like global climate change, toxic emissions and waste disposals. It provides knowledge about development and utilization of energy resources and importance of Environmental

stability in the contemporary culture. Environmental Ethics has produced around Environmental Philosophy. Many scientists have taken up the belief of the aspect of Environmental hazards, this giving rise to Environmental Ethics. Presently, Environmental Ethics, is become a major concern for mankind. The term Environmental awareness has a broad connection. It not only implies knowledge about Environment but also attitudes values and necessary skills to solve Environmental related problems. Moreover Environmental awareness is the first step ultimately leading to the ability to carry on behavior. Ethics belongs to the realm of values. Environmental Ethics includes the principles andvalues that a man as an individual and as a member of the society should follow so at to protect, preserves and manage the Environment thus Ethics has a direct relationship with human behavior mediated through the value system developed by students or individuals. In the light of the above the investigator was felt that it is necessary to investigate the Environmental Ethics and Environmental Behavior A co relational study among secondary school students.

3. OPERATIONAL DEFINITIONS OF KEY TERMS USED IN STUDY

3.1 Environmental Education:

Environmental education is a process to promote the awareness and understanding of the Environment and its relationship with students and their activities and it allow the students to explore Environmental Problems. Participate in problem solving and take action to upgrade the Environment.

3.2 Environmental Ethics:

It is about including the rights of non-humans and animals in our Ethical and moral values and things like water pollution, the depletion of natural resources, loss of biodiversity, destruction of Ecosystem and global climate changes all are the part of the Environmental Ethics debate. Ethical debate impacts on student's ability to solve Environmental issues because students have different viewpoints. Human values are the things that are important to students that they are use to Evaluate actions or Events.

3.3 Environmental Behavior:

Environmental Behavior is what the students intend to do in relation to the present Environment and in saving it. It is any action of the student or group of students towards the Environment or Environmental issues. It is the extent of which the students are inspired to act or behave in the desirable way.

Pro Environmental behavior:

Pro Environmental Behavior that consciously seeks to minimize the negative impacts of one's actions on the nature and build world. It decreases the negative influence of one's action caused by the individual operations. It reduces the negative action of the students towards the Environment and develops the positive attitudes in the students and reactions towards the Environment.

3.5. Dimensions of Environmental Ethics and Environmental Behavior considered in this study:

The dimensions of Environmental Ethics: Honesty, tolerance, Integrity, Responsibility, Truthfulness, Transparency, Cooperation, Punctuality, Patience, Justice, Loyalty, Determination right or wrong, True/False, Honor, Courage, Fairness, Enthusiasm, Acceptance, Empathy.

The dimensions of Environmental Behavior: Action Feeling, Emotion, Attitude, Cognition, Motivation thinking Perception Antecedent Consequences reaction skills Courage. If a student has to benefit from the Environmental Education provided in school and gain and perform pro environmental behavior, he need to develop required environmental ethics. Hence it is relevant to study the Environmental Ethics and Environmental Behavior a corelational study among secondary school students.

METHODOLOGY:

Statement of the Problem: The statement of the problem is, "Environmental Ethics and Environmental Behavior A co relational study among secondary school students.

Objectives of the Study:

The study has been undertaken the following objectives:

1. To study the level of Environmental Ethics among secondary school students.
2. To study the level of Environmental behavior among secondary school students.
3. To compare the Environmental Ethics of male and female secondary school students.
4. To compare the Environmental Behavior of male and female secondaryschool students.
5. To examine whether there is a significant co-relation betweenEnvironmental Ethics and Environmental Behavior among Secondary School Students.

Hypotheses of the study:

The following hypotheses were formulated in pursuance of the objectives of the study;

1. There is no significant difference between Environmental Ethics of Male and Female secondary school students.

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2. There is no significant difference between Environmental Behavior of male and female secondary school students.
3. There is no significant correlation between Environmental Ethics and Environmental Behavior among secondary school students.

Variables of the study:

The following are the variables of the study:

Main variables:

1. Environmental Ethics
2. Environmental Behavior

Back ground variable: Gender

Method of the study: Descriptive survey method has been adopted for the study.

Sample of the study: Random sampling technique has been adopted for selecting sample in Secondary Schools from the city of Mysore. Further 100 male and female students were selected through cluster sampling technique.

Tools used for the collection of data:

Sl.No	Variables	Tools used	Constructed By
1	Environmental Ethics	Environmental Ethics Scale	Investigator
2	Environmental Behavior	Environmental Behavior scale	Investigator

Statistical techniques used for the analysis of data:

The following statistical techniques have been used for analyze the hypotheses formulated in the study.

1. T-test has been used to find out the significant difference between the variables.
2. Pearson product movement correlation has been used to find out thecorrelation
3. Between variables

Analysis and interpretation of the data: Percentage analysis was used as a statistical technique to analyze the level of analysis with respect to first and second objective which have been presented below.

Objective 1: To assess the level of Environmental Ethics of Secondary school students.

Table No. 1: Table showing the percentage of Secondary school students possessing low, moderate and high level of Environmental Ethics.

Environmental Ethics	Score Limit	Secondary school students	
		Frequency	Percentage
Low	608	26	26
Moderate	609-662	49	49
High	623	25	25
Total		100	100%

Figure No.: Figure showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Ethics.

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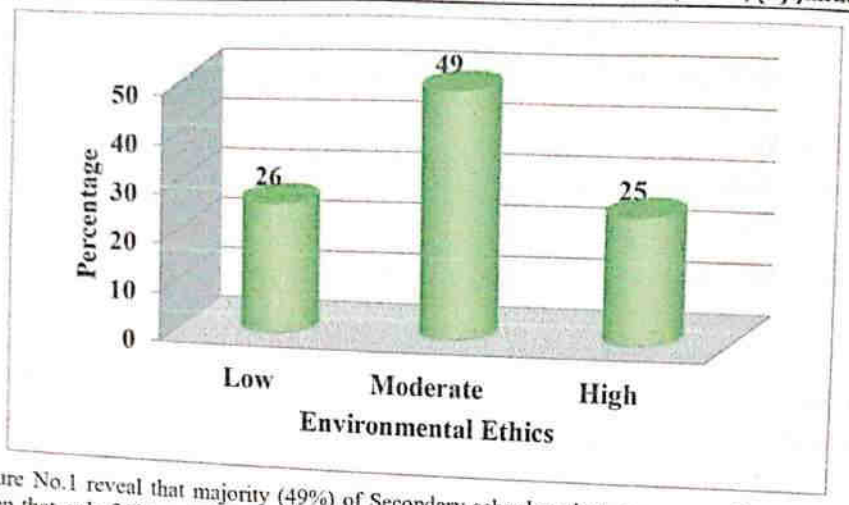

Table no.1 and Figure No.1 reveal that majority (49%) of Secondary school student possess, moderate level of general mental ability. It is also seen that only 26% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively.

Objective 2: To assess the level of Environmental Behaviour of Secondary school students.

Table No. 2: Table showing the percentage of Secondary school students, possessing low, moderate and high level of Environmental Behaviour.

Environmental Behaviour	Score Limit	Secondary school students	
		Frequency	Percentage
Low	176.75	25	25
Moderate	177-196	47	47
High	197	28	28
Total		100	100%

Figure No.2: Figure, showing the percentage of Secondary school students possessing low, moderate and high levels of Environmental Behaviour.

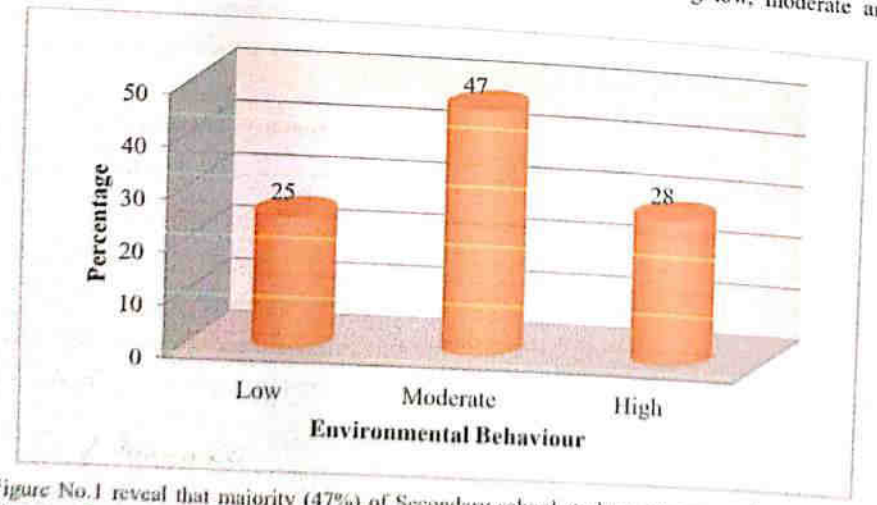

Table no.1 and Figure No.1 reveal that majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively.

Hypotheses-1: There is no significant difference between the Environmental Behaviour of male and female secondary school students.

Table No. 3: showing mean, SD, t-value of male and female with respect to Environmental Behaviour.

	Groups	N	Mean	SD	df	T	Significance
Gender	Male	50	202.08	14.00	98	11.938	0.01
	Female	50	175.42	7.85			

Table No.1 shows that the obtained 't' value 11.938 is greater than the tabled 't' value 2.626 at 0.01 level. Hence, the null hypothesis Ho.1 is rejected and the alternate hypothesis stating that there is a significant difference between the Environmental Behaviour of male and female secondary school students is accepted. Since, the mean value of male (202.08) is greater than that of the mean value of female (175.42), it is concluded that male secondary school students have scored higher in Environmental Behaviour.

Hypotheses-2: There is no significant difference between the Environmental Ethics of male and female secondary school students.

Table No. 4: showing mean, SD, t-value of male and female with respect to Environmental Ethics.

	Groups	N	Mean	SD	df	T	Significance
Gender	Male	50	628.14	60.00	98	0.395	NOT
	Female	50	624.06	41.65			

Table No.4 shows that the obtained 't' value 0.395 is lesser than the tabled 't' value 2.000 at 0.05 level. Therefore, the above stated null hypothesis is accepted and it is concluded that there is no significant difference between the Environmental Ethics of male and female secondary school students is accepted.

Hypotheses-3: There is no significant co-relation between Environmental Ethics of Secondary school students and their Environmental behaviour.

Table no- 5: Showing the Number, Mean 'r value between Environmental Ethics of Secondary school students and their Environmental behaviour.

Variables	N	Df	'r' value	Level of significance
Environmental behaviour	100	98	0.229	0.05
Environmental Ethics				

Table no-5 shows that obtained 'r' value of 0.229 is greater than table value at 0.05 level Hence, the null hypothesis Hypotheses-3 is rejected and the alternative hypothesis stating that there is a significant relationship between Environmental Ethics of Secondary school students and their Environmental behaviour. Therefore, it is concluded that there is a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior.

Findings of the study:

1. Majority (49%) of Secondary school student possess, moderate level of general mental ability. It is also seen that only 26% and 25% of the Secondary school students possessing low and high level of Environmental Ethics respectively.
2. Majority (47%) of Secondary school students possess moderate level of Environmental Behaviour. It is also seen that only 25% and 28% of the Secondary school students possess low and high level of Environmental Behaviour respectively.
3. There is a significant difference between the Environmental Behaviour of male and female secondary school students
4. There is no significant difference between the Environmental Ethics of male and female secondary school students
5. There is a positive and high correlation between the Environmental Ethics of Secondary school students and their Environmental behavior.

Educational implications of the study: Teachers need to develop Environmental Ethics and Environmental Behaviour by teaching concepts of Environmental Education using, activities like role play concept attainment models etc

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"CONTEMPORARY ISSUES DURING COVID-19 PANDEMIC: A MULTIDISCIPLINARY APPROACH"

Special Issue Editors

Prof. D.S. MUNEENDRA KUMAR

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ACHIEVEMENT OF HIGH SCHOOL STUDENTS IN COMPREHENSION AND SKILLS IN THE LEARNING OF MATHEMATICAL CONCEPTS – AN ANALYTICAL STUDY

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Abstract : *Mathematics is a key subject necessary to the promotion of economic development, particularly in developing countries; One way to address this issue is by taking cognisance of the learners' learning styles when teaching. Using the Dunn and Dunn model and the VARK model, the study on which this article is based explored the inter-relationships of Mathematics achievement and seven learning styles, as well as the learning styles of high and low achievers. The study recommends that teachers should create a positive learning environment at school, and use teaching methods that accommodate a variety of learning styles. Further research is needed to determine the impact of demographic variables on learning style preferences in Mathematics.*

Keywords: *learning style, Mathematics achievement, Mathematics teaching, High school*

Introduction

India has placed great emphasis on educating all its children, since independence. Seeking a more just and equitable society, the Constitution of India is committed to providing to all children, opportunities for developing their capabilities and maximizing their learning in their areas of interest. Providing mathematics education is an integral part of India's commitment to universalization of education. Mathematics is a part of our general education and all children have to study mathematics till class 10.

Universalization of education was not an easy task for India at the time of independence. Large regions in the country did not have schools, schools that existed lacked infrastructure and the commonly held perception was that school education is not useful for all. Since then various initiatives of the government have led to a remarkable improvement in access to schooling and various studies show that demand for good schooling is not restricted to only certain groups of people today (PROBE Team, 1999). Significantly, the 86th constitutional amendment declared education a fundamental right of every Indian child in 2002, and the Right to Free and Compulsory Education Act (RtE) in 2009 gave further teeth to the idea of every child being educated up to the age of 14 (i.e. elementary school level) by making it justifiable. Today, primary schools exist within a kilometer of every child and elementary schools, every three kilometers. Access to secondary schools however, may require children to travel up to ten kilometers. While considerable progress has been made in providing schooling facilities to all children, children's learning remains a tenuous area. Various studies undertaken by government and private agencies in primary and elementary classes are evidence of very poor learning levels among children in both Language and Mathematics (Education Initiatives, 2010; Pratham, 2005-2010; NCERT, 2008). Children have difficulty in 'reading texts with understanding' and 'expressing their thoughts in writing'. Understanding of

mathematics in primary classes is largely limited to 'procedural or rote-based learning' and in fact falling averages as we move from the primary to the elementary classes indicate an increase in the level of incomprehension for children (Education Initiatives, 2010).

Organization of secondary education in India

Education is a part of the federal framework of governance in India and so both the centre and the state governments enjoy authority in this area. The National Council for Education, Research and Training (NCERT) is the apex body for advising the central and state governments on school education. NCERT along with its state level counterparts- the State Councils of Education, Research and Training(SCERTs) are involved in various tasks like educational research, curriculum renewal, textbook creation, creation of supplementary material for children and teachers, pre- and in-service training and publications for teachers and children.

The country also has two national level boards of secondary education- the Central Board of Secondary Education (CBSE) and National Institute of Open Schooling (NIOS), the former being popular. All states of the country also have their own official boards of secondary education. Apart from these, one private board of secondary education also exists-the Council for the Indian School Certificate Examination (CISCE). More recently some international boards of secondary education are also coming into India. The secondary boards in India are in many cases responsible for the development of curricular expectations, syllabus and teaching-learning materials at the secondary level as well as reform in examination and evaluation practices. In a few instances they are also responsible for in-service teacher training.

In recent years, there has been an increase in the role of the NCERT and the SCERTs in processes of curriculum renewal and textbook development and boards are focusing on improving assessment processes and mechanisms.

It must be kept in mind that while there are official agencies like NCERT, SCERT and boards of secondary education that produce textbooks of mathematics, there are no restrictions on private publishers bringing out materials for these classes. There are many national and international publishing houses that bring out books; however, the expectation is that these be in line with the national and state curricular documents. Private schools largely form the market for these books.

The vision for mathematics education

The vision with which mathematics has been placed in the school curriculum has evolved over the years. In the 1950s and the 1960s, India developed its mathematics education as a step towards industrialization and scientific research. The Kothari Commission was set up for thinking comprehensively about education in India during this period and published its report in 1966. The report underlined the need for mathematics and science in school as well as in higher education; it emphasized the importance of children learning mathematics for the development of science and technology and for industrial growth. To quote from the report, "One of the outstanding characteristics of scientific culture is quantification. Mathematics, therefore, assumes a prominent position in modern education. Apart from its role in the physical sciences it is now playing an increasingly important part in the development of the biological sciences" (Government of India- Ministry of Education, 1966, p.181). The 1968 and 1986 National Policies of Education spoke in the same tone as the Kothari Commission report and the 1986 policy states that "mathematics should be visualized as the vehicle to train a child to think, reason, analyze and articulate logically. Apart from being a specific subject, it should be treated as a concomitant to any subject involving analysis and reasoning" (Government of India- Ministry of Human Resource Development, 1998, p.29).

The system of Nai Talim (New Education) that had emerged in the 1930s and 1940s from the thinking of various people like Dr. Zakir Hussain and Gandhi working towards building responsible, capable and educated Indians also realized the importance of mathematics. However, it viewed mathematics in terms of its use for the day-to-day requirements of people. The emphasis was on ensuring that calculations necessary for the survival of the child in the circumstances in which she was growing were learnt. The Zakir Hussain committee stated: "Knowledge of mathematics is an essential part of the curriculum. Every child is expected to work out the ordinary calculations required in the course of his craft work or his personal and community concerns and activities." In this sense, the Kothari Commission widened this very concrete, tangible and narrow purpose of teaching mathematics.

Respecting the distribution of the areas of jurisdiction between the centre and state governments on matters of education, the National Policy of Education, 1986 clearly states that "the national system of education will be based on a national curricular framework which contains a common core along with the other components that are flexible". The national curriculum framework brought out by the NCERT in 2000 gave some idea of the content in the syllabus and the kind of teaching process to be followed.

It felt that the teaching-learning process must heed the context of the child and their 'zone of proximal development' and learners should be able to relate the mathematics in their textbooks to their life experiences. This led to the idea of the mathematics lab and use of more and more concrete illustrations and activities in classrooms of mathematics. Under central government supported schemes, teachers and teacher educators made a lot of effort to develop activities and games that would somehow be linked to the teaching of mathematics.

The period of the 1990s and early 2000s was also the period when Minimum Learning Levels (MLL) formed the basis for the curriculum and textbooks and NCF 2000 also asked for their proper implementation. The idea of MLL arose from the need to provide equitable education to all children across India. It itemized learning of language, mathematics and environmental studies in the primary classes into small chunks/ competencies that all children were expected to achieve. Assessment and evaluation was also based on these small chunks. To be measurable these competencies had to be in the form of observable behaviour demonstrated by the child when she received the requisite inputs. This formulation of MLL also paid no heed to the time and space that children needed for concept building. There was a great deal of opposition to this and various alternative formulations were built. These included work by some organizations outside the government framework, some of them being partnerships with public institutions, like Eklavya in Madhya Pradesh, Homi Bhabha Centre for Science Education in Maharashtra, Vidya Bhawan Society in Rajasthan, Suvidya in Karnataka, School Mathematics Program of the Centre for Science Education and Communication of Delhi University, etc. These organizations had worked directly with various government schools and developed their own curriculum, syllabus and textbooks in this process. The experiences and ideas of these organizations have helped in giving shape to the National Curriculum Framework 2005. In fact, the upper primary textbooks produced by the Delhi state in 2000 were also a partnership between SCERT, Delhi and Vidya Bhawan Society, Rajasthan.

In the exercise undertaken by Delhi SCERT, many conceptual areas were re-organized and books made less loaded, complicated calculations eschewed and many areas elaborated. Topics such as surds, complicated proofs, stocks and shares, dividend calculations, income and sales tax were not included. The textbooks also attempted to use language and pictures as devices to communicate mathematics and were based on the argument that a book for the student should be at the level of her comprehension. Another important change initiated was the creation of a complete mathematics book instead of a textbook divided into sections. This

subsequently led to spiraling and developing interrelationships between various mathematics concepts. There was, however, no consensus on removing relatively tedious algebraic expressions, fractional number calculations, theorems and definitions in geometry, etc. There was a fear that the state syllabus would lag behind that of other states across the country. It was difficult for many to accept that it was pointless to load the program with tricks and algorithms to solve particular problems or for the child to do tedious algorithmic manipulations with numbers, algebraic quantities or geometric figures.

All this was part of the wisdom that fed into the emergence of the next National Curriculum Framework in 2005.

Challenges on the road ahead

The vision of mathematics education in NCF 2005 demands changes from the system and schools. It demands a change in the syllabi and textbooks and a change in classroom teaching and assessment. As we have discussed earlier, processes for the former have been initiated and stand at different levels of maturity in different states. However, the latter remains a formidable challenge. An appreciation of what NCF 2005 is saying requires extending the horizons of schools and linking them to the outside world and a different relationship between teachers and children including providing children with opportunities to explore, extend their mind and argue their stance. All these are very hard to achieve. There is little appreciation or acceptance of these principles in society, and among teachers and teacher educators, who are themselves struggling with their limitations in mathematical ability. Also there is little conviction that equitable learning is possible. The belief systems and prejudices about gender, caste, economic status and even cultural practices make mathematics teachers build classrooms differently from those expected in the NCF.

The biggest challenge for us is to change this attitude of teachers, parents and others to mathematics and why and how it should be taught. For most people "why mathematics education" still revolves around mathematics for calculations. Generally, the teacher believes that mathematics is about knowing solutions to problems and not about being able to understand what the concept means and about being able to think of ways of solving problems. The emphasis is on the 'correct answer' rather than on thinking of a variety of ways to approach the solution. Teaching, therefore, gets restricted to sharing solutions with students from either the textbooks or guide books, which offer short cuts and memory devices to children and are used widely especially in the higher classes. Teachers teach in a manner that is entirely de-linked from the experiences of children and participation by children is minimal. There is often even confusion between 'demonstration through concrete examples' and 'the proof of statements'. For the students, the classrooms largely consist remembering the defi nitions of mathematical ideas, axioms, postulates and solutions to problems or theorems and their proofs. Mathematics classroom, therefore, tends to become uninteresting for students. For most teachers, making mathematics interesting and vibrant is not possible because they themselves are often afraid of mathematics and consider it a subject for the privileged few who are capable and intelligent. 'Activity based mathematics teaching' and 'child centered' teaching are the buzz words, open to multiple interpretations and often get restricted to use of concrete materials for a few concepts in primary classes. Mathematics classrooms, in spite of NCF and the recent textbooks of NCERT remain didactic and assessments test calculations, algorithms, definitions and answers to 'difficult questions'.

Teachers who teach mathematics at the elementary and the secondary level are supposed to be graduates or post graduates in mathematics with a degree/diploma for teaching. In many cases, however, teachers with such qualifications are not available to teach mathematics. Mathematics is taught by teachers who are not very confident of their

mathematics. Even in cases where mathematics graduates or post graduates teach the subject their conceptual understanding may be inadequate. Besides, their understanding of the nature of mathematics and attitude to it and its learning are very different from what is underlined in the NCF 2005. The lack of ability of teachers in mathematics is probably the result of their preparation at the school and the college level. It is also because of the inadequate time for pre-service training and the way classroom teaching for pre-service teacher education takes place. Given the large number of teachers in schools and the lack of avenues of for continuing their learning most teachers also do not remain in touch with what they have learnt. There is a strong need for such processes to be initiated that would enable teachers to become more confident and to continue to engage with them. There are, however, insufficiently many institutions and individuals capable of creating and implementing a process that would enable teachers to learn more mathematics and be more confident of their ability. In the Indian context, the lack of this institutional capacity to help teachers learn more mathematical concepts and more about mathematics is the biggest challenge. In India's effort towards universalization of mathematics education, these remain the most critical barriers. They affect the confidence and learning of children much more than the syllabus, textbooks, assessment and everything else put together.

A number of studies and experiences show that many barriers to schooling still exist. These include barriers for the girl child who is not allowed to go to the school after she has reached a certain age, generally the age of puberty. Many schools do not have boundary walls (52%) and separate toilets for girls (41%), and this takes schooling a step further away (NUEPA. 2009). The situation for the secondary classes is worse as the schools are farther from their homes and concerns about the security of girls, forces them to give up schooling. Another factor preventing girls from coming to school is the absence of women teachers in the higher classes. Access is not the only problem for girls and the general societal belief (also shared by teachers) is that the study of abstract ideas does not benefi t girls and also that a girl's life priorities do not require her to take on anything as hard as mathematics and science. Frequently heard statements could be that "X is just like a boy, she is so good in mathematics". This attitude adds to the belief already implanted in them that they cannot learn mathematics.

There are also very strong prejudices about poor children and children from deprived social backgrounds. Some time ago almost all children in school were from the so called upper castes. The situation has changed today but a majority of mathematics teachers are still from the higher castes. Their belief is that the poor and lower caste children are not meant to learn mathematics and any sign of their disability is proof of their belief. It may not be hard to appreciate that such attitudes would also be present in children. Children from privileged backgrounds start with this advantage and that initial advantage is further strengthened by the belief of the system that only children from certain backgrounds can do abstract learning. This belief is in contrast to the commitment that India is bound to educate all its children and wants to teach mathematics to all children.

The NCF entails an expectation of a classroom that is interactive and inclusive and a teacher development program that not only builds the capability of the teachers for all this but also motivates them for this through mechanisms of sharing and scaffolding. At present various mechanisms for building the capabilities and interests of teachers are being evolved and include restructuring of pre-service courses of teacher education, strengthening of in-service training as well as strengthening of decentralized (cluster and block level) structures, seeking linkages between colleges of higher education and departments of education and teacher training colleges, etc. Attempts are also being made to reach ideas to the teachers through the use of ICT.

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Remedial Instructional Programme for Teaching Addition of Fractions to Children with Mathematical Disability (CwMD) In Inclusive Schools

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Abstract

The article explains the different types of error committed and difficulties exhibited by Children with Mathematical Disability (CwMD). The authors made an attempt to know different types of errors committed and difficulties exhibited by the participants while doing the addition of fractions. The study aims in developing the remedial instructional programme for CwMD in fractions related to (addition of fractions). The effectiveness of the programme has been studied and results indicated that the intervention provided was effective in improving the performance of participants from pre-test to post-test. The study has implications for teaching multiplication of fractions in inclusive schools.

Key words: Remedial Instructional Programme, Mathematical Disability, Inclusive Education.

Introduction

Learning fractions is difficult for children in general and especially difficult for children with Mathematical Disability (CwMD).). Fractions are well known to be difficult to learn. Fraction sense "refers to a person's general understanding of fractions and operations along with the ability and inclination to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for handling fractions and operations" (McIntosh et al., 1992, p. 3). However, children encounter fractions as the most complicated mathematical concepts in primary and even in their middle years in school. Moreover, fractions play a key role in mathematics, since they are involved in probabilistic, proportional and algebraic reasoning. Fractions are critical component of mathematics understanding and a gateway for too many sought after occupations. Fractions are an essential foundational skill for future mathematics success (NMAP, 2008). Children with mathematics difficulties (MD) lag behind in numerous aspects of fraction knowledge, including comparing and ordering fractions, estimating fraction on a number line, performing fraction arithmetic calculations, and solving word problems involving fractions (Bailey et al., 2015; Cawley, Parmer, Yan, & Miller, 1996; Hecht & Vagi, 2010; Mazzocco & Devlin,

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2008; Siegler & Pyke, 2013). Fractions are well-known to constitute a stumbling block for primary school children (Behr et al., 1983; Moss and Case, 1999; Grégoire and Meert, 2005; Charalambous and Pitta-Pantazi, 2007). Understanding difficulties in learning fractions seems absolutely crucial as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly & Hunting, 1996) especially when dealing with quantities in numerator and denominator. Pitkethly and Hunting (1996) posited that students view these two quantities as two separate entities of whole numbers instead of part-whole conceptualizations.

The importance of fractions extends beyond the school years. Fractions are essential foundational skill for future mathematics success (NMAP, 2008). The importance of fractions makes it a major topic in elementary and middle school curricula. According to Common Core State Standard Initiative (CCSSI, 2010), students should develop understanding in fraction in Grade 3 and Grade 4 , they should gain competence in fraction and word problems from Grade 4 to Grade 6and they should be able to apply fraction to problem solving ratios and proportions of Grade 6 and Grade 7.

Objectives

1. To analyze the type of errors committed by CwMD in mathematics studying in Grade –VI and VII while attempting items relating to Addition of Fractions w.r.t different criterion measures of Grade V, VI and VII.
2. To plan out the remedial instructional Programme in Addition of Fractions for CwMD studying in the Grade VI and VII w.r.t different criterion measures of Grade – V, VI and VII.

Methodology

The methodology related to the participants, tools and techniques method of collection and analysis of data are discussed in this section.

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria. A total of 21 participants with CwMD were considered as the sample for the study.

Table -1

Performance of the participants in the criterion measures pertaining to Fractions (Addition of fraction) of Grade- V, VI, and VII.

Sl. No	Grade	CRITERION MEASURE	M	PA	NM
1	V	Find the sum of the given fractions	40.47	40.13	19.4
2	VI	Addition of fractions (having same denominator)	--	----	100
3	VII	Addition of fraction	33.33	---	66.67

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Table -02

Errors noticed in while doing the task in Fractions related to Addition by CwMD

Sl. No	Errors	Example	Probable Reasons
1	Conceptual error Procedural Error committed	To find the sum of the given fraction. Example 7/9 + 3/9 = 10/18	Does not know when there is a common denominator it should be taken directly and by not adding it. Does not know that when denominators are same common denominator should be considered. Lack of Procedural Knowledge
	Did not attempt	3/10 + 6/10 +7/10 3 ¼ + 4/5 + 2/3	Does not know how to do the mathematical operation i.e. addition. Confusion prevailed while adding the fractions when numerators are different and denominator are same. Does not know to add the fractions when the denominators are different.
	Conceptual Error committed Procedural Error committed	5/6 +1/3 + 5/2 + 6/3 5+1+5+ 6 ---------- = 17 6+3+2+3 ---- 14	1. Adds the numerator 2. Adds the denominator. 3. Does not know to take LCM when the denominators are not same. 4.Does not have the conceptual understanding 5.Does not have the Procedural Knowledge.

Analysis was done to identify the types of error committed and the difficulties experience by the participants and the probable reasons for the errors/difficulties.

Planning and Preparing the Remedial Instructional Programme

Based on the errors committed and difficulties exhibited by CwMD, the general principles suggested by various researchers a remedial instructional programme to teach Addition of Fractions was developed.

Some of the general principles to learn Fractions are

1. Readiness skill for learning fractions to be emphasized.

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2. Teaching the same concept in different ways or representations.
3. Make use of simple vocabulary while teaching,
4. To foster the cognitive development.
5. Teaching should have direct impact on child's perception in learning.
6. Multisensory approach to be used while teaching.

Specific principles to teach Addition of Fractions

1. To compensate for short-term memory performance cues should be used to remember steps while doing Addition of Fractions.
2. The terms and the symbols of addition of Fractions to be used frequently for better retention and better performance.
3. Activities should be drawn such that a child finds interest in learning.

Main features of the Remedial Programme.

Keeping the above principles in mind the remedial instructional programme to teach addition of fractions to CwMD, was developed. Some of the main features of the programme are

1. The programme is designed in such a way that it caters the needs of the majority of children who have problem in learning the concept of addition of Fractions.
2. Each lesson has specifically designed instructional objectives.
3. Activities are arranged in sequential order.
4. The present learning activities were linked to the previous activities.
5. Achieving the objective of the previous class is a pre-requisite skill to go to the next lesson.
6. Concepts were taught using the concrete materials. Slowly, it was shifted to semi-concrete and finally the abstract form of addition of Fractions with different denominators was used.
7. Lessons were short requiring 20 min covering a specific concept.

SAMPLE LESSON

The addition of fraction teaches us to add two or more fractions with same denominators and to take LCM different denominators are considered in addition of fractions. The addition of fractions depends on two major conditions.

a) Same denominator.
b) Different denominator.

Addition of Fraction:

General Objective: To enable the children to understand the concept and procedure adopted in addition of fraction by taking common denominator and different denominators.

Specific Objective:

a) The pupil will be able to identify fractions having common denominator and fractions having different denominator.
b) The pupil will be able to recognize fractions with same denominators and fractions having

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Teaching-Learning aids used:

1. Mathematics Table used.
2. Charts related to addition of fractions with common denominator and different denominator used
3. Writing board and color chalk used different denominators.

Addition of Fractions with same denominator

If the denominators of two or more fractions are same then we can directly add the numerator keeping the denominator common.

Example 1: General form of Addition of Fraction when the denominator are same.

1. a/b + c/b --→ (The denominators are same, consider once, it is common denominator, here b is common denominator, consider it once)

$$= \frac{a+c}{b}$$ → (Add the numerator) → (Common denominator)

Example 2:

Add the fractions 4/6 + 7/6

4/6 + 7/6 → [Look at the numerator, add them]

$$= \frac{4+7}{6}$$ → [Add the numerator] → (Look, at the denominator they are same, take the common denom

Follow the below steps to add the fractions with same denominator.

- Add the numerator together, keeping the denominator common.
- Writing the simplified fraction

Example 3: Addition of fractions with different denominators.

[(9/6) + (3/4)]

Method-01:

Step -01: Cross multiply the left numerator with the right denominator and right numerator with the left denominator).[Cross multiplication done representing through the arrows using color chalk].

Step-02: Multiply the denominators, they are different. (There is no common denominator). [Asked students whether the denominators considered are same or different]

Step -03: Take LCM of the denominator

Step-04: Finally add the numerator and the denominator.

1. Add the given two fractions [(9/6) + (3/4)].

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$$= \frac{[(9x4) + (3x6)]}{(6x4)}$$

$$= \frac{[36 + 18]}{24}$$

$$= \frac{54}{24}$$

6	6, 4
	1, 4
4	1, 1

L C M 6x4=

6x1=6	4x1=4
6x2=12	4x2=8
6x3=18	4x3=12
6x4=24	4x4=16
6x5=30	4x5=20
6x6=36	4x6=24
6x7=42	4x7=28
6x8=48	4x8=32
6x9= 54	4x9=36
6x10=60	4x10=40

II

Method:

6, 4
1, 4
1, 1

6

[(9/6) + (3/4)]

4

Step 1: Consider each of the fractions separately and multiply with the L C M

LCM 6x4=

24

a) $\frac{9}{6} \times 24$ → (The denominator and the L C M has to be divided)

6)24(4
24

6x4=24

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$9x4 = 36 \rightarrow (1)$

Step 2: Consider the other fraction and multiply the numerator with the LCM or divide the denominator with LCM.

6x1=6	4x1=4
6x2=12	4x2=8
6x3=18	4x3=12
6x4=24	4x4=16
6x5=30	4x5=20
6x6=36	4x6=24
6x7=42	4x7=28
6x8=48	4x8=32
6x9= 54	4x9=36
6x10=60	4x10=40

b) $\frac{3}{4} \times 24 \rightarrow$ (The denominator and the L C M has to be divided)

$3 \times 6 = 18 \rightarrow (2)$

4)24(6
24

0

Step 3: Add the product of both the fractions
With the denominator

$$\frac{36+18}{24} = \frac{54}{24}$$

Table -3

Performance of the participants in the criterion measures pertaining to Fractions (Addition of fraction) of Grade- V, VI, and VII in Pre-Test and Post-Test.

Sl. No	Grade	CRITERION MEASURE	Pre-Test			Post-Test		
			M	PA	NM	M	PA	NM
1	V	Find the sum of the given fractions	40.47	40.13	19.4	90.47	9.53	--
2	VI	Addition of fractions (having same denominator)	--	----	100	47.61	47.63	4.76
3	VII	Addition of fraction	33.33	---	66.67	100	--	--

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Teachers should be trained in methods to teach CwMD and other children who face difficulties in learning mathematics.

Addition of fraction having same denominator was found to be most difficult in the pre-test and mastery was seen at 47.61% in the post-test and partial achievers at 47.63% .

7. Addition of fraction was seen to have 100% mastery in the post-test from 66.66% of non mastery in the pre-test of Grade VII.

Implications of the study

1. Since the programme developed to teach Addition of fraction to CwMD, this programme can be used for any children who are having difficulty in understanding the addition of fractions due to various other reasons in upper primary schools.

2. As factions are found to be difficult for most of the normal children also. So, the remedial strategies suggested here can be made use to teach n the regular classrooms so that it will be helpful to the normal children.

3. Children with Mathematical disability (CwMD), can overcome their problem if the specific deficits are identified and faulty strategies adopted to do the operations are rectified.

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Effectiveness of a Remedial Instructional Programme in Attaining Mastery in Fractions among Children with Mathematical Disability (CWMD) in Grades VI and VII

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Abstract

The article explains the different type of errors committed and difficulties exhibited by Children with Mathematical Disability (CwMD). The authors made an attempt to know different type of errors committed and difficulties exhibited by the participants while doing the addition of fractions. The study aims in developing the remedial instructional programme for CwMD in fractions related to (addition of fractions). The effectiveness of the programme has been studied and results indicated that the intervention provided was effective in improving the performance of participants from pre-test to post-test. The study has implications for teaching multiplication of fractions in inclusive schools.

Key words:, Mathematical Disability, Difficulties in Learning Fractions, Effectiveness of Remedial Instructional Programme in Mathematics for CwMD.

Introduction

Learning fractions is difficult for children in general and especially difficult for children with Mathematical Disability (CwMD). Fractions are well known to be difficult to learn. Fraction sense "refers to a person's general understanding of fractions and operations along with the ability and inclination to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for handling fractions and operations" (McIntosh et al., 1992, p. 3). However, children encounter fractions as the most complicated mathematical concepts in primary and even in their middle years in school. Moreover, fractions play a key role in mathematics, since they are involved in probabilistic, proportional and algebraic reasoning. Fractions are critical component of mathematics understanding and a gateway for too many sought after occupations. Fractions are an essential foundational skill for future mathematics success (NMAP, 2008). Fractions are well-known to constitute a stumbling block for primary school children (Behr et al.,1983; Moss and Case, 1999; Grégoire and Meert, 2005; Charalambous and Pitta-Pantazi, 2007). Understanding difficulties in learning fractions seems absolutely crucial

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as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly & Hunting, 1996) especially when dealing with quantities in numerator and denominator. Pitkethly and Hunting (1996) posited that students view these two quantities as two separate entities of whole numbers instead of part-whole conceptualizations.

The importance of fractions extends beyond the school years. Fractions are essential foundational skill for future mathematics success (NMAP, 2008). The importance of fractions makes it a major topic in elementary and middle school curricula. According to Common Core State Standard Initiative (CCSSI, 2010), students should develop understanding in fraction in Grade 3 onwards. Children with mathematics difficulties (MD) lag behind in numerous aspects of fraction knowledge, including comparing and ordering fractions, estimating fraction on a number line, performing fraction arithmetic calculations, and solving word problems involving fractions (Bailey et al., 2015; Cawley, Parmer, Yan, & Miller, 1996; Hecht & Vagi, 2010; Mazzocco & Devlin, 2008; Siegler & Pyke, 2013). Fractions instruction in the United States had predominately relied on teaching part-whole understanding (Fuchs, Sterba, Fuchs, & Malone, 2016c; Ni & Zhou, 2005: Thompson & Saldanha, 2003). Part-whole understanding refers to conceptualizing fractions as representing one or more equal parts of an object or set of objects. More recent studies reveal that strong whole-number knowledge supports fractions learning (e.g., Namkung et al., 2018; Resnick et al., 2016; Rinne, Ye, & Jordan, 2017). Students with a strong foundation in whole-number magnitude understanding had more accurate fraction magnitude understanding than those who did not (Resnick et al., 2016). Hence, there is a need to develop knowledge and competencies in Whole numbers before attempting to improve the same in Fractions. It is also essential to understand the specific difficulties experienced by the Children with Mathematical Disability (CwMD) in fractions and also the type of errors committed by them. Remedial programme should be planned on the basis of the difficulties and errors. In order to train the teachers in providing Remedial Instruct to CwMD, there is a need to have evidence based programmes. The studies relating to Remedial Instructional Programmes conducted in India on CwMD mainly focused on Whole numbers. Hence,the need for the study.

Objectives

1. To analyze the types of errors committed in Fractions by CwMD studying in Grades –VI and VII.
2. To find out the Effectiveness of a Remedial Instructional Programme in Attaining Mastery in different criterion measures pertaining to Fractions among Children with Mathematical Disability (CWMD).

Methodology

The methodology related to method of collection and analyses of data are discussed in this section.

as they can lead to mathematics anxiety, and affect opportunities for further engagement in Mathematics. The learning of fractions is traditionally a difficult topic for many students (Charalambous & Pitta-Pantazi, 2007; Meert et al., 2010; Pitkethly

fractions learning (e.g., Namkung et al., 2018; Resnick et al., 2016; Rinne, Ye, & Jordan, 2017). Students with a strong foundation in whole-number magnitude understanding had more accurate fraction magnitude understanding than those who

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria.

Table -1

Details of the participants

Type of School	Grade	Number of children included in the study
Government	VI	6
Private Aided	VI	3
Government	VII	6
Private Aided	VII	6
		21

Brief Description of the Tools

Though the participants were from Grades VI and VII the Diagnostic Tests in Mathematics for the Grades I-IV, V, VI, and VII were administered to the participants in order to understand their specific difficulties in different criterion measures of all the 7 Grades. A brief account of the tools used in the study is given below.

The Arithmetic Diagnostic Test (ADT) was developed by Ramaa S (1994, 2015) is used as a means to identify the difficulties and to diagnose the errors made by the children in arithmetic. This test is not the disability specific test. The test could be administered to any children studying in the grades I-IV. The test intends to diagnose the specific difficulties encountered by children of primary schools of grade I-IV while doing the arithmetic sum. The test is developed in such a way that the items are appropriate to the different grades of the primary school stage, cumulative and varies from each other at the minimal difference level

The Mathematics Diagnostics Test developed by Nair Prithi Govindhan, 2015, was used in the study. The test intends to assess the performance level of children in mathematics studying in the Grade –V. The test intends to diagnose specific difficulties exhibited and errors committed by the children of Grade V. The test covers almost all the areas of mathematics of Grade V.

The Mathematics Diagnostic Tests for the Grade –VI and VII were developed by the investigator to know the performance level of children in mathematics studying in the grade VI and VII. The test intends to diagnose the errors committed and specific difficulties exhibited by children in solving the mathematical operations. The test covers almost all the areas of Arithmetic, Algebra and Geometry in mathematics of the grades VI and VII of Karnataka state board Text book of Kannada medium.

Collection of the Data

The data relating to difficulties and errors were collected by administering the tests to the participants in small groups of 2 to 3 children in two sessions of about 60 min in order to avoid the fatigue factor. The children were given sufficient time.

The scoring was done with reference to each of the criterion measures of the total tests. However, in the article the data related to addition of Fractions is only discussed.

In order to collect the data related to the effectiveness of a Remedial Instructional Programme in attaining mastery in fractions among Children with Mathematical Disability the experiment was conducted with Pre-Test and

The data was analyzed qualitatively. The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the specific difficulties in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) .

In order to achieve the objective no.2 that is :To find out the Effectiveness of a Remedial Instructional Programme in Attaining Mastery in different criterion measures pertaining to Fractions among Children with Mathematical Disability (CWMD) an experiment was conducted with a single subject pretest post test design . This phase involved two stages:

1. Preparation of the remedial instruction programme
2. Evaluation of the remedial instruction programme

Preparation of Remedial Instructional Programme.

The remedial instructional programme was planned and prepared on the basis of the difficulties exhibited by the participants and the errors committed in the criterion measures on all the 4 diagnostic tests. In the programme. the principles suggested by various investigators such as Myklebust in Gearheart (1973), Rozario and Kapur (1992), Otto & Smith (1980), Ray (2001),Stewart and Kluwin (2001) and Westwood (2004)), National Council of Teachers of Mathematics (2007), Lin, Liu, Chen, Liou, Chang, Wu and Yuan (2012) were incooperated. The remedial programme aimed at mastery in all the criterion measures pertaining to the components of the mathematics the grades I-VII: Number concept, Addition of whole numbers, Subtraction of whole numbers, Multiplication of whole numbers, Division of whole numbers and fractions pertaining to grade I-IV and to ascertain the percentage of children with mathematical disability in grade V exhibiting difficulties in various criterion measures of mathematics namely Number concept, Addition of whole number, fractions and decimals, Subtraction of whole number, fractions and decimals, Multiplication of whole numbers and fractions, division of whole numbers and fractions, percentage and geometry pertaining to grade-V.and to ascertain the percentage of children with mathematical disability in grade VI and VII exhibiting difficulties in various criterion measures of mathematics namely Number concept, Addition of whole number, integers, rational numbers, fractions and decimals, Subtraction of whole number, integers, rational numbers,

fractions and decimals, Multiplication of whole number, integers, fractions and decimals, division of whole numbers, integers, rational numbers, fractions and decimals, Introduction to Algebra, Algebraic expressions, exponentials, Factorization, Ratio and Proportion, Percentage, Simple Interest, Profit and Loss and geometry pertaining to VI and VII. However, in this article details regarding fractions only included..

An experiment was conducted on 21 children with mathematical disability to meet one of the objectives of finding out the effectiveness of the remedial instructional programmme with single subject pre-test and post-test design as the difficulties and errors of the participants in different criterion measures were varied considerably.

Analysis and Interpretation of the Data

The data was analyzed qualitatively.

Analyzing the difficulties of the participants in various criterion measures pertaining to fractions

The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the errors committed in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) . The participants with partial achievers (PA) commit varied error patterns in addition of fractions, such errors committed by the participants are listed with the type of error committed, probable reasons for committing such errors are discussed in the section below and followed by designing the Remedial Instructional Programme in Addition of Fraction for CwMD.

Table -1

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions in Mathematics Diagnostic Test(N= 21)

Sl. No	Grade	N	Criterion Measures	No. of Items	Max. Score	M	PA	NM
1	I-IV	21	Reading/Writing the Fractions	6	6	----`	42	47.61
	I-IV	21	Addition of Fraction	2	2	19.04	14.3	66.66
2	V	21	Find the sum of the given fractions	4	4		40.13	59.4
3	VI	21	Addition of fractions (having same denominator)	2	2	--	----	100
4	VII	12	Addition of fraction(having different denominator)	2	2	----	33.33	66.67

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Table No 2

Difficulties of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09)

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fraction having same denominator

Case No	Grade I-IV		Grade V	Grade VI	Status of performance		
	CM-1	CM-2	CM-3	CM-4	Mastery	Partial achievement	Non Mastery
1	NM	NM	NM	NM	0	0	4
2	NM	M	NM	NM	1	0	3
3	NM	NM	NM	NM	0	1	4
4	NM	NM	NM	NM	0	1	4
5	NM	NM	PA	NM	0	1	3
6	NM	PA	NM	NM	0	1	3
7	NM	NM	NM	NM	0	0	4
8	NM	NM	NM	NM	0	0	4
9	NM	NM	PA	NM	0	1	3

Table No 3

Difficulties of the participants of Grade VII in the criterion measures pertaining to Addition of Fractions (N=12)

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fractions with same denominator CM-5 Addition of Fraction with different denominator

Case No	Grade I-IV	Grade IV	Grade V	Grade VI	Grade VII	Status of performance		
	CM-1	CM-2	CM-3	CM-4	CM-5	Mastery	Partial achievement	Non Mastery
111	PA	M	PA	NM	PA	1	3	1
	NM	NM	NM	NM	NM	0	1	4
	NM	NM	PA	NM	NM	0	1	4

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	NM	NM	NM	NM	PA	0	1	4
	PA	NM	NM	NM	NM	0	1	4
	NM	M	NM	NM	NM	1	0	4
	PA	NM	PA	NM	NM	0	2	3
	PA	NM	PA	NM	PA	0	3	2
	PA	NM	NM	NM	NM	0	1	4
	PA	NM	NM	NM	NM	0	2	3
	PA	NM	PA	NM	NM	0	2	3
	PA	NM	PA	NM	NM	0	2	3

From the Table No 2 and 3, it can be understood clearly that none of the participants had mastery in all the criterion measures pertaining to addition of fraction measured in the study. The numbers of criterion measures partially achieved are also significantly less in most of the cases. Even if a few steps were correct in any item of each criterion measures the participants given quarter or half marks, thus belonging to the category of Partial achievers.

Analysis of the Errors

The errors were analyzed qualitatively. Examples for some types of errors and the explanation are given in the Table 3

Table 5

Examples for Errors committed in different criterion measures pertaining to addition of Fractions, and Explanation (N=21).

Sl. No	Criterion Measure	Example	Explanation
1.	Reading the Fractions	**Problem:** Read 51/2 **Response** = a)Read as five and two b) Read as five one two	Does not have the factual

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2.	Writing the Fractions	To write the given fraction in words **Problem:** 7 ¾ **Response** = Seven three Four **Problem:** ¾ **Response** = Writes it as three four (Instead of writing it as three fourth or three by four).	Knowledge about reading and writing fractions
3.	Addition of Fractions	To add the given Fractions **Problem:** 1 ½ + ½ **Response** = Writes the fraction as 1 only.	a) Does not have the conceptual understanding in adding the fractions.
4.		**Problem :** ¾+ ¼ **Response** = Writes it as 4/8 (Adds the denominator)	b) Does not know to convert the mixed fraction to improper fraction. c) When the denominator is common should consider only once.
5.	Addition of the fractions with same denominator	To find the sum of the given fraction. **Problem:** 7/9 + 3/9 **Response** = 10/18	Does not know when there is a common denominator only numerators have to be added and denominator to be retained as it is.

6.	Addition of the fractions with different denominator	**Problem:**5/6 +1/3 + 5/2 + 6/3 **Response** 5+1+5+ 6 ---------- = 17 6+3+2+3 ---- 14	Adds the numerator Adds the denominator. Does not know to take LCM when the denominators are different.

Effectiveness of the Remedial Instructional programme in attaining mastery, by the participants in the criterion measures pertaining to addition of Fraction

The percentage of the participants who were masters(M), partial achievers(PA) and Non masters(NM) in the criterion measures pertaining to Addition of fraction in Pre-Test and Post-Test were computed and the details are given in the Table 4

Table -6

Percentage of the participants who were masters(M), partial achievers(PA) and Non masters(NM) in the criterion measures pertaining to Addition of fraction in Pre-Test and Post-Test.

Sl. No	Grade	CRITERION MEASURE	Max. Score	Pre-Test			Post-Test		
				M	PA	NM	M	PA	NM
1	I-IV	Reading/Writing the Fractions	6	`----	42	47.61	95.5	5.5	-
2	I-IV	Addition of Fractions	2	19.04	14.3	66.66	95	5.0	
3	V	Find the sum of the given fractions	4	---	40.13	59.4	90.47	9.53	--
4	VI	Addition of fractions (With same denominator)	2	--	----	100	66.5	23.5	--
5	VII	addition of fraction (with different denominator)	2	----	33.33	66.67	100	--	--

CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: Addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fraction having same denominator.

Table No 7

Comparison of the performance of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09)

Case No	Grade I-IV				Grade V		Grade VI	
	CM-1		CM-2		CM-3		CM-4	
	Pretest	Post Test	Pretest	Post Test	Pretest	Post Test	Pretest	Post Test
1	NM	M	NM	M	NM	M	NM	M
2	NM	M	NM	M	NM	M	NM	PA
3	NM	M	NM	M	NM	M	NM	M
4	NM	M	NM	M	NM	PA	NM	M
5	NM	M	NM	M	PA	M	NM	PA
6	NM	M	PA	M	NM	M	NM	M
7	NM	M	NM	M	NM	PA	NM	M
8	NM	M	NM	M	NM	M	NM	M
9	NM	M	NM	M	PA	M	NM	PA

Table No 8

Comparison of the performance of the participants of Grade VI in the criterion measures pertaining to Addition of Fractions (N=09).

Case No	Grade I-IV		Grade IV		Grade V		Grade VI		Grade VII	
	CM-1		CM-2		CM-3		CM-4		CM-5	
	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
111	PA	M	NM	M	PA	M	NM	M	PA	M
	NM	M	PA	M	NM	M	NM	M	NM	M
	NM	M	NM	M	PA	M	NM	M	NM	M
	NM	M	NM	M	NM	M	NM	PA	PA	M
	PA	M	NM	M	NM	M	NM	M	NM	M
	PA	M	PA	M	NM	M	NM	M	PA	M
	PA	M	NM	M	PA	M	NM	M	NM	M
	PA	M	NM	M	PA	M	NM	M	PA	M
	PA	M	NM	M	NM	M	NM	PA	NM	M
	PA	M	NM	M	NM	M	NM	M	PA	M
	PA	M	NM	M	PA	M	NM	M	NM	M
	PA	M	NM	M	PA	M	NM	M	NM	M

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CM-01: Reading the Fractions (limited to ¼, 1/2/3/4) and mixed fractions involving these fractions. CM-02: addition of fraction CM-03: Find the sum of the given Fraction CM-4: Addition of Fractions with same denominator CM-5: Addition of Fraction with different denominator

Major Findings

From the analysis of the data the following observations were made

1. It was observed that majority of the participants of Grade VI and VII exhibited non-mastery in (more than 50%) in all the criterion pertaining to addition of Fractions. In reading and writing the Fractions difficulty was exhibited by 48% of the participants.
2. Only one of the participants of Grade VI and two participants of Grade VII attained mastery only in Addition of Fractions of Grade (I-IV). In all the criterion measures all the participants had difficulty.
3. The error analysis relieved that majority of the participants lacked the knowledge and procedure of addition of Fractions. A few participants had difficulty even in reading and writing the Fractions.
4. The Remedial Instructional programme was found to be effective in enabling the participants to attain mastery in the criterion measures of Addition of Fractions.
5. Majority of the participants of the Grade VI and VII have shown mastery at 95.5% in the criterion measures pertaining to reading and writing of Fractions and addition of Fractions of grade I-IV. This shows the effectiveness of the Remedial Instructional Programme .
6.. Majority of the participants of the Grade VI and VII have shown mastery at 90.47% in the criterion measures pertaining to Addition of Fraction of Grade V. This shows that the Remedial Instructional Programme was effective in improving the performance of the participants in attaining mastery.
7. More than 60% of the participants of the Grade VI and VII have shown mastery in the criterion measures pertaining to Addition of Fraction with same denominator of Grade VI. This shows that the Remedial Instructional Programme was effective in improving the performance of participants from Non-mastery to mastery.
8. All participants of Grade VII have shown 100% of mastery in the criterion measure pertaining to Addition of Fractions with different denominator. This shows that the Remedial Instructional Programme was effective in improving the performance of participants in attaining mastery.

Discussion

Fractions have been seen as numbers that have unique properties compared to whole numbers that students have learned before. The uniqueness of its nature has made it difficult to understand (Braithwaite et al., 2018).

Fractions have been one of the most difficult mathematical skills to master, for children with and without difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

The observations made in the present study supports the findings of the previous studies.

There are four things that students often do when answering addition of

fraction operation namely systematic errors, random errors, negligence errors and not knowing how to answer fraction questions (Braithwaite et al., 2018; Loc et al., 2017; Purnomo et al., 2019; Salleh et al., 2013; Saparwadi et al., 2017; Tian & Siegler, 2017). In the study it was observed all the four types of errors were committed by the participants, however negligence errors were less compare to other types.

Students with MD are also frequently reported to have difficulties solving word problems

(Zhang & Xin, 2012; Parmar, Frazita, & Cawley, 1996). Here, in addition to the conceptual

understanding of simple arithmetic problems, specific competencies are required. Word problems

have to be transformed into mathematical expressions (Montague & Applegate, 2000).

Procedural knowledge denotes the knowledge of calculation strategies and procedures,

understanding how and when to use them, and the mastery of the skills needed to apply them in a

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Learning the concept of fractions is one of the most difficult skills to master for elementary school students (Gaetano, 2014; Nurhani et al., 2018). Fractions are also seen to affect other mathematical knowledge such as algebra. This in turn will affect mathematic achievement. In the study also it was noticed that some participants committed difficulty even in reading and writing the Fractions.

Students find fractions in their daily life, they are not able to relate it to the fractions they learn in classroom situation (Keijzer, 2003). Secondly, students have the difficulty in understanding the meaning of the mathematical symbols of fractions (Thomson & Saldanha, 2003). Thus, it is understandable that students mix up the fractions as natural numbers when they add two fractions (Idris & Narayanan, 2011; Izsák, Tillema, & Tunç-Pekkan, 2008;). The findings of the study also support the above observations as majority of the participants had difficulty in adding the fractions with common denominator.

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13. flexible manner (Andersson, 2010).
14. Understanding and mastery of fractions is essential pre-
15. requisite knowledge for algebraic instruction (NMAP,
16. 2008). Underscoring the importance of such knowledge,
17. the CCSSM (NGAC & CCSSO, 2010) for Grades 3
18. through 5 stipulate fraction concepts and skills to be
19. taught. Thus, it is clear that if they are to succeed in school
20. and beyond in the 21st century, fraction instruction is criti-
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One of the aspects that can improve students' understanding is through the use of effective teaching aids for teaching Fractions (Noh et al., 2016; Rohaeti et al., 2020). Therefore, innovation and transformation must be done through the development and construction of teaching aids. The use of teaching aids is very important so that teachers can explain things more accurately and clearly compared to oral explanations only. The remedial instructional programme also involved variety of learning experiences with appropriate teaching aids. Thus proved effective in enabling the participants attain mastery.

Further, Noh et al.,(2016); Rohaeti et al., (2020), justified that appropriate teaching aids can ensure the delivery of teaching and learning can be implemented more effectively. The need to develop these teaching aids is very significant as described by Jones et al. (2011) and McNeil and Jarvin (2007). The use of aids can change the teaching and learning methods of the teacher for the better and give internal motivation to students to learn something (Gaetano, 2014).

Conclusion

On the basis of the observations made in the study it can be understood that Children with Mathematical Disability (CwMD) in the upper primary schools face serious difficulties in addition of fractions and also commit errors in learning operations related to addition of fraction.

Through structured Remedial instructional programmes similar to the one planned and tried out in the study it is possible to enable the participants to attain mastery in the criterion measures of addition of Fractions at elementary level. The success of the programme is also due to the effective remedial instruction provided to the participants to master the concepts and procedures related to whole numbers prior to fractions. So, even if difficulties in Fractions noticed in the participants with CwMD, their difficulties in whole numbers have to be diagnosed and rectified. On the basis of the evidence based programmes tried out in the study teachers can to be trained.

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Specific Difficulties Exhibited by Children with Mathematical Disability (CWMD) in Arithmetic Learning Fractions at Elementary Level.

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Abstract

Competence with fractions is foundational to acquire more advanced mathematical skills. However, achieving competency with fractions is challenging for many students, especially for those with mathematics learning difficulties who often lack foundational skill with whole numbers. Difficulties exhibited in fractions prevent the child from enjoying the world of numbers. Thus in the present study the authors try to know the percentage of children with mathematical Disabilities of Grade VI and VII exhibiting difficulties in various criterion measures pertaining to Fraction. These participants were considered as Masters, Partial Achievers and Non-Masters based on the different criterion measures. The Major findings are discussed in the article.

Keywords: Specific Difficulties in Arithmetic and Mathematical Disability, Difficulties in Learning Fractions.

Introduction

Although many children encounter difficulties with mathematics in elementary school, much less research has been conducted in this area (Ginsburg, 1997). Thus weaknesses in the area of mathematics can impede educational opportunities for students (Rivera-Batiz, 1992). Children with mathematics difficulties often have problems in several areas of mathematical cognition. These include the ability to solve relatively complex story problems and retrieval of number facts (Jordan & Hanich, 2000; Russell & Ginsburg, 1984). fractions have been one of the most difficult mathematical skills to master, for children with and with-out difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001). Struggling learners in mathematics (students with learning disabilities [LD], mathematics learning disability (MLD), low-achievement in mathematics, and at-risk for failure in mathematics) are at an even greater disadvantage, as their performance in mathematics has

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traditionally lagged at least two grade levels below their peers (Wagner & Blackorby, 1996).

The National Mathematics Advisory Panel (NMAP, 2008 fractions have been one of the most difficult mathematical skills to master, for children with and with- out difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

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Accumulating data from the National Assessment of Educational Progress (NAEP) also provide evidence for students' difficulties with fractions. According to the 2017 NAEP, only 32% of fourth graders correctly identified which fractions were greater than, less than, or equal to a benchmark fraction, ½ . In 2009 NAEP, only 25% of fourth graders correctly identified a fraction closest to ½.

Norton and Boyce (2013) and Siegler, Thompson and Schneider (2011) argued that fraction is very difficult to teach, most cognitively challenging and most essential for advanced mathematics.

Traditionally, difficulty with fractions has been attributed to fundamental differences between whole numbers and fractions. This can lead to whole-number bias, which refers to students' overgeneralization of whole number knowledge to fractions (DeWolf & Vosniadou, 2015; Ni & Zhou, 2005). This finding confirms the observation of Hackenberg and Lee (2015) that teaching fraction effectively requires using correct language and technical terms.

The present study intends to identify the specific difficulties in fractions faced by CwMD, the objective of analyzing the difficulties faced by CwMD in Mathematics Diagnostic test.

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Need and importance of the study

Math concepts such as fractions that students do not master in the early grades can go on to confuse them later on and to cause them a great deal of math anxiety. Fractions are often the first hurdle experienced by school learners while learning mathematics as it is one of the operation beyond basic skills of addition, subtraction, multiplication and division (Chinnappan 2006).The new research shows that students need to intuitively understand concepts rather than just to memorize language or symbols, as such rote memorization does not lead to long-term understanding. Many math teachers do not realize that the language of math can be confusing to students and that students must understand the concepts behind the language. They tend to learn addition and subtraction of fractions earlier and multiplication and especially division of fractions later. Fractions forms a building block for other mathematical skills and it is important that learners feel comfortable and confident in understanding of fractions. Researchers argue that children generally perform badly in fractions and that the knowledge of fractions is crucial for success (Booth, Newton & Twiss-Garrity 2014). Competence with fractions is foundational to acquiring more advanced mathematical skills. However, achieving competency with fractions is challenging for many students, especially for those with mathematics learning difficulties who often lack foundational skill with whole numbers. Teaching fractions is also challenging for many teachers as they often experience gaps in their own fractions knowledge. Jessica Namkung Lynn Fuchs

Objectives of the Study

1. To analyze the difficulties experienced by Children with Mathematical Disability (CwMD) of Grades -VI, VII in various criterion measures of the following components of Arithmetic in Grades V-VII:

a) Addition of fractions
b) Subtraction of fractions
c) Multiplication of fractions
d) Division of fractions

Methodology

The methodology related to the participants, tools and techniques method of collection and analysis of data are discussed in this section.

Participants

In order to achieve the objectives of the study the participants, CwMD were selected from seven Government and Private Aided schools with Kannada as Medium of Instruction from Mysore City by applying a set of Exclusionary and Inclusionary Criteria. The details of the participants are given below in the Table-1

Table -1

Details of the participants

Type of School	Total No of children in Grades VI and VII in the selected school.			Number of children Identified as CwMD in Grades VI and VII		Number of children included in the study
	Grade	No of Children				
Government	VI	134	234	11	17	6
Private Aided	VI	100		6		3
Government	VII	147	259	9	18	6
Private Aided	VII	112		9		6
		Total Strength 493		Total 35		21

It can be viewed from the above Table that an alarming 7% incidence of CwMD in upper primary school children,

Assessment Instruments and Method of Collection of Data

The data was collected by administering Mathematics Diagnostic Test developed by the investigator.

Brief Description of the Tools

The Mathematics Diagnostics Test developed by Nair Prithi Govindhan, 2015 was used in the study. The test intends to assess the performance level of children in mathematics studying in the Grade –V. The test intends to diagnose specific difficulties exhibited and errors committed by the children of Grade V. The test covers almost all the areas of mathematics of Grade V.

The Mathematics Diagnostic Tests for the Grade –VI and VII were developed by the investigator to know the performance level of children in mathematics studying in the grade VI and VII. The test intends to diagnose the errors committed and specific difficulties exhibited by children in solving the mathematical operations. The test covers almost all the areas of Arithmetic, Algebra and Geometry in mathematics of the grades VI and VII of Karnataka state board Text book of Kannada medium.

Collection of the Data

The data was collected by administering the tests to 21 children of Grades VI and VII who were identified as children with Mathematical Disability. The total tests were administered in small groups of 2 to 3 children in two sessions of about 60 min in order to avoid the fatigue factor. The children were given sufficient time.

The scoring was done with reference to each of the criterion measures of the total tests. However, in the article the data related to Fractions of all the 3 Grades are discussed.

Method of Analysis of Data

The data was analyzed qualitatively. The score obtained by the each child based on the criterion measures was converted into percentage For the purpose of analyzing the specific difficulties in each of the criterion measures relating to Fractions the children were categorized as Masters (M)(Scored 80% and above), Partial Achievers (PA) (Scored 79% and below) and as Non-Achievers (NA) (Scored 0) .

Table 2:

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions of Mathematics Diagnostic Test of grade – V (N=21).

Sl. No	Criterion Measures Grade V	Max. Score	M	PA	NA
1	Find the sum of the given fractions	4	40.47	40.13	19.4
2	Writing the decimal form of the fraction (With 10 and 100 as denominator)	1	40.47	40.13	19.4
3	Selecting the correct equivalent fractions	4	34.52	51.2	14.28
4	Selecting the correct equivalent fractions	4	32.14	53.58	14.28
5	Write the missing fractions	1	28.58	0	71.42
6	Find the product of the given measurement	2	23.8	47.63	28.57
7	Find the quotient for the given fractions	2	21.42	59.54	19.04

Table 3:

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions of Mathematics Diagnostic Test of grade – VI (N=21)

Sl. No	Criterion Measures Grade VI	Max. Score	M	PA	NA
1	Writing the Prime Number	2	0	0	100
2	Writing the product of Prime Number	2	0	0	100
3	Writing the missing fraction	2	0	0	100
4	Match the following numbers with the correct factor	4	10.71	32.15	57.14
5	Finding the greatest common factors	2	0	0	100
6	Finding the LCM and HCF by factor method	2	0	0	100
7	Writing the improper fraction to Mixed fraction	2	0	0	100
8	Writing the mixed fraction to improper fraction	2	0	0	100
9	Selecting the correct equivalent fraction	2	0	0	100
10	Fill in the missing fraction	2	0	0	100

11	Using the > or < sign in fraction	2	0	0	100
12	Find the sum of the given fractions	2	0	0	100
13	Addition of fractions (having same denominator)	2	0	0	100
14	Subtraction of fractions (Having same denominator)	4	17.85	53.58	28.57
15	Problem-Solving	2	0	0	100

Table 4

Percentage of Children with Mathematical Disabilities (CMD) who were considered as - Masters, Partial Achievers and Non-Masters in different criterion measures pertaining to Fractions in Pre-Test of Mathematics Diagnostic Test of grade (VII) (N=12).

Sl.No	Criterion Measure	Max. Score	Percentage of Masters	Percentage of Partial Achievers	Percentage of Non-Masters
1	Stating whether the given statement is True or False	3	100	0	0
2	Reducing the fractions to the lowest form	2	33.33	0	66.67
3	Addition of fraction	2	0	41.67	58.33
4	Writing the mixed fraction into inverse form	2	0	50	50
5	Identifying Positive and negative fractions	2	8.33	8.34	83.33
6	Classifying into proper, improper and mixed fraction	2	0	0	100
7	Reducing the fractions into lowest form	2	0	0	100
8	Converting the improper fraction to mixed fraction	2	0	0	100
9	Subtraction of fraction	2	0	0	100
10	Fundamental operations related to fractions	4	0	0	100
11	Problem Solving (Word Problem)	2	0	0	100
12	Dividing the whole number by the fraction (Simplification)	2	0	0	100
13	Multiplying fraction by fraction	2	0	0	100
14	Dividing the fraction by fraction	2	0	0	100
15	Writing in inverse fraction	2	0	0	100

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Major Findings of the study

From the analysis of the data the following observations were made

a. In almost all the criterion measures of Fractions considerable percentage of children experienced difficulties.
b. Majority of the participants were found to be partial achievers in attempting the items from the criterion measures pertaining to Fractions of Grade V, the percentage of mastery and non-mastery were less.
c. All participants showed difficulty in almost all the criterion measures pertaining to Fractions of Grade VI with 100% of Non-Mastery, except two of the criterion measures which showed 57.14% of Non-Mastery in matching the numbers with the correct factors and 53.58% of partial achievers in subtracting the fractions having the same denominator.
d. Participants exhibited difficulty in all most all the criterion measures pertaining to Fractions of Grade VII with 100% of Non-Mastery, except in three criterion measures of fractions where 100% of mastery is noticed while stating whether the given statement, exhibiting non-mastery with 58.33% in addition of fraction and 83.33% of non-mastery in identifying Positive and negative fractions.

Fractions have been one of the most difficult mathematical skills to master, for children with and without difficulties (Behr, Wachsmuth, Post, & Lesh, 1984; Hiebert, 1985; McLeod & Armstrong, 1982; Ni, 2001).

The performance in mathematics has traditionally lagged at least two grade levels below their peers (Wagner & Blackorby, 1996). The National Mathematics Advisory Panel (NMAP, 2008).

The observations made in the present study supports the findings of the previous studies.

Conclusion

On the basis of the observations made in the study it can be understood Children with Mathematical Disability in the upper primary schools face serious difficulties. The Remedial instructional programmes have to be planned and tried out with systematic research. On the basis of such evidence based programmes teachers have to be trained.

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HIGH SCHOOL PUPILS PERCEPTION ON DIFFICULTIES IN LEARNING OF MATHEMATICAL CONCEPTS-AN ANALYTICAL STUDY

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Abstract

Most pupils find mathematics to be challenging and unfulfilling in their studies. Pupils often choose to discontinue their study of mathematics as soon as they can. However, mathematics is often regarded as vital and occupies a prominent position in the curricula in the majority of countries. Numerous facets of life and a wide range of professions utilise mathematical concepts. Therefore, Pupils' unfavourable attitudes may have a significant impact on their career decisions and ability to contribute to society at large. It has examined a group of Pupils (n = 547) from Karnataka, India, and compiled their opinions on their mathematical learning. Questionnaires were used as the study's primary data gathering instrument.The results reveal that Pupils in grades 9 and 10 in mathematics have a good attitude and a solid understanding of the material. It was observed that there were attitude disparities between what the Pupils expected and what really happened in the classroom while the Pupils were learning mathematics. This research offers suggestions for improving pupils' abilities to solve mathematical problems.

Keywords: Mathematics learning, challenges, perceptions, and field dependence

Introduction-

When examining mathematics education, Brown et al. (2008) discovered that many Pupils believe the subject to be challenging and avoid it whenever feasible. In contrast, mathematics is a very popular topic at all levels in schools and universities in the neighboring nation of Scotland (Scottish Qualifications Authority, undated). This shows that while mathematics may be regarded as difficult and unappealing in some nations, this is not universally true. Sadly, there isn't enough study on mathematics learning to determine whether the causes of the discrepancies can be identified.

One of mathematics' issues comes from the subject matter itself. One objective of math instruction is for pupils to be able to follow steps to get the right answers. The Pupils are urged to put the steps into practice as they work toward achieving this objective. As a result, the methods are learned and afterwards automated in learners' minds (Alenezi, 2008). While this may inspire confidence, it frequently overlooks the need for children to comprehend the why behind their actions. With limited chance to comprehend the meaning of the processes or how they may be used in real-world situations, mathematics can be reduced to a process of rehearsing methods until they are remembered. Almadani et al. (2012) conducted an intriguing study in which factor analysis was used to establish that memory abilities were crucial for performance on exams in arithmetic, with this general conclusion holding true for all academic courses. In certain subject areas, information may be learned, but in mathematics, it was the techniques that were being memorized.

Mathematics places significant intellectual demands on pupils by its very nature. It entails

steps that could seem abstract and unconnected to life. It has often been demonstrated that this exerts enormous demands on Pupils' limited working memory capacity (Reid, 2009). The brain's working memory aids in thinking, understanding, and problem-solving abilities in Pupils. It helps to govern understanding and has a limited capability for people.

The aim of this study is to investigate the degree of field dependence in high school Pupils' mathematical learning. According to Witkin and Goodenough (1981), a field dependent individual is one who is unable to separate an object from its environment. Field-Dependant people are able to accept the prevailing field and unsatisfactorily isolate an item from its context. An organized perceptual field may be readily "broken apart" by field-independent people, who can voluntarily isolate an object from its environment. Experienced math professors frequently hear Pupils comment that they are unsure of where to begin when presented with a mathematical issue. This is a typical indication of working memory issues caused by information overload, and it is at this point that knowledge of the learner trait known as field reliance becomes crucial.

Nearly every country in the world includes mathematics in its core curriculum. In India, math is regarded as a crucial subject for many occupations. Khan (2012) observed that mathematics is not often a subject that Pupils enjoy and that many Pupils choose to drop out as long as they are permitted. According to Ali (2011), it is inadequately taught in India. Teachers, however, are limited to what is prescribed for them to teach. Teachers are frequently compelled to adhere to the procedures outlined in textbooks. Procedures are remembered, rehearsed, and then assessed in formal exams. Credit is awarded for following procedures correctly, which results in the right responses (Mohammad, 2002; Amirali&Halai, 2010).A research done in India clearly demonstrated the superiority of a demanding curriculum created by school instructors over one that was imposed from without and created by people outside the classroom (Ali & Reid, 2012). Therefore, an improper curriculum might be a contributing factor to the issue in mathematics education.

Statement of the Problem

Although mathematics has numerous applications in life, because it is logical in nature and sometimes somewhat abstract, it can be difficult to make these applications practical and approachable to young learners. The current study's focus was "Attitude in Learning Mathematics: High School Pupils' Perceptions, Difficulties, and Field Dependency in their Mathematics Studies.

a. The views and attitudes of high school Pupils toward mathematics were the main goals of the study".
b. The hurdles and difficulties associated with performing mathematics.
c. The association between age and mathematical aptitude and field dependence.

Research Questions

These questions were the focus of this investigation.

a. How do high school pupils view their experiences learning mathematics in the classroom?
b. What challenges do the children have when learning mathematics?
c. What is the connection between kids' field dependence and their math prowess and age?

Significance of the Study

It has hopes to provide light on the solutions to the concrete math problems that Indian secondary school pupils typically encounter. Pupils will benefit from this study by developing their subject-matter mastery in mathematics at the secondary level. There appears to be a significant gap between what Pupils are expected to do and what really occurs in math classes. This study may make recommendations on the majority of secondary mathematics Pupils' lack of ability to solve mathematical problems. This project also plans to investigate why Indian Pupils' lack critical thinking and problem-solving skills, as well as why they are unable to apply their mathematical knowledge in unexpected contexts.

Research Methods and Sample

A quantitative study was conducted on high school Pupils' attitudes toward learning mathematics as well as their experiences in the classroom using a 45-item questionnaire. The questionnaire was created using topics from the literature to investigate the attitudes of high school Pupils about learning mathematics as well as their experiences in the classroom. Cronbach's Alpha, which was 0.94, assessed the internal consistency of 45 items. From Karnataka, India, 647 kids in the science group, ranging in age from 14 to 16, were chosen. In the sample, there were 58 percent pupils in the ninth grade and 42 percent in the tenth grade. There were 43 percent males and 57 percent females, 65 percent urban and 35 percent rural, and 35 percent public and 65 percent private school children. The percentage and chi-square tests were employed to analyse the data, which was acquired during school hours.

Results and discussion

This section presents the general image that may be drawn from the answer data. Perceptions, attitudes, and challenges are addressed in the replies, which are displayed as percentages.

Pupils' perceptions of learning mathematics

The first portion of the questionnaire's Table 1 asks Pupils how they view their mathematical learning.

Table1 Pupils' perceptions of learning mathematics

Statements	SA	A	N	DA	SDA
My lessons are fully understood by me.	44	46	6	3	1
I appreciate my professors' instructional techniques.	53	36	5	4	2
I really do understand how things work in class.	33	48	11	5	3
I dislike having to complete a lot of homework every day.	28	28	15	17	12
I detest household chores since I can't complete them on my own.	19	18	15	24	24
There is enough review in school for me to understand fully.	37	41	7	10	5
For me, taking classes is essential if you want to excel in arithmetic.	41	27	9	14	9
Near the exam, I often become anxious.	20	25	20	20	15
I find it difficult to review the full year's curriculum for the yearly exams.	15	35	10	20	20
I dislike short questions since I can't fully communicate my knowledge in them.	10	16	11	35	28

In math exams, I enjoy multiple-choice problems.	53	28	6	7	6
I am aware that the allotted time for the math paper is inadequate.	28	35	12	20	5
If I'm having trouble comprehending something new, I ask my teacher for assistance.	50	30	5	10	5
When I have trouble comprehending something new, I ask my tutor for assistance.	35	31	10	17	7
Pupils' improved math grades are the result of their own diligence.	51	28	9	6	6
I find it tough to comprehend a subject since I didn't grasp earlier concepts.	17	32	16	25	10
My comprehension is aided by teacher questions in class.	54	34	4	4	4
Only those textbook chapters that are crucial for passing the test are taught.	23	20	10	23	24

(Source: Field survey)

Inference

Table 1 demonstrates many favorable aspects, although in most situations, sizable minority does not concur with the majority viewpoints. This is consistent with the research of Alhmali (2007). who discovered a clear polarization of viewpoints on mathematics. The majority of individuals concurred that they generally comprehend their arithmetic lectures. They are content with the mathematics instruction methods employed and are aware of how to approach arithmetic problems. The research also demonstrates that the majority of participants concur that they want multiple-choice questions to be included in math exams. However, some subjects cause pupils to feel uneasy. Inevitably, Pupils do not want to work too hard and have a tendency to feel concerned as exams draw near. They also do not love studying for math exams.

AttitudeofPupilsinMathematics

What are the students' attitudes regarding their learning in mathematics, according to Table 2 from the second half of the questionnaire?

Students' attitude toward mathematics

Statements	High	Medium	Low
I enjoy mathematics.	50	25	25
I benefit from maths in my daily life.	48	32	20
Mathematics is a topic that I find intriguing	58	32	10
I like maths and I want to study it.	55	35	10
I think it's simple to grasp maths.	58	32	10
Knowing math will be beneficial to my profession.	62	28	10
I can generate thoughts thanks to mathematics.	50	30	20
My interest in maths is crucial.	68	22	10
Rules of mathematics cannot be disproven.	62	28	10

(Source: Field survey)

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Pupils Difficulties in Learning in Mathematics

The information in Table 3 answers queries about the students' struggles with arithmetic learning. Tables 3 and 4 list the themes related to math challenges.

Table3 Grade9thPupils'difficultiesinlearninginmathematics

Grade9, N =275	Easy	Moderate	Difficult	NotTaught
Determiners and matrices	40	30	15	15
Complex and real numbers	40	20	20	20
Logarithms	42	20	18	20
Using algebraic formulae and equations	30	25	25	20
Factorization	40	20	20	20
manipulating algebra	50	20	15	15
Inequalities and linear equations	50	20	15	15
Applications of the linear graph	42	28	10	20
Basics of coordinate geometry	38	32	20	10
symmetric triangles	50	20	15	15
Triangles and parallelograms	45	20	15	20
Bisectors of a line and an angle	50	25	20	05
Triangle's sides and angles	55	15	15	15
Average score	48	22	20	10

(Source: Field survey)

Table 4 Grade10thPupils difficulties in learning mathematics

Grade 10,N =272	Easy	Moderate	Difficult	NotTaught
quadratic formulas	55	20	15	10
Quadratic equations theory	48	22	20	10
Variations	55	25	10	10
incomplete equations	45	25	20	10
Systems and operations	55	30	10	5
simple statistics	50	20	15	15
Trigonometry	55	20	15	10
projection of a triangle's side	48	22	20	10
Circle's chords	55	25	15	5
A circle's tangent	45	25	18	12
Arcs and chords	65	25	5	5
Angle in a circle's section	55	20	15	10
Applied geometry	60	15	15	10
average rating	55	25	10	10

(Source: Field survey)

According to the tables above, Pupils seem to think that the majority of topics are simple and not too challenging. However, a logarithm is the most challenging for kids. Additionally, the replies indicated that parallelograms and triangles are challenging for children as well as the introduction to coordinate geometry. This is consistent with what Ali and Reid discovered (2013). The percentages of Pupils choosing "tough" are substantially greater than in the ninth grade. This pattern closely resembles that which Ali and Reid found (2012). Male and female student data were compared through the use of the chi-square statistic in the evaluation of the results.

Table 5 presents the findings. The majority of participants, according to the data, felt that they understood their arithmetic lectures.They also mentioned that they dislike doing homework since they lack the skills necessary to complete it on their own. The result illustrates how there are little possibilities in India's educational culture to gain greater field freedom. Boys and those attending urban schools tended to have greater levels of confidence in their ability to study mathematics in the total data. The chi-square contingency test was used to examine this, and it was discovered that the differences were significant.

Table 6 Area of school differences in the school mathematics learning

Items	Area	SD	D	N	A	SA	χ^2	df	p
lessonscompletely I understand	Urban	6	16	30	114	152	16.5	2	p <0.001*
	Rural	1	4	6	89	129			
Icannotexpressall short questionsbecause I do not like that	Urban	100	129	45	47	47	19.7	4	p <0.001*
	Rural	41	65	13	44	16			
In class Teacher question helpsmyunderstanding	Urban	21	17	24	133	183	11.7	2	p <0.01*
	Rural	6	12	3	44	104			

The majority of students from urban regions had good attitudes, according to the findings of the Chi square test on mathematics learning related area difference. The majority of urban students said that they fully comprehend their mathematical sessions.

Conclusion

The purpose of this study was to investigate how Pupils perceived math learning and challenges. The results demonstrate that pupils from private schools and metropolitan locations have different viewpoints from those from public schools and rural places. India's educational system is modeled around this, particularly in the public schools. The majority of pupils in India's public schools are from middle- or lower-class families who have lower earnings. They are forced to learn using restricted, outdated, and outdated materials since they lack numerous contemporary facilities. There is a prescribed mathematics textbook for every class in Indian schools. This recommended textbook serves as the only foundation for the test.Instead of imparting to the Pupils a complete understanding of the fundamentals of mathematics, the present teaching style places a great deal of emphasis on getting the Pupils to solve these exercises. As a result, children are currently taught mathematics via memorization of textbook material.

This survey demonstrates that the majority of respondents had favorable opinions on mathematics, with the majority saying that learning mathematics makes people happy. The kids had a positive perception of their mathematical learning. Pupils typically believe mathematics to be a tedious and challenging subject, which is somewhat in contrast to (Brown et al, 2008). The majority of Pupils demonstrated that they did not place as much emphasis on solving problems in class as they should on employing student-centered

approaches in mathematics education. Simply said, the kids' accomplishment in arithmetic is neither praised nor rewarded. Problems arise due to a lack of resources and development programmes for both Pupils and instructors (Memon, 2007; Halai, 1998). Pupils from remote schools in particular brought up the challenges in their mathematics learning experiences because of in experienced staff and insufficient resources (Memon, 2007; Anderson et al., 2005).

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PRESENT TRENDS OF ASSESSMENT

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Abstract

Consistent with 21st Century learning and the benefits brought on by better assessment tools, assessment is becoming more student-centric, offering educators the insights that will help them determine the best instructional next steps and how to make learning more personal for the individual student.

Trading the punitive elements of policies like No Child Left Behind for the growth mindset presented in the Every Student Succeeds Act (ESSA), states are now able and incensed to take advantage of alternatives to the expensive, high-stakes, end-of-level tests that have persisted for decades despite providing little benefit to the students.

Though a list of trends this may be, the growing practice of deliberate formative assessment is here to stay. When educators embed frequent, in-class assessments into daily instruction they're gathering the data they need to identify student levels of understanding, target intervention, and evaluate their instructional practices individually and across their teams.

Formative assessments, whether graded or ungraded, can and should be carried out in a variety of modalities (i.e. paper-and-pencil or online quizzes, verbal cues, informal observations by the teacher, etc), with each providing nuanced insights into student understanding that drive instruction. Teachers and students begin to view assessments as informative rather than punitive. Differentiated, ongoing assessments should address the varied levels of understanding that make up every classroom.

Key Words: Evaluation, Assessment, Teachers, Students, Innovative Methods, Level of understanding.

Introduction

Traditional grading approaches provide letter and/or number grades meant to show a student's overall academic standing, yet this offers students, teachers, and parents little to no insight into what the student has actually learned. When focused on what students actually know and don't know, teachers and stakeholders realize the need to identify deficiencies in a student's learning, using these insights to adjust instruction. Students can work to achieve mastery *prior* to moving on to more complicated skills and concepts. Progression is now based on understanding and readiness, rather than by some other schedule disconnected from the student's needs.

Among the shifting mindsets within K-12 education is the need for schools and districts to move from a culture of collecting data to one of using data. Formative and benchmark assessments provide data teachers can use, in the moment, to improve student outcomes. By upgrading the tech tools used in the assessment process, teachers can simplify and shorten the feedback loop, becoming increasingly accustomed to using data to drive their instruction.

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chers, schools, and entire districts find themselves using common platforms for gathering and using ative and benchmark assessment data, all aligned to common standards, such stakeholders are better able more willing) to collaborate around assessment data to support resource sharing, instructional best ctices, and larger learning trends.

With the unacceptable results of high-stakes testing persisting each year, ESSA offered states much-needed relief with the opportunity to replace end-of-level tests with alternative, 'innovative assessments.'

Among the alternatives being developed, breakthroughs in machine learning have allowed psychometric models (i.e. valid and reliable) that reduce assessment seat times and improve the quality of actionable data. These models can do far more to improve student growth while requiring much less of the students, from a testing standpoint. It's a win across the board, but most importantly for the students and their academic growth.

For many, the word "assessment" translates into multiple choice questions or writing for hours in a crowded exam hall – it is something very defined and has a certain place in our education or career. The huge advancements in computer-based testing are now redefining the possibilities of assessment, particularly in terms of what can be tested, how and when. These advancements mean that there are many more applications for both summative and formative testing, applications that even a couple of years ago would not have been possible.

Based on working with a wide and varied client base, here are the top five trends we've identified that are changing how assessment is delivered:

- 1. Movement away from traditional assessment delivery methods.
- 2. The end of the road for pen and paper.
- 3. Much more engaging and effective assessment.
- 4. Increasing levels of automation.
- 5. Assessments are much more candidate centric.

The use of professional remote invigilation, which recreates the exam hall experience in an online environment, means there is a move away from the use of traditional assessment delivery methods, such as running exams in a test centre. Remote invigilation (also known as online proctoring) means that a secure exam can be run from any location as long as there is an internet connection. This gives a great deal of flexibility to candidates, who can sit their exam at a time and place that suits them, rather than spend time and incur costs associated with taking time off and travelling to a test centre.

Live remote invigilation happens in real-time. This means that for the duration of an exam, an invigilator watches the candidate using video, audio and remote screenshare. The session is recorded and can be reviewed at a later stage if required. Any infringements can be raised as they happen e.g. if the candidate keeps looking away from the screen, the candidate will be advised to stop this behaviour. If infringements are severe e.g. the candidate takes a phone call or someone else comes into the room, the exam may be immediately stopped.

For organisations, the benefits of remote invigilation are numerous, such as a significantly reduced administration overhead, greater security and the ability to cater for candidates in any country worldwide. Exams can also be offered with greater frequency, so instead of one long test available once or twice a year, there may be multiple shorter tests run closer to the period of tuition.

...t is the gathering of information in the form of data. Students' conceptual knowledge and skill ...e measured and assigned a grade in the form of a number or letter. Concepts are what students ...bout a topic, and skills are what students can do. An evaluation is then made as a way to judge ...t achievement. Administrators also equate student assessment as a method of measuring teacher ...ntability.

...dvantage

The benefits of using effective assessment for learning include:

- Improved relationships between teachers and students.
- Improved attainment and achievement.
- Improved confidence, resilience, and self-esteem amongst learners.
- Improved classroom culture and teaching and learning environments.

Disadvantages

Assessments may have a negative effect on student motivation, particularly for students performing below grade level. Careless implementation of assessments may have negative consequences, especially when the needs of special education students are not considered. Using only a written formal assessment does not provide an overall picture of student achievement. Students that perform better with oral and visual skills or who display superior creativity are at a disadvantage. Basing teacher effectiveness on standardized test scores may encourage teachers to narrow the curriculum to teach to the test. While it is unclear whether alternative assessments are effective, what is clear is that this debate will not be going away any time soon.

Conclusion

Assessments should be an integrated part of learning and development and demonstrate an individual's ability to apply knowledge - rather than just a measure of knowledge at a given time. Using online exam software opens up a suite of useful tools to simplify creation, delivery and marking of a range of assessment types. The trends towards flexible delivery, engaging assessments, automation and a candidate-centric focus are helping organisations move to a model where assessments are far more effective, and where the candidate experience is both positive and engaging.

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Utilization-Focused Evaluation by Michael Quinn Patton

Developmental Evaluation : Applying Complexity concepts to Enhance Innovation and Use By Quinn Patton

Building Evaluation Capacity Activities for Teaching and Training by Hallie S Preskill

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HIGH SCHOOL STUDENTS PERCEPTION ON DIFFICULTIES IN LEARNING OF MATHEMATICAL CONCEPTS – AN ANALYTICAL STUDY

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Abstract

Mathematics holds a relevant and unique place in the school curriculum as it is important for a better living of the individual. But, it is known that most of the students are considering mathematics as difficult. The factors that make mathematics difficult for students to learn included difficulty in remembering the content learned in the previous classes, rapid forgetting of the learned material and the difficulty in understanding mathematics concepts. Further analysis revealed that students who feel mathematics highly difficult tends to believe that they lacks in learning strategies. Such students have lack of self efficacy and feel more difficulty in understanding mathematics. Students who feel Mathematics as highly difficult tends to forget it faster. Conversely students who feel mathematics as fairly easy reports their teachers teaching them well and understanding the concepts quickly. It was noted that the students who feel Mathematics as highly difficult tends to leave the task with little effort than those who feel the subject easy. According to teachers, students' lack of effort and prerequisites are the major reasons for mathematics being a difficult subject for students. Reluctance to seek help from others, inattention in the classroom and students' lack of motivation were also perceived to contribute toward difficulty in learning mathematics. Teachers reported also that, lack of relevant prerequisites, difficulty in speedy grasping of the concepts and more number of students in a classroom are causing difficulty in teaching mathematics. The findings indicate the need for teachers to realize the importance of making school mathematics interesting for students to take effort in learning it. The result is discussed in relation to students' beliefs and study strategies.

Keywords: Mathematics Learning, Teaching, Self-Efficacy, Learning Strategy, Mathematics Difficulty, Learner Beliefs, Teacher Beliefs.

Introduction

Mathematics emerged as a subject of study along with civilisation. In the present scenario mathematics is absolutely necessary subject for living. This importance is evident in school curriculum and in the importance given to mathematics education.

Learning of mathematics results in both cognitive as well as affective outcomes. To learn anything both experience and practice are necessary. There are several types of learning like motor learning, verbal learning, concept learning, discrimination learning and problem solving. Most of the learning in mathematics belongs to the categories of concept learning, principle learning or problem solving. As these types of learning are higher order learning processes cognitive activity and effort from the part of learner is essential. Role of effort in the process of learning is pointed in the initial theories of learning itself. When we consider the cognitive part of mathematics learning, it goes through a higher

cognitive processing because Mathematics learning requires higher cognitive processes especially because of interrelated and abstract nature of mathematics content and processes.

Factors affecting Mathematics Learning

Learning in particular mathematics learning is complex type of performance in human cognition. It is affected by many factors like short term memory, long term memory, ability to memorize mathematical facts, visual and spatial perceptual abilities. The degree of influence of these factors may be relative. Previous researches identified many reasons for students' difficulties in learning mathematics. There are cognitive, affective and environmental factors contributing to differences in students' learning of mathematics.

Educational psychologists had studied the relation of mathematics learning with certain cognitive factors. Mathematics is found affected by intelligence, working memory and processing speed. Murayama, Pekrun, Lichtenfeld and vom Hofe (2013) found that intelligence is strongly related to achievement in starting stage but motivation and use of cognitive strategies predicted the growth of achievement. In determining a student's achievement, their attitude is rather important than inability to study. Students like and dislike towards mathematics as well as their belief about efficacy are influencing their learning as well.

Factors external to the learner also are known to influence learning mathematics. Mbugua, Kibet, Muthaa and Nkonke (2012) reported the findings of Chepchieng (1995) that achievement of secondary school students is strongly related to the availability of quality textbooks. And they found under staffing, inadequate teaching or learning material, lackof motivation and poor attitudes by both teachers and students are some major factors contributing to poor performance in mathematics education. Parental involvement and help from other family members has shown significant improvement in students' achievement.

Significance of present study

A subject like mathematics, having a cumulative nature, can't be taught without relevant prior knowledge. It differs from other school subjects for many reasons like its abstract nature, demand of higher cognitive process and engagement and perseverance from learner. It is found that as the students move to higher grades, due to reasons including their lack of previous knowledge they are getting worse in mathematics.

Difficulty in learning mathematics is found as a common and significant problem throughout the school years. As per Annual Status of Education Report (ASER, 2014), 50% of standard fifth students not achieved even the standards of grade two and 44% of eighth standard students not achieved even basic skills in the arithmetic. Also they reported a worrying pan Indian trend that students' arithmetic skill has been dropping since 2010. In 2010, percentage of eighth standard students who could do division of three digits by one digit was 68.3%, but in 2014 it fell down to 44.1%. That is close to half of population still not have basic skills; and even it is falling. From this point the authors felt a necessity to study the causes that make mathematics learning difficult for students. For taking further action to improve students' mathematics learning, it is necessary to analyze the causes. This study is analyzing students' affective beliefs and teachers' perception regarding students' difficulties in mathematics instead of analyzing the content mastery of relevant prior knowledge. Teachers were probed through semi structured interview about possible reasons for students' difficulties in learning mathematics and then teacher cited reasons were used to probe into student perceptions.

Discussion

Students' report and teachers' perception indicate that the major cause for mathematics being difficult for students is lack of previous knowledge. Without relevant previous knowledge it is difficult and even impossible to learn mathematics in the higher classes. And, as per content and structure of existing curriculum, teachers have been reporting that it is hard to allow more time for renewing previous knowledge. However it is meaningless to teach seventy five percentages of students who lack the basics about newer contents. Teaching students without prior knowledge promotes mechanical or rote learning. Gradually students tend to believe that they are not fit to learn mathematics or they would not able to learn mathematics. Here students attributing failure or backwardness in mathematics to an internal, stable and uncontrollable cause, but actually it were an internal controllable reason. So teachers should spend some more time for making relevant prerequisites and to make them aware that problem lies with their learning strategy. Otherwise difficulty becomes progressive and as they move on to higher class students' achievement in mathematics will go down.

Learning of mathematics is comparable to construction of a complex structure; knowledge of basics determines the students' meaningful understanding of mathematics. So whatever barriers may be there it is important to strengthen essential basics. Also as per cognitive load theory, during problem solving subject need to first identify the categories of problem and the required moves. If the subject lacks in particular schema they would have immense difficulty in solving problem, and the cognitive load will be high; larger the supporting schema, better the learning would be.

Students feel that reason for lack of previous knowledge is the rapid forgetting of learned material. Generally, cause for forgetting is the absence of deep processing of the material or improper coding. Deeper learning strategies promote deeper processing and hence long term memory. But majority of the students are following strategies like just memorizing equations or repeating the class notes. Students are approaching different portions as different, and not connecting the new with existing. Unstructured knowledge is susceptible to forgetting; to be successful in mathematics students need to create a rich, integrated knowledge structure.

Hay Meber (2000) reports that students' progress is highly influenced by teacher quality and effectiveness rather than other classroom, school and student factors. Present study found that teacher effectiveness can be a relevant factor in making mathematics easy for those who felt mathematics as an easy subject; but those who feel mathematics as a difficult subject, did not attribute it to teaching. This finding resonates with that of Haimowitz (1989) who observed that insufficient or inadequate instruction is not the cause of most failures in the school, but active resistance by the learner is a reason. Hence teacher can only make mathematics learning easy to those students who felt mathematics as an easy subject, but not to those who felt mathematics as a difficult subject.

Affective variables are an integral part of cognitive development. Students' expectancy about the difficulty of mathematics should be given serious concern, because expectancy of the difficulty is found associated to many negative beliefs and thoughts, whereas positive expectancy had association with positive believes only. When considering students' motivational beliefs, many students lack self-efficacy for learning mathematics. Self efficacy, person's belief about his own ability to accomplish or succeed in a task, has found to significantly affect cognitive processes, motivational processes, affective processes and selection processes. When a student perceives himself as incapable to learn mathematics, s/he tends to leave situation or shunning effort when confronted with difficult problems.

Majority of students are following surface learning strategies like just repeating the class work and memorizing equations, most of the students are not trying to solve problems in textbook by

themselves. And teachers' report indicating that students possess less control over their learning in essence.

The most relevant reason observed by teachers for students' difficulties in learning mathematics is lack of sufficient effort by students, and they were not that much aware about the role of students' self-efficacy for learning mathematics.From this point it is relevant to discuss the reasons for less effort by students. Motivational research finds lack of self-efficacy and interest as major reasons for not taking effort. Thus foremost step for promoting students effort taking behavior is the enhancement of students' self efficacy and interest for learning mathematics.

Implications

- Before starting a new topic, the related previous content should be revised and mastered.
- Instruction should be designed in a manner that reduces cognitive load by prior development of relevant scheme.
- Knowledge should be well structured and connected to previous content to promote meaningful understanding and memory.
- Students' should be instructed to follow deeper learning strategies so as to improve understanding and memorization.
- Students should be given problems that promote metacognition instead of blind drill work.
- Students' self-efficacy, expectancy beliefs regarding mathematics to be finely tuned to– increase their effort.
- Provide clear the curricular goals to students and help them to set their own goals.
- Make students confident that ability can be improved through effort and effort is– important than ability

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IMPACT OF MULTIMEDIA APPROACH ON THE ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN SCIENCE

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ABSTRACT : *Science and Technology have played a crucial role in shaping the world we live in today. The integration of Science and Technology in education has transformed the way we teach and learn. It has opened up new possibilities for enhancing learning experiences and improving educational outcomes. The present study was carried out by the investigator to compare the effectiveness of the Multimedia approach and the Normally Practiced method of teaching on achievement in science among secondary school students. Multimedia Approach is one of the most important tools of ICT, which will provide a theoretical background to the student, enhanced by the use of different media such as sound, video, text, pictures and animations. These multimedia presentations aim at providing the students with a realistic description of the topic and enhance greatly their interest, retention and effective learning. The investigator experimented using MMA (Multi Media Approach) on experimental group and NPM(Normally Practiced Method) on control group after equating them using Pre-Test and Post-Test was administered on both groups to study the Impact of Multimedia Approach and Normally Practiced Method for comparative analysis.*

Keywords: *MMA, NPM, Achievement in Science.*

I. Introduction

In recent years, there has been a growing interest in the use of multimedia resources such as videos, animations, and simulations in the classroom, particularly in the field of science education. Multimedia resources offer a range of benefits for teaching and learning , including increased engagement, enhanced retention, and improved understanding of concepts. However, despite the potential benefits of multimedia, there is a need to assess the effectiveness of these resources in achieving learning outcomes, particularly in the field of science. This study aims to explore the impact of multimedia resources on the achievement of science among secondary school students. The study will investigate the effectiveness of using multimedia resources in the classroom and whether they can lead to improved learning outcomes, such as increased knowledge retention and improved academic performance.

Need and Importance of the Study

A multimedia approach is essential in teaching because multimedia resources such as videos, animations, and simulations can make learning more engaging and interactive. These resources can capture students attention and help them understand complex concepts in a fun and interesting way. Multimedia resources can also help to provide visual representations of abstract concepts and processes that are difficult to explain through words or static images. Visuals can help to improve retention and understanding of concepts , especially for visual learners, and multimedia resources can provide learning opportunities for students with different learning styles. Students can learn through auditory, visual and kin-esthetic modes which can help to improve learning outcomes and engagement. They can be accessed from various locations, providing students with the flexibility , to learn at their own pace and in their preferred environment. This can help to promote self-directed learning and increase motivation. Multimedia resources can provide authentic and real life experiences that cannot be replicated in the classroom. Multimedia approach is essential in the study because it captures students attention and make learning more engaging. This can help to increase student participation and motivation, leading to better

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learning outcomes. It promotes active learning by providing opportunities for students to interact with the material and accessed from anywhere, at any time, providing flexibility for both teachers and students. It enhances and supports teacher effectiveness by providing them with additional tools to teach difficult concepts in the learning process.

Teaching of science as the nature of science demands should have more scope for direct and purposeful learning experiences ultimately leads to promotion of rationality and scientific attitude among students. This demands for a shift from conventional method of learning to modernize experiential learning., that ignites multi-sensory perception. In the context of constructiveness for teacher can use varieties of methods, approaches and strategies that are supported with contextual usage of varieties of media. This termed "Multimedia Approach of Teaching Science".

II REVIEW OF RELATED STUDIES

Review related literature on the study of Impact of Multimedia Approach on the achievement in science among secondary school students in India

There have been several studies examining the impact of multimedia approach on the achievement in science among secondary school students in India. Below is a brief review of some of the relevant literature:

A study by **Singh and Agarwal (2014)** investigated the impact of Multimedia approaches on the achievement of Science among secondary school students in India. They found that Multimedia instruction significantly improved students understanding of science concepts and their ability to apply these concepts to real world situations.

Another study by **Chiryali and Mathew(2016)** examined the effect of multimedia-based teaching on the achievement of science among secondary school students in kerala, India. They found that students who received multimedia-based instruction had higher test scores and better understanding of science concepts compared to students who received traditional instruction.

A study by **Yadav and Yadav(2016)** investigated the impact of multimedia approaches on the achievement of science among secondary school students in Haryana, India. They found that multimedia instruction significantly improved students scores on science tests and increased their interest in science.

A study by **Nagaraju and AnilKumar(2018)** investigated the impact of multimedia approaches on the achievement of biology among secondary school students in Karnataka, India. They found that multimedia instruction significantly improved students test scores and increased their interest in biology.

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.

Kaur and Singh (2015) investigated the effect of multimedia approach on the development of scientific attitude among secondary school students in India. The study revealed that multimedia approach positively influenced the students' scientific attitude, which in turn enhanced their achievement in science.

Reddy and Jha (2017) conducted a study on the use of multimedia approach in teaching physics to secondary school students in India. The study showed that multimedia approach had a significant impact on the students' achievement in physics and helped develop a positive attitude towards the subject.

Kumar et al. (2018) investigated the effectiveness of multimedia approach in teaching biology to secondary school students in India. The study found that multimedia approach significantly improved the students' achievement in biology and helped develop a positive attitude towards the subject.

Overall, these studies suggest that the use of multimedia approaches in science instruction can improve student achievement and interest in science among secondary school students in India, However, it is important to note that the effectiveness of multimedia approaches may depend on several factors, such s the quality of the materials used and the instructional design.

III METHODOLGY

Statement of the Problem

The title of the study is **"Impact of Multimedia Approach on the Achievement of Secondary School Students in Science".**

Objectives of the study

1. To compare the achievement of Secondary students in Science, taught using MMA and NPM.

2 To find out the impact of MMA on the achievement of Secondary students in Science, in total.

3 To compare the achievement of Secondary Boys and Girls in Science , when taught using MMA.

4 To compare the Achievement of Secondary Boys taught using MMA and NPM.

5 To compare the Achievement of Secondary Girls taught using MMA and NPM.

Hypotheses of the study

The major hypotheses formulated for the study in Null form are:

1..There is no significant difference in the achievement of Secondary students in Science taught using MMA and NPM.

2. There is no significant impact of MMA on the achievement of Secondary students in Science.

3.There is no significant difference in the achievement of Boys and Girls taught using MMA.

4.There is no significant difference in the achievement of Secondary Boys taught using MMA and NPM.

5.There is no significant difference in the achievement of Secondary Girls taught using MMA and NPM.

Variables

The following variables are considered in the study:

1. Independent variable- Methods of Teaching science.: a)Multimedia Approach[MMA] b)Normally Practiced Method [NPM].
2. Dependent variable- Achievement in Science
3. Intervening variable – Gender[Boys and Girls]

Operational Definitions

MultiMedia approach

Multimedia approach is an approach of teaching in which different media are incorporated to make the teaching-learning process more effective, enthusiastic, inspirational, meaningful and interesting. It refers to the application and usage of diversified instruments, gadgets and electronic devices of multi-sensory perception, as well, advanced modes of curriculum transaction and evaluation, using internet, LCD, smart class, CAI, Virtual class room, Dry lab and other media in schools in the present study MMA includes..

In the present study, the Multimedia Approach [MMA] of teaching science includes using of .Projected materials included Text on Screen, Diagrams, Animated Pictures, Video Clips and Graphics Pictures. Related to physics, chemistry, biology , concepts of secondary science Visuals included Models, Specimens, Charts and Chalk board, Print Media included Work sheets, Books (text, reference), and Oral Media included Explaining, Questioning and Group Discussion on topics related to science .

NPM: Normally Practiced Method of teaching refers to the conventional or usually practiced methods of teaching-learning, which normally involve explaining the content by the teacher, followed by questioning and dictation of notes using chalk board and charts or models.

Achievement in Science

Achievement in Science refers to an increase in the Knowledge, Understanding, Application ,Attitude and Skills of students when they are taught Science. Normally achievement of students with respect to improvement in the levels of achieving aforesaid objectives in terms of scores gained in Science Test. In the present study achievement of Secondary students in science is measured in terms of scores gained by the students in pre and post test .

Gender: It refers to difference in students, as Boys and Girls based on Sex.

Population , Sample and Sampling Procedure: Population for the present study consists of two hundred 9th standard students studying in two selected Private Unaided Schools located in the city of Mysuru with English as the medium of instruction. . To draw this sample **"Stratified Proportionate Random Sampling Procedure " was employed.**

Experimental Design

Two Group –Pre-Test and Post Test design was employed

General Achievement Test in Science: In the beginning a general achievement test was administered on all the 240 students on four sections of two schools, finally after equating the scores gained, 200 students were selected for the study that included 100 from each school. 100 students of Nataraja English medium school were considered as experimental group and they were taught using MMA, on

the other hand 100 students of Vidya Vikas English medium school formed control group and were taught same lessons using NPM. Then post test was administered to find out whether any significant differences exist.

A General Science Achievement Test was administered in the beginning on all 240 students of two schools (NES and VVES) in order to select two equated groups of 100 students of each school. Further 100 students of Nataraja English Medium School [Experimental Group] and 100 students of Vidya Vikas Public School [Control Group] were administered with pre- test, so as to know their existing levels of Knowledge, Understanding, Application, Attitude and Skills related to a few selected Science concepts. This was followed by Experimental Group treatment given to Experimental Group, by teaching the concepts using MMA and the control Group using NPM.

Treatment

For the present study, Experimental Method of research was used by the researcher.

Two Group –Pre-Test and Post Test design was employed. Students of Experimental Group were exposed to teaching Physics, Chemistry and Biology of 9th standard science using MMA, on the other hand students of Control Group were taught the same concepts with NPM that included teaching of science using explanation followed by questioning and giving notes.

Tools used in the study

In order to obtain data on the variables considered in the study, the following tools were used.

1.Achievement test in Science for equating the groups

2.Achievement Test in Science (Pre-test)

3. Achievement test in Science (Post-test)

4. MM Package on selected concepts of science

5. All the achievement Tests in Science were developed by the researcher.
6. Multimedia Instructional Package in Science was also developed by the Researcher.

Procedure for Collecting Data

Achievement test in science for class 9th students was developed and administered by the researcher on both control group and experimental group to assess their achievement in science. Both the groups were taught for a period of six months. Controlled group was taught selected science concepts using NPM and students of Experimental group were taught the same concepts using MMA. Further the achievement test in science developed by the researcher was administered on both the groups to know their achievement in science after treatment. Scores obtained from both the groups in pretest and post test were compared and also the difference of achievement in science between control and experimental group were estimated using suitable statistical techniques.

Statistical Technique employed

Statistical Techniques such as Mean, SD, t-test and ANOVA were employed for Analysis and Interpretation of the Data.

III Analysis and Interpretation of Data

In order to test the Objectives, Hypotheses have been formulated and tested for their significance level, Appropriate Statistical Techniques i.e. Mean, Standard Deviation and t-test were computed for the gain scores of Experimental and Control group for measuring Achievement in Science.

Analysis of Gain in Achievement in Science

Comparison of Gain Scores of Experimental and Control group in Science.

Mean pre test scores on science achievement of experimental and control groups and results of Independent sample 't' test

Table 1

Mean pre-test and post-test scores on science achievement of students of experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.28	3.92	35.17	3.43	7.89
MMA	26.77	3.86	47.14	3.52	20.37
Total	27.03	3.89	41.16	6.93	14.03
Test statistics	Gain (overall) = F =2515.453; p=.001 Gain (groups) = F =490.576; p=.001				

In the case of science achievement scores, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 2515.453 was found to be highly significant at .001 level. In the pre-test the mean achievement scores was 27.03, which has been increased to 41.16, with an increase of 14.03 scores, which was found to be significant. Further, group wise comparison revealed that the experimental group had significantly increased its achievement scores (F=490.576; p=.001), where the gain is as much as 20.37 scores (pre-test 26.77; post-test 47.14), as against control group which has gained only 7.89 scores (pre-test 27.28; post-test 35.17). This clearly indicates the effectiveness of intervention in increasing the achievement in science.

Table 2

Mean pre-test and post-test scores on science achievement of students in the experimental group

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
MMA	26.77	3.86	47.14	3.52	20.37
Test statistics	Paired samples t = -37.55; p=.001				

Paired samples t revealed a significant increase in the scores of students under experimental group. An increase of 20.37 scores from pre-test (mean 26.77) to post-test (mean 47.14) was found to be highly significant (t= t = -37.55; p=.001).

Table 3

Mean pre-test and post-test scores on science achievement of boys and girls in the experimental group

Gender	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
Boys	27.20	3.87	47.36	3.82	20.16
Girls	26.34	3.84	46.92	3.21	20.58
Total	26.77	3.86	47.14	3.52	20.37
Test statistics	Gain (gender) = F =0.149; p=.701				

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Repeated measure ANOVA revealed a non-significant difference in the science achievement scores from pre- test to post- test situation. Both the genders gained equally after intervention (F=0.149; p=.701). Boys have gained a mean score of 20.16 whereas girls gained a mean score of 20.58, which were statistically almost the same.

Table 4: Mean pre-test and post-test scores on science achievement of boys in the experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.64	3.91	35.36	3.46	7.72
MMA	27.20	3.87	47.36	3.82	20.16
Total	27.42	3.88	41.36	7.04	13.94
Test statistics	Gain (overall) = F =1110.55; p=.001 Gain (groups) = F =221.102; p=.001				

In the case of science achievement scores of boys only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1110.55 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 27.42, which has been increased to 41.36, with an increase of 13.94 scores, which was found to be significant. Further, group wise comparison revealed that boys in the experimental group had significantly increased their achievement scores (F=221.102; p=.001), where the gain is as much as 20.16 scores (pre-test 27.2; post-test 47.36), as against control group which has gained only 7.72 scores (pre-test 27.64; post-test 35.36).

Table 5

Mean pre-test and post-test scores on science achievement of girls in the experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	26.92	3.94	34.98	3.43	8.06
MMA	26.34	3.84	46.92	3.21	20.58
Total	26.63	3.88	40.95	6.85	14.32
Test statistics	Gain (overall) = F =1414.723; p=.001 Gain (groups) = F =270.259; p=.001				

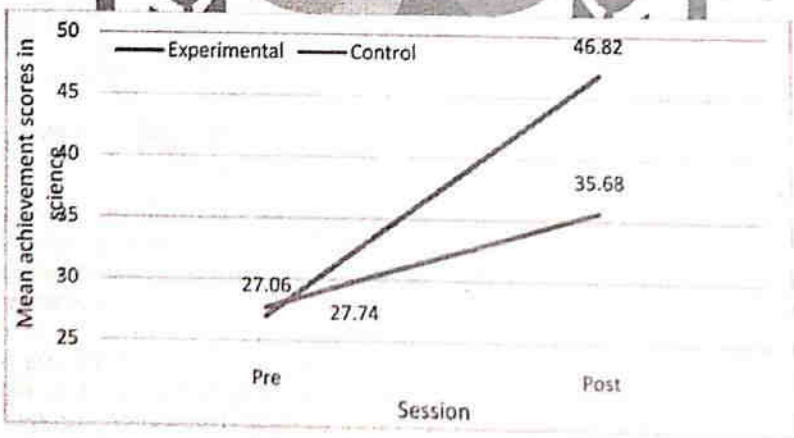
In the case of science achievement scores of girls only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1414.723 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 26.63, which has been increased to 40.95, with an increase of 14.32 scores, which was found to be significant. Further, group wise comparison revealed that Girls in the experimental group had significantly increased their achievement scores (F=270.259; p=.001), where the gain is as much as 20.58 scores (pre-test 26.34; post-test 46.92), as against control group which has gained only 8.06 scores (pre-test 26.92; post-test 34.98)

Descriptive Statistics

	Group	Mean $\bar{x}$	Std. Deviation (σ)	N
pre science total	NPM	26.9200	3.93747	50
	MMA	26.3400	3.83651	50
	Total	26.6300	3.87860	100
Post science total	NPM	34.9800	3.42553	50
	MMA	46.9200	3.21248	50
	Total	40.9500	6.84957	100

Graph

Mean pre test and post test scores on achievement in science of students in experimental and control groups



IV Major Findings of the Study

The major findings of the study were :

1. Comparison of Mean pre-test and post-test scores on science achievement of students in experimental and control groups, comparison of group revealed that the experimental group had significantly increased in achievement scores.. This clearly indicates the effectiveness of intervention of MMA in increasing the achievement in science.

2. Comparison of Mean pre-test and post- test scores on science achievement of students in the experimental group revealed that there is a significant increase in the scores of students of experimental group. The result implies that the multimedia approach is more effective on the achievement of science

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3. The Mean pre-test and post-test scores of Boys and Girls of experimental group have significantly higher scores as compared to control group.

4. The Comparison of Mean pre-test and post- test scores on science achievement of Boys in the experimental and control groups revealed that experimental group scored significantly higher as compared to control group.

5. The Comparison of Mean pre-test and post- test scores on science achievement of girls in the experimental and control group revealed that girls in the experimental group had significantly increased in their achievement scores.

Conclusion

The present study concludes that, MMA of teaching science proved to be better than the NPM in teaching of science, When the control group students were taught some concepts of science by the NPM and experimental group of students were taught by MMA. It was found that the achievement of experimental group was higher when in science compared to control group , experimental group was better. Therefore MMA of teaching science is more effective in fostering science achievement. Multimedia teaching approach was very significant with respect of achievement in science among both boys and girls.

The Impact of Multimedia on the achievement in science among secondary school students appeared to be positive. The use of multimedia, such as videos, animations and simulations, can enhance students understanding of science concepts with an increase in their motivation and their engagement in science learning.

Multimedia can provide students with visual and interactive representations of scientific phenomena that may be difficult to understand through conventional methods, such as lecture method.

Additionally, multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style.

However, it is important to note that the effectiveness of multimedia in science education depends on the quality of the multimedia materials, as well as how they are integrated into the curriculum transaction. Teachers must have appropriate training and support to effectively incorporate multimedia into their teaching practices.

Furthermore, whole multimedia can be a valuable tool in science education, it should not replace hands on, experiential learning opportunities, such as laboratory experiments and field based learning experiences. These types of activities can provide students with important skills, such as critical thinking and problem solving, that are essential for an enhanced in science.

Overall, the use of multimedia in science education can have a positive impact on the development of achievement in science among secondary school students, but it should be used in conjunction with other teaching strategies and implemented carefully and thoughtfully.

EDUCATIONAL IMPLICATIONS:

There are several educational implications that can be drawn from the study onthe impact of multimedia on the achievement of science among secondary school students in India.

1. **Incorporate multimedia into science curriculum:** The study suggests that multimedia can enhance students understanding of science concepts and increase their motivation and engagement in science learning. Therefore, education in India should incorporate multimedia, such as videos, animations and simulations, into their science curriculum to support student learning.
2. **Provide training to teacher:** Teachers should receive training on how to use effectively multimedia in their teaching practices. This includes selecting appropriate multimedia materials and integrating them into the curriculum in a meaningful way. Teacher training programs can be designed to help teachers become proficient in using multimedia and to promote effective teaching practices.
3. **Encourage hands on, experiential learning :** Whole multimedia can be a valuable tools. It should not replace hands on experiential learning opportunities. Therefore, educators in India should encourage laboratory experiments and field work, which can provide students with important skills, such as critical thinking and problem solving.
4. **Foster personalized learning experiences:** Multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style. Therefore, educators in India should design learning activities that enable students to personalize their learning experiences and get opportunities for self directed learning.
5. **Consider accessibility:** In India, access to technology and the Internet can be barrier to implementing multimedia in education. Therefore, educators should consider accessibility issues and ensure that all students have access to multimedia materials, regardless of their Socioeconomic background.

Overall, the study suggests that incorporating multimedia into science education in India can have a positive impact on students achievement. However, it is important to implement multimedia thoughtfully and carefully. While also providing opportunities for hand on experimental learning.

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IMPACT OF MULTIMEDIA APPROACH OF TEACHING SCIENCE ON THE DEVELOPMENT OF SCIENTIFIC ATTITUDE AMONG SECONDARY SCHOOL STUDENTS

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Abstract : *The process of teaching -learning can be made interesting, more effective and child-centered, when technology is made use appropriately. Many technology interface media like smart classrooms, blended leaning and multimedia approach are helping teachers and students in this regard. The aim of the present study was to investigate the impact of multimedia approach in teaching science on the development of scientific attitude among secondary school students. The main Objectives of the study have been to find out the effectiveness of Multimedia Approach(MMA) on the development of scientific attitude in teaching science. And to find out the effectiveness of Multimedia Approach of teaching Science on the development of Scientific Attitude among boys and girls. Sample for the present study two hundred students of 9th standard , 100 students of Vidya Vikas High School and 100 students of Nataraja English Medium school in the Mysuru city. Selected sample was divided into two groups - An Experimental group and a Control group. The experimental group received instruction through MultiMedia Approach (MMA), while the control group received the same through Normally Practiced Method (NPM). Test on Scientific Attitude was administered to assess the development of scientific attitude in both the groups before and after the intervention*

KEYWORDS: MMA, NPM, Secondary School Students, Scientific Attitude

I. INTRODUCTION

Science is an inevitable and integral part of secondary school curriculum, as it helps students to develop critical thinking, problem solving, and inquiry-based skills. Developing scientific attitude is an essential part of the science learning process, as it helps students develop a deeper understanding and appreciation of science. The use of multimedia resources can enhance the development of scientific attitude among secondary school students. Incorporating multimedia resources such as videos, animations, simulations, and interactive activities can create a more engaging and dynamic learning environment for students. This approach can help students to understand scientific concepts more easily, leading to improved comprehension and retention of information. By stimulating curiosity and encouraging inquiry, multimedia resources can help to promote a more active and reflective approach to learning, which is essential for developing scientific attitude.

Furthermore, the use of multimedia resources can facilitate collaboration among students, allowing them to work together to explore scientific concepts and solve problems. This can help to develop social skills as well as scientific skills. In total multimedia approach can create a more immersive and interactive learning experience, which can foster the development of scientific attitude among secondary school students. In conclusion, the use of multimedia resources in science education can help to promote the development of scientific attitude among secondary school students. By promoting engagement, improving comprehension, encouraging inquiry, and infusing collaboration, multimedia resources can help to create a more dynamic and effective teaching and learning process.

NEED AND IMPORTANCE OF THE STUDY

There are several reasons why studying the impact of multimedia approach on the development of scientific attitude among secondary school students is important.

Firstly, scientific attitude is essential for the progress and development of any society, and education plays a critical role in shaping such attitude. By examining the impact of multimedia approach on the development of scientific attitude, researchers can gain insights into how effectively teach science to students and promote a scientific mindset among them, using diversified multimedia resources.

Secondly, multimedia is becoming increasingly prevalent in education, particularly in science education, as it can enhance students engagement and comprehension of abstract scientific concepts. However, it is important to assess the effectiveness of this approach in developing scientific attitude, which encompasses not only knowledge but also critical thinking, curiosity, skepticism, and a willingness to learn, with more scope for enhancing science process skills.

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Thirdly, secondary school education is a critical period in students life as they are developing their identity and values, including their attitudes towards science. Therefore, understanding the impact of a multimedia approach on the development of scientific attitude among secondary school students can have long-term implications for their career choices with more scope for enhancing choices and contributions to society.

Finally, India is a rapidly developing country that has placed a strong emphasis on science education and innovation. As such, investigating the impact of multimedia approach on the development of scientific attitude among secondary school students in India can provide valuable insights for policy-makers and educators to improve the quality of science education in the country.

Overall, studying the impact of multimedia approach on the development of scientific attitude among secondary school students is essential for promoting a scientific mindset among students, improving the impact of science education, and contributing to the progress and development of the country.

Review of Related Studies

Review related literature on study on Impact of Multimedia Approach on the Development of Scientific Attitude Among Secondary School Students in India.

There have been several studies examining and below is a brief review of some of the relevant literature.

Singh and Bagwe (2017) Conducted a study on the relationship between scientific attitude and academic achievement among secondary school students in India. The study found a positive correlation between scientific attitude and academic achievement, suggesting, promoting a positive attitude towards science can lead to better academic performance.

Joshi and Pathak (2018) Conducted a study on the scientific attitude of secondary school students in India. The study found that students had a generally positive attitude towards science, but also identified areas of improvement, such as increasing student interest and engagement in science.

Rana and Rastogi (2015) a conducted study on the impact of multimedia on the development of scientific attitude among secondary school students in India. The study found that the use of multimedia had a positive effect on students attitude towards science, particularly among female students.

Malhotra and Bhattacharjee (2016) conducted a study on the influence of parental involvement on the scientific attitude of secondary school students in India. The study found that parental involvement, particularly in the form of discussions and activities related to science, had a positive impact on student's attitudes towards science.

Overall, these studies reveal that scientific attitude among secondary school students is influenced by a variety of factors, including academic achievement, interest and engagement in science, multimedia, and parental involvement. Further research is needed to better understand and factors that contribute to scientific attitude among secondary school students to develop effective strategies for promoting a positive attitude towards science.

I METHODOLOGY:

Statement of the Problem

The Title of the study is **"Impact of Multimedia Approach of Teaching Science on the Development of Scientific Attitude among Secondary School Students."**

Objectives of the study

1. To compare the Scientific Attitude of Secondary School students in Science, taught using MMA and NPM.
2. To find out the impact of MMA on the development of Scientific Attitude of Secondary School students in science in total.
3. To compare the development of Scientific Attitude of among Boys and Girls who were taught using MMA.
4. To compare the Scientific Attitude of Secondary Boys who were taught Science using MMA and NPM.
5. To compare the Scientific Attitude of Secondary Girls who were taught Science using MMA and NPM.

Hypothesis of the study

The major Hypotheses formulated for the study in Null form are:

1. There is no significant difference in the Scientific Attitude of Secondary school students who were taught using MMA and NPM.
2. There is no significant difference in the Impact of MMA on the Scientific Attitude of Secondary students in science.
3. There is no significant difference in the Scientific Attitude of Boys and Girls taught using MMA.
4. There is no significant difference in the Scientific Attitude of Secondary School students of Boys taught using MMA and NPM.
5. There is no significant difference in the Scientific Attitude of Secondary School of Girls taught using MMA and NPM.

Operational Definitions

Multimedia Approach: Multimedia approach is an approach of teaching in which different media are incorporated to make the teaching-learning process more effective, enthusiastic, inspirational, meaningful, and interesting. It refers to the application and usage of diversified instruments, gadgets and electronic devices of multi-sensory perception, as well, advanced modes of curriculum transaction and evaluation, using internet, LCD, smart class, CAI, Virtual classroom, Dry lab and other media. In the present study, multi-media approach(MMA) of teaching science includes using of projected materials like text on screen, diagrams, animated pictures, video clips and graphics pictures. Related to Physics, Chemistry, Biology; Concepts of secondary science visuals included models, specimens, charts and chalk board; print media included worksheets, book(text, reference) ; and oral media included explaining, questioning and group discussions on topics related to science.

NPM: Normally Practiced Method of teaching refers to the conventional or usually practiced methods of teaching-learning, which normally involve explaining the content by the teacher, followed by questioning and dictation of notes using chalk board and charts or Models.

Scientific Attitude: Scientific Attitude is defined as a way of looking into things that are governed by facts which are known as well as demonstrative. There are certain attitudes that should be considered to be a successful scientist. These are curiosity, careful judgments, open mindedness, critical mindedness, objectivity, rationality and intellectual honesty. Scientific Attitude refers to willingness to change opinion, desire for completeness of knowledge and acceptance of warranted generalizations. It's a way to look at everything rationally and with a Scientific mind set.

Gender: It refers to difference in students, as Boys and Girls based on sex.

Variables

The following variables are considered in the study

1 Independent Variables- Methods of Teaching Science -a) Multimedia Approach (MMA)

b)NPM

2. Dependent Variable- Scientific Attitude

3. Intervening Variable-Gender (Boys and Girls)

POPULATION AND SAMPLE: Population for the present study consists of 9th standard students studying in private unaided schools in the city of Mysore with English as the medium of instruction. The sample consists of 200 students of 9th standard studying in two private secondary schools with application of multimedia for teaching. To draw this sample **"Stratified Proportionate Random Sampling Procedure "** was employed .

Experimental Design: The study employs a "Two Group Pre-Test design" for carrying research.

Tools used in the Study

In order to obtain data on the variables considered in the study, the following tools were used.

1) Pre-Scientific Attitude Test*

2) MMP

3) Post-Scientific Attitude Test*

*** Developed by Dr.Benny Alexander , ISEC ,Bangalore.**

Procedure for collecting Data

Following steps were used in the data collection

Administration of the Scientific Attitude Pre-Test [SAT-1]

Teaching Science Concepts to control group with the Normally Practiced Method.

Teaching Science Concepts to the Experimental group using Multimedia Approach with Multimedia Package.

Administration of the post-test [SAT-II] to both the groups after Experimental Treatment.

Collected response were recorded accurately and subjected to analyze the data by using Statistical analysis.

Statistical Technique employed

Statistical Techniques such as Mean, SD, t-test, and ANOVA were employed for analysis and interpretation of the data.

Analysis and Interpretation of the data

Analysis of Gain in Scientific Attitude

Analysis of Gain in Attitude towards Science

Comparison of Gain Scores of Experimental and Control group in science.

Mean pre -test scores on Science Attitude of experimental and control groups and results of Independent sample 't' test

Table 1

Mean Pre- Test and Post -Test scores on science Attitude of students in experimental and control groups

Groups	Tests				Gain
	Pre- test		Post- test		
	Mean	S.D	Mean	S.D	
NPM	21.63	2.88	29.60	2.90	7.97
MMA	21.34	2.86	40.77	2.89	19.43
Total	21.49	2.87	35.19	6.30	13.70
Test statistics	Gain (overall) = F =5214.269 p=.001 Gain (groups) = F =912.14; p=.001				

In the case of attitude scores, irrespective of the groups, we find a significant increase in the attitude scores of the selected sample. The obtained F value of 5214.269 was found to be highly significant at .001 level. In the pre testing the mean attitude scores was 21.49, which has been increased to 35.19, with an increase of 13.70 scores, which was found to be significant. Further, group wise comparison revealed that experimental group had significantly increased its attitude scores (F=612.14; p=.001), where the gain is as much as 19.43 scores (Pre-Test 21.34; Post-Test 40.77), as against control group which has gained only 7.97 scores (Pre-Test 21.63; Post-Test 29.60). This clearly indicates the effectiveness of intervention in increasing the attitude towards science.

Table 2

Mean Pre-Test and Post- Test scores on science Attitude of students in the experimental group

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Groups	Tests				Gain
	Pre test		Post test		
	Mean	S.D	Mean	S.D	
MMA	21.34	2.86	40.77	2.89	19.43
Test statistics	Paired samples t = -51.77; p=.001				

Paired samples t revealed a significant increase in the attitude scores of students under experimental group. An increase of 19.43 scores from pre-Test (mean 21.34) to post test (mean 40.77) was found to be highly significant (t= -51.77; p=.001).

Table 3

Mean Pre-Test and Post-Test scores on science Attitude of boys and girls in the experimental group

Gender	Tests				Gain
	Pre test		Post test		
	Mean	S.D	Mean	S.D	
Boys	21.30	2.82	40.72	2.86	19.42
Girls	21.38	2.92	40.82	2.95	19.44
Total	21.34	2.86	40.77	2.89	19.43
Test statistics	Gain (gender) = F =0.001; p=.979				

Repeated measure ANOVA revealed a non-significant difference between the genders in the science attitude scores from pretest to post- test situation. Both the genders gained equally after intervention (F=0.001; p=.979). Boys have gained a mean score of 19.42 whereas girls gained a mean score of 19.44, which were statistically the same.

Table 4

Mean Pre-Test and Post -Test scores on science Attitude of boys in the experimental and control groups

Groups	Tests				Gain
	Pre- Test		Post- Test		
	Mean	S.D	Mean	S.D	
NPM	21.66	2.83	29.58	2.86	7.92
MMA	21.30	2.82	40.72	2.86	19.42
Total	21.48	2.82	35.15	6.28	13.67
Test statistics	Gain (overall) = F =2693.665; p=.001 Gain (groups) = F =476.587; p=.001				

In the case of science Attitude scores of boys only considered, irrespective of the groups, we find a significant increase in the attitude scores of the selected sample. The obtained F value of 2693.665 was found to be highly significant at .001 level. In the pre-testing the mean Attitude scores was 21.48, which has been increased to 35.15, with an increase of 13.67 scores, which was found to be significant. Further, group wise comparison revealed that boys in the experimental group had significantly increased their Attitude scores (F=476.587; p=.001), where the gain is as much as 19.42 scores (Pre-Test 21.30; Post -Test40.72), as against control group which has gained only 7.92 scores (Pre-Test21.66; Post-Test 29.58).

Table 5

Mean Pre-Test and Post- Test scores on science Attitude of girls in the experimental and control groups

Groups	Tests				Gain
	Pre- test		Post -test		
	Mean	S.D	Mean	S.D	
NPM	26.92	3.94	34.98	3.43	8.06
MMA	26.34	3.84	46.92	3.21	20.58
Total	26.63	3.88	40.95	6.85	14.32
Test statistics	Gain (overall) = F =2478.769; p=.001 Gain (groups) = F =428.714; p=.001				

In the case of science attitude towards science scores of girls only considered, irrespective of the groups, we find a significant increase in the Attitude scores of the selected sample. The obtained F value of 2478.769 was found to be highly significant at .001 level. In the pre testing the mean attitude scores was 26.63, which has been increased to 40.95, with an increase of 14.32 scores, which was found to be significant. Further, group wise comparison revealed that Girls in the experimental group had significantly increased their Attitude scores (F=428.714; p=.001), where the gain is as much as 20.58 scores (pre-test 26.34; post -test46.92), as against control group which has gained only 8.06 scores (pre-test 26.92; post -test 34.98)

FINDINGS OF THE STUDY

The study revealed that the use of multimedia approach in science teaching can be an effective way to develop scientific attitude among secondary school students. The study highlights the importance of incorporating multimedia in science education to enrich students learning experiences and attitudes towards science, and in turn promote the development of Scientific Attitude. These results could have important implications for science educators and curriculum developers, as they seek to improve the quality and effectiveness of science education and increase students interest in science.

1. In the pre-testing, the mean attitude score was increased which was found to be significant. Further group-wise comparison revealed that the experimental group had significantly increased its attitude scores. These findings clearly indicate the effectiveness of the intervention in increasing the Scientific Attitude. The results are important as a positive attitude towards science is known to be linked to better academic performance, and also to promote the development of Scientific Attitude.

2. The findings suggest that the intervention was effective in improving the Scientific Attitude scores of the students under the experimental group.

3. The findings suggest that the intervention was equally effective in improving Scientific Attitude scores for both boys and girls. This result is important as it suggests that interventions aimed at improving Scientific Attitude can benefit both genders equally.

4. The findings suggest that the intervention was effective in improving the Scientific Attitude scores of the participants, particularly among boys in the experimental group. The results is significant, as attitude towards science have been linked to better academic performance and increased interest in science related field, that in turn leads to promotion of development of Scientific Attitude.

CONCLUSIONS

Based on the present study the use of a multimedia approach in science teaching can have a positive impact on the development of scientific attitude among secondary school students.

Multimedia can increase students engagement and interest in science, leading to a more positive attitude towards science and enhance Scientific Attitude.

Multimedia resources can improve students understanding of scientific concepts by providing visual and interactive representations of complex ideas that in turn leads to Scientific Attitude.

The use of multimedia in science education can help to develop students critical thinking skills, as they are asked to analyze and evaluate scientific claims presented in multimedia resources.

The use of multimedia can increase accessibility to science education for students with disabilities.

Studies have shown that the use of multimedia can lead to improved academic performance in science and further increased Scientific Attitude.

However, it is important to note that the effectiveness of a multimedia approach may vary depending on the specific context and implementation. More research is needed to better understand how multimedia can be effectively used in science education to promote a positive scientific attitude among secondary school students. Overall, the use of multimedia in science education holds promise as a way to engage students and promote a positive attitude towards science.

EDUCATIONAL IMPLICATIONS

The use of multimedia approach in science education can have several educational implications for the development of scientific attitude among secondary school students. Here are some of the key implications:

Increased engagement: The use of multimedia, such as videos, animations, and interactive simulations, can help to increase students engagement and interest in science. This can lead to a more positive attitude toward science and a greater desire to learn more about scientific concepts.

Improved understanding: the use of multimedia can also help to improve students understanding of scientific concepts. Visual representations can help students to better visualize and understand complex ideas, while interactive simulations can help students to explore scientific phenomena in a more hands-on way.

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Enhanced critical thinking: The use of multimedia can also help to develop students critical thinking skills. For example, students may be asked to analyze and interpret data presented in a video or simulation, or to evaluate the credibility of scientific claims made in multimedia resource.

Increased accessibility: the use of multimedia can also increase accessibility to science education for students who may struggle with traditional text-based resources. For example, students with visual or auditory impairments may find it easier to engage with science content presented in a multimedia format.

Improved academic performance: Finally, the use of a multimedia approach in science education can have a positive impact on students academic performance. Studies have shown that the use of multimedia can improve students retention of scientific concepts and lead to better performance on assessments.

In total, the use of multimedia in science education can pose several educational implications can educational implications for the development of scientific attitude among secondary school students, including increased engagement, improved understanding, enhanced critical thinking, increased accessibility, and improved academic performance.

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Role Of Social Media In Teaching-Learning Process

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Abstract: The Role of social media in the teaching-learning process and how it has transformed the educational landscape. Social media has enabled collaboration, engagement, and access to information, making it easier for learners to connect with experts, peers, and mentors. The paper discusses the advantages of using social media for collaboration, promoting active learning, and developing essential skills such as communication and critical thinking. It also highlights the importance of engagement in the teaching-learning process and how social media can be used to make the learning experience more interactive and participatory. However, the paper also discusses some challenges and limitations of social media in the teaching-learning process, such as information overload, accuracy, and privacy concerns.

Keywords: Social Media, Teaching, Learning, Collaboration, Engagement, Access.

Introduction

Social media has revolutionized the way in which people interact and share information. With the emergence of social media, there has been a paradigm shift in the teaching-learning process. The integration of social media in education has opened up new possibilities for enhancing the quality of education. In this paper, we will explore the role of social media in teaching-learning process and how it has transformed the educational landscape.

Keywords: Social Media, Teaching, Learning, Collaboration, Engagement, Access.

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e of Social Media in Teaching-Learning Process

ocial media has brought about significant changes in the teaching-learning process. It has provided educators and learners with new opportunities for collaboration, engagement, and access to information. In this section, we will discuss how social media has transformed the teaching-learning process.

Collaboration

Collaboration is a process of working together with one or more people to achieve a common goal or objective. It involves sharing ideas, knowledge, and expertise to create something that is greater than the sum of its parts. Collaboration is an essential component of the teaching-learning process, as it enables learners to work together on projects, assignments, and discussions, and share their ideas and perspectives with one another.

Social media has provided an excellent platform for collaboration in the teaching-learning process. It has enabled learners to work together on projects, share ideas, and provide feedback to one another. Social media tools such as Facebook, Twitter, LinkedIn, and Instagram can be used to share knowledge, discuss ideas, and collaborate on assignments. These platforms enable learners to work together, regardless of their location or time zone.

One of the main advantages of using social media for collaboration is that it promotes active learning. When learners collaborate with one another, they are more likely to be engaged with the material and to learn actively. Collaboration can also help to develop essential skills such as communication, problem-solving, and critical thinking, which are valuable for learners both in and out of the classroom.

Social media has also provided learners with the opportunity to connect with experts and mentors in their field of study. This can help learners to build relationships and networks that can be valuable throughout their career. Learners can use social media to follow industry leaders, participate in online discussions, and connect with peers and mentors who can provide guidance and support.

Engagement

Engagement is a critical factor in the teaching-learning process. It is essential to keep learners motivated, interested, and focused on the learning goals. Social media has played a significant role in promoting engagement in the teaching-learning process. It has provided an opportunity for learners to interact with the content, instructors, and peers in a more interactive and participatory manner.

Social media platforms offer a variety of features that can be used to promote engagement in the teaching-learning process. For example, instructors can use social media to share multimedia content such as videos, images, and infographics that can make the learning experience more exciting and interactive. Learners can also use social media to create and

their own content, such as videos and podcasts, which can help to promote engagement and creativity.

Social media has also enabled instructors to provide personalized feedback and support to learners. Instructors can use social media platforms such as Twitter, Facebook, and Instagram to provide feedback on assignments, answer questions, and provide guidance to learners. This can help to promote engagement by providing learners with a sense of connection and support.

Another way social media can promote engagement is through gamification. Gamification involves the use of game design elements such as points, badges, and leader boards to make the learning experience more enjoyable and engaging. Social media platforms such as Facebook, Twitter, and Instagram offer a variety of gamification tools that can be used to make the learning experience more interactive and engaging.

Social media has also provided an opportunity for learners to collaborate and work together on projects. This can help to promote engagement by providing learners with a sense of community and shared responsibility. Learners can use social media platforms to collaborate on assignments, share ideas and feedback, and support one another.

Access

Access is an essential component of the teaching-learning process. It is critical to ensure that all learners have equal opportunities to access educational resources, regardless of their location or background. Social media has played a significant role in promoting access to educational resources, making it easier for learners to access content, communicate with instructors, and collaborate with peers.

Social media platforms have provided a wide range of opportunities for learners to access educational resources. For example, instructors can use social media platforms such as Facebook, Twitter, and Instagram to share links to online resources, such as articles, videos, and podcasts. This makes it easier for learners to access relevant content, regardless of their location or time zone.

Social media has also made it easier for learners to communicate with instructors and peers. Learners can use social media platforms to ask questions, share ideas, and provide feedback on assignments. This can help to promote engagement and collaboration, as learners can connect with one another and with instructors in a more interactive and participatory manner.

Another way social media has promoted access in the teaching-learning process is through online courses and webinars. Many educational institutions and organizations offer online courses and webinars on social media platforms such as Facebook, Twitter, and Instagram.

makes it easier for learners to access educational resources, regardless of their location schedule.

Social media has also provided an opportunity for learners to connect with experts and mentors in their field of study. This can help learners to access valuable resources and knowledge that can support their learning and career development. Learners can use social media to follow industry leaders, participate in online discussions, and connect with peers and mentors who can provide guidance and support.

Challenges and Limitations

1: Information Overload and Accuracy

One of the biggest challenges of social media in the teaching-learning process is information overload. With the vast amount of information available on social media, it can be difficult for learners to navigate and filter through the noise to find credible and accurate information. Moreover, social media is also plagued with fake news and misinformation, which can mislead learners and hamper their learning outcomes.

To mitigate this challenge, instructors must guide learners on how to evaluate the reliability and accuracy of information on social media. Learners must be equipped with critical thinking skills to evaluate sources and distinguish between credible and unreliable information. Instructors must also provide clear guidelines on the types of sources that are acceptable for research and academic purposes.

Challenge 2: Distraction and Time Management

Social media can be a significant source of distraction for learners, especially when it is not used appropriately. Social media can hinder concentration, reduce attention span, and impede the learning process. Additionally, learners can also get sucked into the never-ending cycle of social media, leading to poor time management and procrastination.

To address this challenge, instructors must provide clear guidelines on the appropriate use of social media in the learning process. Learners must be encouraged to use social media for educational purposes only and avoid using it during class hours. Instructors must also incorporate time management strategies in their teaching methods to help learners manage their time effectively.

Challenge 3: Privacy and Security Concerns

Privacy and security concerns are also significant challenges of social media in the teaching-learning process. With the increasing reliance on social media, learners may unknowingly share personal information, which can be accessed by unauthorized parties. Additionally, learners may also become victims of cyber bullying, harassment, and online threats.

Mitigate this challenge, instructors must educate learners on the importance of online privacy and security. Learners must be encouraged to use privacy settings and avoid sharing personal information on social media. Instructors must also create a safe and secure online learning environment that is free from harassment and cyber bullying.

Challenge 4: Unequal Access to Technology

Another significant challenge of social media in the teaching-learning process is unequal access to technology. Learners from low-income backgrounds may not have access to the necessary technology and equipment to participate in online learning. This can create a digital divide and limit the learning opportunities for certain learners.

To address this challenge, instructors must ensure that all learners have equal access to technology and equipment. This can be achieved by providing technology and equipment to learners who do not have access to it. Instructors can also adopt a hybrid approach to teaching, which combines online and offline learning, to ensure that all learners have equal learning opportunities.

Conclusion

Social media has had a significant impact on the teaching-learning process. It has provided a wide range of opportunities for learners to engage with educational content, collaborate with peers and experts, and access educational resources. One of the key benefits of social media in the teaching-learning process is collaboration. Social media platforms have enabled learners to work together on projects, share ideas, and provide feedback to one another. This has helped to promote engagement, creativity, and a sense of community among learners. Social media has also played a significant role in promoting engagement in the teaching-learning process. Social media platforms offer a variety of features that can be used to promote engagement, including multimedia content, personalized feedback, gamification, and collaboration tools. By harnessing the potential of social media for engagement, instructors can enhance the quality of education and improve learning outcomes. Access is another important aspect of the teaching-learning process, and social media has provided many opportunities for learners to access educational resources. Social media platforms have made it easier for learners to access relevant content, communicate with instructors and peers, and connect with experts and mentors in their field of study. However, social media also presents challenges and limitations in the teaching-learning process. These include issues such as privacy and security, information overload, and the potential for distraction. Instructors and learners must be mindful of these challenges and take steps to mitigate their impact.

Overall, social media has had a transformative impact on the teaching-learning process. By leveraging the potential of social media platforms for collaboration, engagement, and access, instructors can enhance the quality of education and improve learning

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EDUCATIONAL DEVELOPMENT AND SOCIAL WELFARE

VOLUME - VI

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THE CHALLENGES AND ISSUES OF TEACHER EDUCATION IN INDIA

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Abstract

Teachers play a vital role in helping people to develop their talents and develop their potential for personal growth. They need to acquire a complex plethora of knowledge of skills needed for teachers and citizens of the world at large. The school teachers mediate between a fast-evolving world and the students who should keep their pace in progress. The success of student community depends entirely on quality of teacher. With the advent of quality reforms, the quality of teachers become the prerogative of policy makers, college and university heads espesially in teacher education colleges. This article aims at making an humble contribution to the on-going debate of challenges faced by teacher education.

Teacher Education and Higher Education

Throughout the world, Higher Education Institutions function in a dynamic environment. In India also, the institutions of higher education (HEIs) /teacher education (TEIs) are facing many challenges and are undergoing significant changes from time to time. There is a need to expand the system of higher education, the impact of technology on the educational delivery, the increasing private participation in higher education and the impact of globalization, have necessitated such marked changes in the Indian higher education scenario. These changes and the consequent shift in values should be taken into cognizance in order to enhance the standard of teacher education.

Higher Education invariably is concerned with quality maintenance and enhancement. It is self evident from the quotation "The destiny of the nation is shaped in the classroom" that the primary concern of teacher education is quality. Undoubtedly education plays a significant role in the nation's development and the quality of teachers and therefore great efforts were made and still are being made to improve the quality of teacher education.

There has been a great expansion of teacher education over the years. No doubt education plays a signnificant role in nation's development but the quality of education imparted is greatly determined by the quality of teachers and teaching.

One of the biggest challenges faced by developing countries is the lack of preparedness of the teachers to implement an effective approach to teaching in schools. If teachers are to become effective prac'itioners of knowledge by understanding and meeting the needs of learners then they must be educated to that extent. Yet another important issue in effective teaching is that teacher educators themselves are professionally unprepared and take the role of educating pre-service and in-service teachers about effective teaching practices. They need to update the teacher educators to offer an appropriate curriculum and to employ suitable pedagogies and to prepare them for excellence in teaching can be very challenging in countries where there are few academics that are themselves not trained in and lacking the necessary skills, knowledge and sentiments to undertake such a role. To overcome the problem of adjustment teacher educators are trained for effective teaching practices. Pre-service teacher education programs are to be organized for this purpose. Teachers are crucial in determining what happens in classrooms and there are those who would argue that the development of more effective classrooms requires teachers to cater to different student learning needs through the modification or differentiation of the curriculum. There is a perfect agreement of the need to reform initial education so that all sophomore teachers enter the profession better prepared to deal with diversity in their classrooms and also more aware that they will be working with adults as well as pupils. Most mainstream teachers do not believe that that they have the skills and knowledge to do this kind of work and that there is an army of 'experts' out there to deal with these students on a one-to one basis or in small more manageable groups. Factors Involved in Effective teaching

Though teachers have concerns about effective teaching and many surveys have found that teachers' attitudes towards effective teaching are not particularly positive,they express concerns about their lack of preparation for excellence and for teaching all learners. Teacher education emphasizes on teaching and training with reference to these aspects:

- Teaching strategies
- How children learn
- What children need to learn

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- Classroom organization and management
- Where to get help when necessary
- Identifying and assessing difficulties
- Assessing and monitoring children's learning
- The legislative and policy context
- Disability and special needs

It is important to point out that content knowledge is no doubt important, but it is insufficient to improve practice in schools because many teachers did not act upon this knowledge when they returned to the classroom. It was clear that there was a big gap between what teachers knew as a result of being on a course and what they did in their classrooms. In an attempt to bridge this gap, initiatives have been designed to link individual and institutional development. In other words 'doing' has become an essential element of professional learning and institutional development. The penultimate aim of teacher education is turning knowledge into useful 'doing'.

Changing attitudes is difficult, particularly for those teachers whose professional identities are secure. The traditional way of attempting to bring about developments in inclusion was to focus on improving teachers' knowledge and skills, but this did not always work.

For this purpose, The National Policy on Education (NPE 1986) and the subsequent Programme of Action (PoA 1992) laid great stress on the quality of education at every level. If the nation has to rise up its standards the teacher education should be at a high pedestal and make a lofty resolve in uplifting the quality of Higher Education. Ultimate aim of education is to build up the core values among the younger generation and to live up to them.

Core values in teacher education

- Contributing to National Development : Most of the Teacher Education Institutes have a remarkable capacity to adapt to changes, and at the same time pursue goals and objectives that they have set forth for themselves. Contributing to national development has always been the ultimate philosophical goal of education. The Teacher Education Institutes have a significant role in human resource development and capacity building of individuals, to cater to the needs of the economy, society and the country as a whole, thereby contributing to the development of the nation. Serving the cause of social justice, ensuring equity, and increasing access to higher education are a few ways by which Teacher Education Institutes can contribute to the national development.
- Fostering Global Competencies among Students : The spiralling developments at the global level also warrant that skill development of students should be on par with their counterparts elsewhere. With liberalization and globalization of economic activities, the need to develop skilled human resources of a high calibre, is imperative. Consequently, the demand for internationally – acceptable standards in higher standard of teacher education is evident.
- Inculcating a Value System among Students : Though skill development is crucial to the success of students in the job market, skills are of less value in the absence of appropriate value systems. Teacher education institutes have to shoulder the responsibility of inculcating the desirable value systems amongst the students. In a country like India, with cultural pluralities and diversities, it is essential that students imbibe the appropriate values commensurate with social, cultural, economic and environmental realities, at the local, national and universal levels. Whatever be the pluralities and diversities that exist in the country, there is no scope for debate about inculcating the core universal values like truth and righteousness apart from other values emphasised in the various policy documents of the country. The seeds of values sown in the early stages of education, mostly aimed at cooperation and mutual understanding, have to be retreated and reemphasized at the teacher education institutions, through appropriate learning experiences and opportunities.
- Promoting Use of Technology : Most of the significant developments that one can observe today, can be attributed to the impact of Science and Technology. While the advantages of using modern tools and technological innovations in the day-to-day-life are well recognized, the corresponding changes in the use of new technologies, for teaching – learning and governance of TEIs, leave much to be desired. Technological advancement and innovations in educational transactions have to be undertaken by all TEIs, to make a visible impact on academic development as well as administration.
- Quest for Excellence : Although contributing to nation-building and skill development of students, institutions should also demonstrate a drive to develop themselves into centres of excellence. Excellence in all that they do, will contribute to the overall development of

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the system of teacher education of the country as a whole. This 'Quest for Excellence' could start with the assessment or even earlier, by the identification of the strengths and weaknesses in the teaching and learning processes as carried out by the institution. The institution may feel free to expand or modify the Core Values in conformity with the goals and mission of the institution.

Curricular Design helps in systematic organisation and delivery of lectures which paves the way for academic flexibility and enables teachers to cater to the diversified needs of students thus bringing flexibility in teaching-learning process thereby enhancing teacher quality.

Some of the other issues and challenges of teacher education are -Evaluation Processes and Reforms Promotion of Research, Research and Publication output, Consultancy and Extension Activities.

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