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Message from the Director, SCERT, Assam

In the realm of education, research-based interventions have now attained the status of an essential tool, deemed indispensable for ensuring the quality of education. Conventional and stereotypical educational endeavours have proven to yield meagre outcomes in terms of advancing the educational landscape of a nation. Hence, it becomes imperative that our state embraces innovative, research-driven actions to propel itself forward in alignment with the contemporary advancements within the educational domain.

Since its inception, SCERT, Assam, has consistently underscored the importance of research and activities rooted in research, particularly pertaining to school and teacher education. It is with great pride that the Department of Research and Evaluation at SCERT, Assam, presents the Sixth volume (No. II) of its Educational Research Journal. This compilation showcases research contributions from scholars engaged in diverse educational spheres.

It is my anticipation that this enlightening journal will effectively facilitate the dissemination of research findings amongst educational practitioners. Moreover, I believe it will serve as a valuable resource for teachers, teacher educators, educational planners, and administrators, aiding them in comprehending the current status of school and teacher education. Furthermore, it will empower them to formulate pertinent, outcome-oriented strategies for the advancement of these domains.

I extend my heartfelt gratitude to all the diligent contributors of research papers, the esteemed members of the editorial board, the discerning reviewers, the assiduous editors, and the unwavering support group. Their painstaking efforts have culminated in the publication of this volume.

Dr. Nirada Devi
Director, SCERT, Assam, Ghy-19
Chief Editor

Editorial

The imperative integration of research-derived discoveries for the enhancement of quality control within educational endeavours is now an undeniable necessity for every educational institution. Through research-oriented planning, various indicators of quality education can be rigorously assessed, thereby formulating strategies for the judicious and optimal utilization of available educational resources. While research seminars and conferences have garnered favour among academicians in our state recently, the publication of research papers in the form of a journal remains considerably limited. Consequently, the constrained dissemination of findings from these research inquiries curtails their potential utility.

In an effort to address this shortfall, the Department of Research and Evaluation at SCERT, Assam, is pleased to present the Sixth volume (No. II) of its educational research journal, complete with an ISSN. This endeavour not only aims to disseminate the findings of these studies among educational stakeholders but also to instil motivation among educational practitioners to delve into research endeavours tackling diverse educational challenges within the state. Recognizing the scarcity of such opportunities in Assam, a concerted effort has been made to include a substantial number of research papers, fostering the proliferation of research-driven actions for elevating educational quality.

The editorial board has undertaken minor revisions, ensuring coherence in language and clarity of the content, while retaining the essence of the original submissions. Although individual researchers have undertaken studies, a systematic approach has often been underutilized, potentially due to a lack of orientation or awareness about methodological rigor in research. Consequently, those engaged in educational research should be equipped with proficient research techniques, allowing their comprehensive studies to effectively inform the formulation of education policies. While a significant portion of studies conducted are either action research or applied research, there is an evident need for fundamental and foundational studies across various dimensions of education to uphold quality standards. Thus, appropriate authorities are encouraged to provide comprehensive exposure to individuals driven by research motivation, offering grant schemes that facilitate meaningful research endeavours.

A notable observation pertains to the fact that implementing departments are often less inclined toward research objectives. Consequently, even if high-quality research is conducted, the outcomes tend to languish within university libraries or other repositories, with limited accessibility for those who could enact these findings in practical educational contexts. It is essential to infuse a conducive research environment within the State, nurturing an appetite for innovative methodologies and techniques that yield superior outcomes. This involves continuous orientation of researchers and updates regarding evolving research paradigms from academic organizations.

In this edition, an earnest endeavour has been made to present a peer-reviewed journal, benefiting from the expertise of distinguished educational specialists, particularly in the realm of research. I extend my heartfelt appreciation to Dr. Mona Sedwal, NIEPA, Delhi; Dr. M.V. Srinivasan, NCERT, Delhi; Dr. Tulika Dey, NERIE, Shillong; Sima Kalita, Guwahati University; Prof. Daisy Bora Talukdar, Dibrugarh University; Dr. Yeasmin Sultana, Tezpur University and Prof. Nil Ratan Roy, Tezpur University for their commendable contributions, instrumental in refining the papers for publication.

Furthermore, I seize this moment to express my gratitude to the dedicated researchers who have contributed their papers to this journal, the members of the editorial board for their rigorous efforts, and the supportive group for their unwavering commitment in realizing this comprehensive volume of the educational research journal.

Dr. Jayanta Kr. Sarmah,
Editor

CONTENT

A Correlational Study of Emotional Intelligence and College Adjustment of Students Belongs to Golaghat District of Assam

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Abstract

The aim of the present study is to study the correlation between emotional intelligence and adjustment of college students of Golaghat District (Assam). Emotional intelligence is involved in the capacity to perceive emotions, accept emotions-related feelings understand the information of those emotions and manage them. Adjustment is the psychological process of adapting in coping with, managing their problem, challenging tasks and requirements of daily life. Adjustment is an important trait for a happy living in a society. It helps one to keep out basic impulses at tolerable levels, to believe in one's own abilities and to achieve desired goals. There are many researches done on emotional intelligence and adjustment among the school students as well as secondary and higher secondary students. But a very few studies had been carried out among the college students particularly in Golaghat district. That is why investigator intend to carry on research to find out the relationship between emotional intelligence and adjustment. For this study a sample of 165 students consisting 88 males and 77 females were selected from three different colleges of Golaghat district by simple random sampling technique. The tools used in the present study were Emotional Intelligence Scale (EIS) developed by Anukool Hyde, Sanjyot Pethe and Upinder Dhar and Adjustment Inventory for College Students (AICS) developed by A.K.P. Sinha and R.P. Singh. Majority of college students have been found with high emotional intelligence and found with high adjustment. Investigator found a positive correlation between emotional intelligence and adjustment of college students. It means that the students who have high levels of emotional intelligence have high degree of adjustment. Further it was found that There is no significant difference between male and female college students with regard to their emotional intelligence and adjustment level.

Keywords - *Emotional Intelligence, Adjustment, Emotions.*

Introduction

The present study is the study of correlation between emotional intelligence and adjustment. "Intelligence is the aggregate or global capacity of an individual to act purposefully, to think rationally, and to deal effectively with his environment". Emotions are attitudes or responses to a situation or an object, like judgments (Zemach, 2001). Positive emotions are not simply "happy feelings". Emotional Intelligence is a person's ability to understand his or her own emotions and the emotions of others and to act appropriately based on this understanding". Emotional Intelligence is generally said to include three skills which are Understanding emotions of self and others, using emotions for solving complex problems of life and managing emotions to lead a happy and successful life. Emotional intelligence refers to the mental processes involved in the recognition, use, understanding and management of one's and others' emotions, to discriminate among them and to use the information to guide one's thinking and actions. Emotional intelligence refers to an ability to recognize the meanings of emotion and their relationships and to reason and problem-solve on the basis of them. Emotional intelligence is involved in the capacity to perceive emotions, assimilate emotion-related feelings, understand the information of those emotions, and manage them. The concept of emotional intelligence taken together means, how intelligently we can control our emotions. Emotional intelligence refers to the capacity for recognizing own feelings and those of others, for motivating ourselves and for managing emotions well in us and in our relationships (International Journal for Educational Planning and Administration, 2011). Daniel Goleman (1995), developed a framework of five elements that define emotional intelligence which are Self-Awareness, Empathy, Motivation, Self-Regulation and Social Skills. Emotional intelligence as the ability to perceive emotions to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge and reflectively to regulate emotions so as to promote emotional and intellectual growth. (Mayer and Salovey, 1997) Emotional intelligence are the ability to correctly understand, evaluate and communicate emotions of self and others. Man is a social animal who not only adapts to physical demands but also adjusts to social pressures. This adjustment means reaction to the demands and pressures of social environment, imposed up on the individual. The demand may be external or internal to whom the individual has to react (Chauhan, 1978). Adjustment therefore is a process which leads us to a happy and contented life, maintains a balance between our needs and the capacity to meet these needs and persuades us to change our way of life according to the demands of the situation. (Mangal, 1984). If a college student is highly emotional intelligent, he

or she can easily adjust any situation but if a student has low emotional intelligent, he or she difficult to be easily adjust any situation. Emotional intelligent intelligence and adjustment both are interrelated. Therefore, it is necessary to study whether there is a positive or negative relation both of them. Adjustment may be viewed from two angles. From one angle, adjustment may be viewed as an achievement or how well a person handles his conflicts and overcomes the resulting tension. From another angle, adjustment may be looked upon as a process or how a person adjusts to his conflicts. In the first case, we ask whether a person's adjustment is adequate and efficient. In the second case, we ask how does he adjust or what are the modes of adjustment to various demands. Adjustment is the process by which living organism maintain a balance between its need and the circumstances that influence the satisfaction of these needs. (L.S. Shaffer, 1961). Adjustment means the modification to compensate for or meet special conditions. James Drever, (1952). Adjustment is a continual process by which a person varies, his behaviour to produce a more harmonious relationship between himself and environment. (Gates, Jerslid et.al, 1970). There are certain areas of adjustment. These are- Home and Family adjustment, Health adjustment, Social Adjustment, Emotional Adjustment, Educational Adjustment etc.

Review of Related Literature

Saheny, A. (2016) conducted a study on "Adjustment in relation to emotional intelligence of students studying in schools of Ludhiana District". The sample consisted of 100 school students, out of 100 students 50 were male and 50 were female. The main findings of the study were there was no significant difference between total emotional intelligence and adjustment of male and female students and there exists a positive relationship between adjustment and emotional intelligence of students. Kumar, S. and Singh, J. (2013) conducted a study entitled, "Emotional Intelligence and Adjustment among Visually Impaired and Sighted School Students" found that there is significant relationship between emotional intelligence and adjustment and sighted students have better intelligent and adjusted than visually impaired students. Tripathi, I. (2016) studied "Emotional Intelligence as Related to Adjustment: A Study of Tribal Nontribal Adolescents of Ranchi (Jharkhand) District". Found that there is different pattern of emotional intelligence and adjustment in tribal- nontribal group. One striking finding is that tribal adolescents have more emotional intelligence score than non-tribal group and they are better on adjustment scale. Babaei, M. and Cheraghali, M.R. (2016) conducted a study name as "The relation of emotional

intelligence with social and job adjustment among health care centres' staffs". The major findings of the study were that high emotional intelligence would facilitate the ability to recognize and organize emotions and adaptation (compatibility) with situations; further, it enhances psychological well-being. Singh, U and Mahato, B. (2015) conducted a study on "Emotional Intelligence, Adjustment and Anxiety among Standard ten Students: A Co- relational Study". The result revealed that emotional intelligence and adjustment were significantly and positively correlated. Emotional intelligence was negatively and significantly correlated with anxiety. Furthermore, the result also revealed that adjustment and anxiety were negatively and significantly correlated with each other.

Rational of The Study

A person's emotional intelligence helps him or her much in all spheres of life through its various components namely knowledge of his or her emotions, managing the emotions motivating oneself, recognizing emotions others and handling relationship. At the same time adjustment is also important for one's individual life. It is the process through an individual can easily adjust any situation according to the need and demand. Adjustment of a student is related to arrive at a balance state between his needs and satisfaction. Students have good adjustment in all the aspects of their life if there is balance between their academic, intellectual, emotional, social and other needs and their satisfaction. The situation that offers few barriers compels the person to struggle to overcome them. There are many researches done on emotional intelligence and adjustment among the school students as well as secondary and higher secondary students. A few numbers of studies have been carried out among the college students particularly in Golaghat district (Assam). That is why Investigator intend to carry out research to find out the relationship between emotional intelligence and adjustment.

Objective of the Study

1. To study the relationship between emotional intelligence and adjustment of college students.
2. To Compare Emotional Intelligence of male and female college students.
3. To Compare Adjustment of male and female college students.

Hypotheses of the Study

1. There is no significant relationship between Emotional Intelligence and Adjustment of college students.
2. There is no significant difference between male and female college students with regard to their emotional intelligence.
3. There is no significant difference between male and female college students with regard to their adjustment.

Sample and Sampling Technique

For this study a sample of 165 students consisting 88 males and 77 females were selected from three different colleges of Golaghat district by a simple random sampling technique.

Table - 1

College wise male and female students of different colleges of Sample in Golaghat (Assam)

Name of Colleges	Male	Female	Total
Debraj Roy college	40	28	68
Hemprova Borbora Girls College	-	25	25
Golaghat commerce College	48	24	72
Total	88	77	165

Tools

Emotional Intelligence Scale (EIS) developed by Anukool Hyde, Sanjyot Pethe and Upinder Dhar and Adjustment Inventory for College Students (AICS) developed by A.K.P. Sinha and R.P. Singh were used to assess emotional intelligence and adjustment of college students of Golaghat District (Assam).

Data Analysis

Relationship Between Emotional Intelligence And Adjustment Of College Students.

Table-2

Correlation between emotional intelligence and adjustment of college students

Variables	N	r
Emotional Intelligence	165	-.89
Adjustment	165	

Significant at the 0.01 level (2-tailed)

Table 1 reveals that the value of correlation between emotional intelligence and adjustment is -.89 which is significant at 0.01 level. This shows that as the scores of emotional intelligences increases the scores of adjustments is decreases and less scores of adjustments show better adjustment of the college students. It means that the students who have high levels of emotional intelligence have high degree of adjustment as per test interpretation. Therefore, the null hypothesis "There is no significant relationship between emotional intelligence and adjustment" is rejected, and it may be said that students with high emotional intelligence have better college adjustment and the adjustment of students increases with enhancement in the emotional intelligence.

Comparison Between Male and Female College Students with Regards to their Emotional Intelligence

Table-3

Gender wise N, Mean of Emotional Intelligence scores, SD and t-value

Gender	N	Mean	SD	t-value
Male	88	89.63	4.89	.71*
Female	77	92.66	5.24	

Not Significant at 0.05 level of Significance

On the basis of table 2 it is found that the mean score of males is 89.63 with SD 4.89 and female mean score of emotional intelligence is 92.66 with SD 5.24. The t value is .71 which is not significant at 0.05 level of significance. Therefore, the null hypothesis "There is no significance difference between male and female college students with regard to their emotional intelligence" is not rejected. Hence it can be said that there is there is no significance difference found between male and female college students with regard to their emotional intelligence. Further, it may be said that male and female students have similar emotional intelligence.

Comparison Adjustment Score of Male and Female College Students

Table-3

Gender wise N, Mean of adjustment scores, SD and t-value

Gender	N	Mean of adjustment scores	SD	t-value
Male	50	32.34	19.36	.84*
Female	50	31.22	16.97	

Not Significant at 0.05 level

It is evident from table 3 that the Adjustment mean score of males is 32.34 with SD 19.36 and Adjustment mean score of females is 31.22 with SD 16.97. The t value is .84 which is not significant at 0.05 level. Therefore, the null hypothesis "There is no significance difference between male and female college students with regard to their adjustment" is not rejected. Therefore, it may be said that the male and female college students have similar adjustment.

Results and Findings

Positive relationship was found between emotional intelligence and adjustment of college students. It means that the students who have high levels of emotional intelligence have high degree of adjustment. Further it was found that There is no significant difference between male and female college students with regard to their emotional intelligence and adjustment level. The majority of students found with high emotional intelligence. The majority of students found with high degree of adjustment. Therefore, it may be said that the male and female college students have similar adjustment. Further, it may be said that male and female students have similar emotional intelligence and further, it may be said that students with high emotional intelligence have better college adjustment and the adjustment of students increases with enhancement in the emotional intelligence. The students having high emotional intelligence are well adjusted in their life.

Discussion

A high level of adjustment found among the students is that they may be well aware of their self-concept. Self –concept is the ability to know about one's own strength and weakness, potentialities to live a healthy life and accordingly adapt effectively to the world around them. This finding was supported by Sharma, (2011), Haynes, Emmons & Ben-Avie (1997) .(Mlhotra,P & Shihotra, K., 2013). Ranjan,(2012), Rekha, Milan& Rani(2014), Yengimolki, Kalantarkousheh& Malekitabar (2015), Norwal (2018), Gangadharmurthy (2017), Gaikward (2015). Another reason behind this may be due to fact that they have more self-management, and have strong adaptable potential. It means that the students who have high emotional intelligence have high degree of adjustment. The reason of no significance difference between male and female may be both have adequate level of aspiration. Their level of aspiration is neither too low nor high in comparison to their own strengths and abilities.

Conclusion

Majority of college students have been found with high emotional intelligence and have been found with high adjustment. Investigator found a positive relationship between emotional intelligence and adjustment of college students. It means that the students who have high levels of emotional intelligence have high degree of adjustment. Further it was found that There is no significant difference between male and female college students with regard to their emotional intelligence and adjustment level. The study would be helpful to the teachers, parents' wardens, guidance workers and counsellors. Teaching method should include proper development of emotional intelligence. So, emphasis should be laid on more Child Centred Methods of Teaching. Emphasis should be laid on co-curricular activities to develop Social and Emotional development and emotional intelligence of the students. Teachers should understand the dynamics of emotional intelligence of students in a better way.

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7 Day Reading Campaign in the Lab Area Schools of DIET Nagaon: A Pilot Project

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Abstract

Reading skill is one of the most important skills in learning a language. Education of a child may hamper if he/she is not competent enough to read with comprehension. But after a survey it was found that most of the students of the elementary schools of Nagaon district are not able to read properly with comprehension. So, DIET Nagaon has conducted a 7 day reading campaign in its lab area schools as a pilot project with an objective to improve the reading skills of Class 3 students. The project was carried out by the D.el.ed 2nd Semester trainees, during their School Internship Activities under the supervision of the investigators. After the campaign, most of the students could improve their reading skill. It was concluded that to improve reading skill of the students, appropriate reading environment should be constructed in schools and implementation of these type of reading campaigns are effective.

Introduction

Reading skill is a cognitive ability which a person uses when interacting with the written text. Reading skills involve: identifying word meaning, drawing inferences, identifying writer's technique, recognizing mood of passage, finding answers to questions etc. Reading skills can also include: recognizing the script of language; deducing the meaning, use of unfamiliar lexical items; understanding explicitly and non-explicitly stated information, conceptual meaning, communicative value of sentences, relations within the sentences and between parts of text through lexical cohesion devices; recognizing indicators and main point of information in discourse ;distinguishing main idea from supporting detail; selective extraction of relevant points from the text; basic reference skills; skimming, scanning, transcoding information from diagrams/charts. Reading skill means knowing the meaning of the word in context, literal comprehension, drawing inferences, interpretation of metaphor, finding main ideas and forming judgments.

A survey was conducted in about 110 elementary schools of the 11 blocks of Nagaon district to check the reading skills of the students of Class 3, 4 and 5. During the survey, it was observed that most of the students in the elementary schools of Nagaon District are not able to read their age level texts with comprehension. To improve their reading skill a structured 7 day strategy namely '7 days reading campaign' in the lab area schools of DIET Nagaon was carried out as pilot project. To execute this campaign in reality, first the sample schools and students were defined. After that a schedule of reading activities for 7 days was prepared to be conducted by our D. el.ed 2nd semester trainees during their School Internship Programme.

Objective

1. To study the status of reading skills of the students
2. To intervene the method of developing reading skills
3. To improve reading skills of the students of the sampled schools

Population of the study

For this research project, class 3 students of 9 lab area schools of DIET Nagaon are taken as population.

Sample of the study

10 students of class III of each of those schools are selected as sample for this research project.

Significance of the study

As reading skill is one of the basic skills of learning a language, so it is very much essential that it is developed in the early classes of a child. The research is significant as it has improved the reading skills of the students of class 3 of the 9 lab area schools of DIET, Nagaon. The research is also significant for future researcher to make it as resource. Subsequently, the research will help teachers of Nagaon District to apply the techniques, used in the project to improve reading skill, in their schools too.

Research methodology

To carry out the research project, experimental research method is used. Only primary data has been used for the purpose of this research.

Tools that are used

Two Reading tools are used for conducting the project. In the Reading Tool 1, 10 words are given to the sample students to read. In the Reading Tool 2, a small passage has been selected from a workbook, prepared by SCERT, Assam, and 5 MCQs are prepared to test the reading comprehension of the sample students.

Analysis

In the pre-test, two tools were provided to the sample students. In Tool 1, 10 words were given to the students to read. In Reading tool 2, a short passage was given to read with comprehension.

After determining the reading level of the sample students, a structured program of 7 days was conducted. The program included activities such as word recognition and sound recognition, pre-reading, while reading and post reading activities. Pew-reading activities include prior knowledge, title reading, scanning and making predictions, generating questions etc. While reading activities include paired reading, checking predictions, generating answers and asking new questions, making visualizations etc.

After conducting these activities for 7 days, a post test was conducted with the same tools as used in pre-test. The results of pre-test and post-test are analysed below in detail:

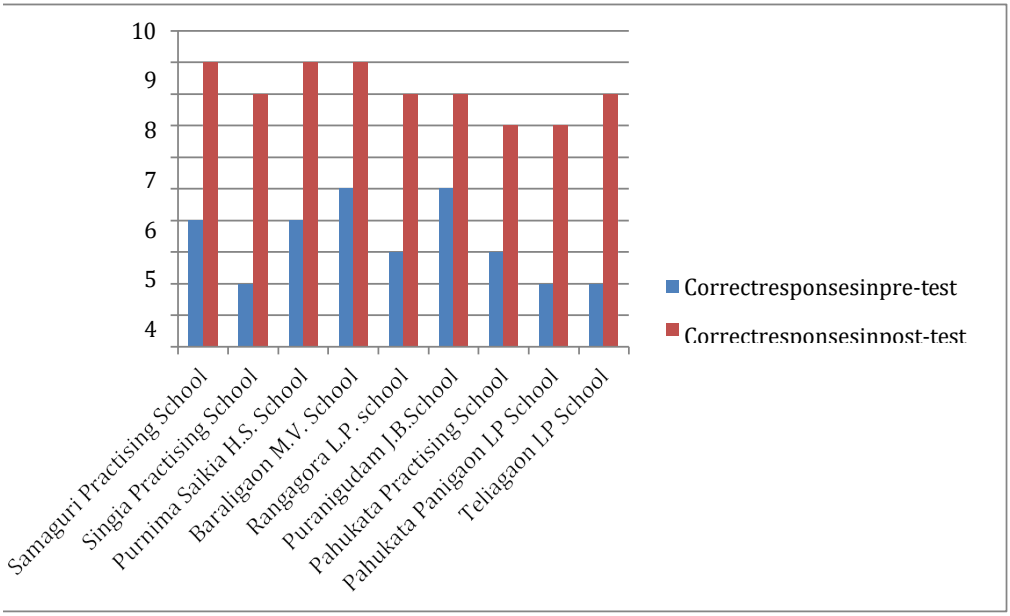
Results of Reading Tool 1

Out of 10 students in each school the following number of students could read all the 10 words.

Table-1
Showing the results of ReadingTool 1

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	4	9
2.	Singia Practising School	2	8
3.	Purnima Saikia H.S.School	4	9
4.	Baraligaon M.V.School	5	9
5.	Rangagora L.P. School	3	8
6.	Puranigudam J.B.School	5	8
7.	Pahukata Practising School	3	7
8.	Pahukata Panigaon L.P.School	2	7
9.	Teliagaon L.P. School	2	8

Figure 1
Showing the results of the Reading Tool 1 of the sample schools



Results of Reading Tool 2

In reading Tool 2, a text is provided to the sample students to read with comprehension and answer a few MCQs.

The passage is:

ভাৰতৰ অন্যান্য ঠাইত পালন কৰা কিছুমান উৎসৱ আমাৰ অসমতো পালন কৰা হয়। যেনে- দুর্গা পুজা, ঈদ, মহৰম, বৰদিন, দৌল বা ফাকুৱা আদি। বিহু হৈছে অসমৰ জাতীয় উৎসৱ। ইয়াৰ উপৰিও অসমত আৰু ভালেমান উৎসৱ পালন কৰা হয়। ভঠেলি, মহ' হ', বড়োসকলৰ বৈশাগু আৰু খেৰাই পূজা, মিচিংসকলৰ আলি আয়ে লিগাং, কার্বিসকলৰ চমাংকান, তিৱাসকলৰ জোনবিল মেলা, ডিমাচাসকলৰ মাঘ ছাইন্ জ্রা, ৰাভাসকলৰ মায়ুখ, চাহ জনগোষ্ঠিৰ টুচু পূজা, আহোমসকলৰ মে-ডা-মে-ফি ইত্যাদি।

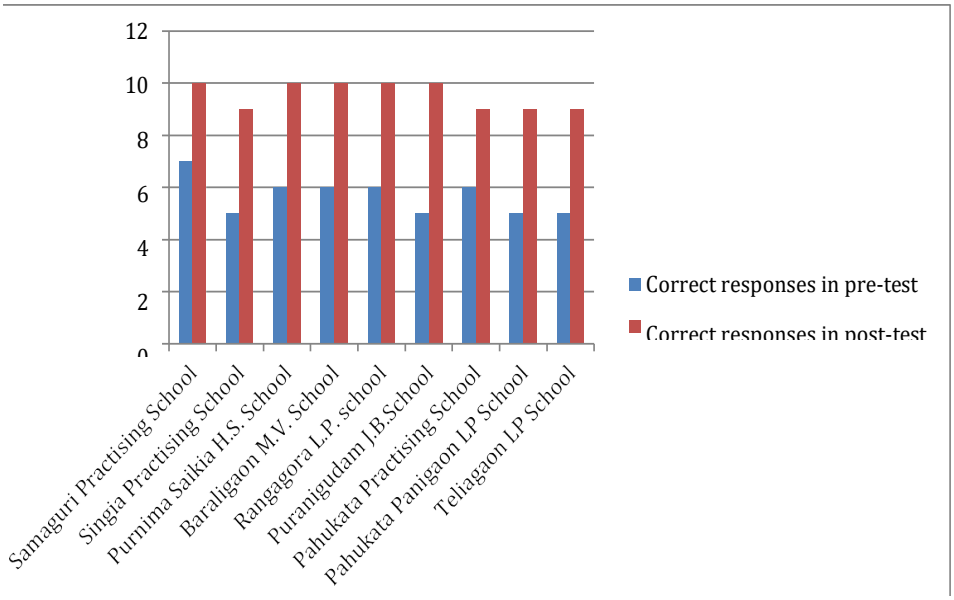
Q1. তলৰ কোনটো অসমৰ জাতীয় উৎসৱ?

a) বৰদিন
b) বিহু
c) বায়ুখ
d) ফাকুৱা

Table-2
Showing the correct responses of Q1 of Reading Tool 2

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	7	10
2.	Singia Practising School	5	9
3.	Purnima Saikia H.S.School	6	10
4.	Baraligaon M.V.School	6	10
5.	Rangagora L.P. School	6	10
6.	Puranigudam J.B.School	5	10
7.	Pahukata Practising School	6	9
8.	Pahukata Panigaon L.P.School	5	9
9.	Teliagaon L.P. School	5	9

Figure 2
Showing the correctres ponses of Q1 of Reading Tool 2



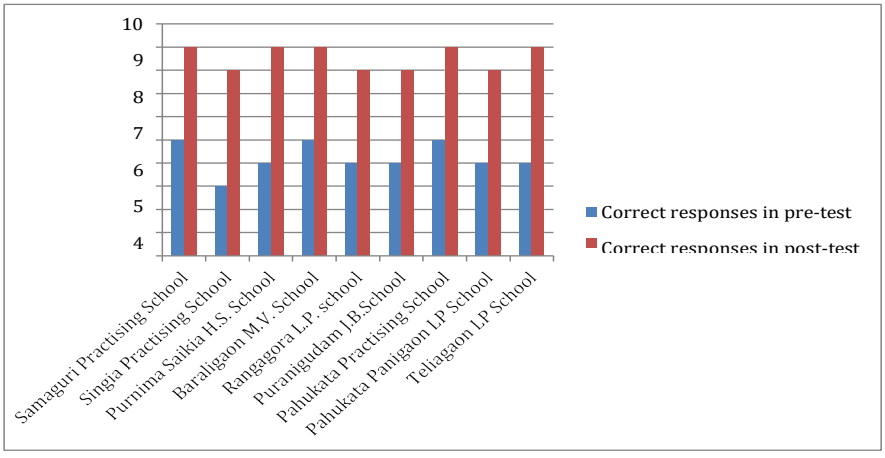
Q 2. তলৰ কোনটো উৎসৱ বড়োসকলৰ?

a) টুচু পূজা ***b)*** দৌল ***c)*** চমাংকান ***d)*** বৈশাগু

Table-3
Showing the correct responses of Q2 of Reading Tool 2

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	5	9
2.	Singia Practising School	3	8
3.	Purnima Saikia H.S.School	4	9
4.	Baraligaon M.V.School	5	9
5.	Rangagora L.P. School	4	8
6.	Puranigudam J.B.School	4	8
7.	Pahukata Practising School	5	9
8.	Pahukata Panigaon L.P.School	4	8
9.	Teliagaon L.P. School	4	9

Figure 3
Showing the correct responses of Q2 of Reading Tool 2



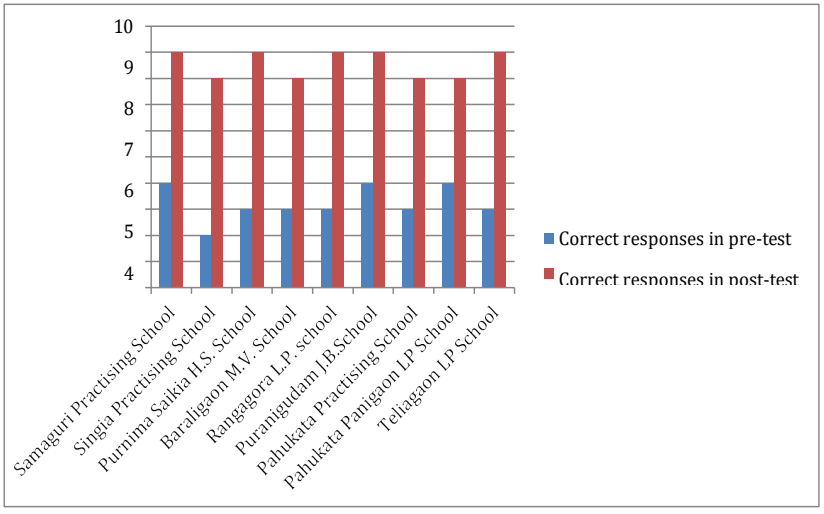
Q 3. মে-ডা-মে-ফি কোনটো সম্প্রদায়ে পালন কৰে?

a) ৰাভা ***b)*** তিৰা ***c)*** আহোম ***d)*** ডিমাচা

Table - 4
Showing the correct responses of Q3 of Reading Tool 2

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	4	9
2.	Singia Practising School	2	8
3.	Purnima Saikia H.S.School	3	9
4.	Baraligaon M.V.School	3	8
5.	Rangagora L.P. School	3	9
6.	Puranigudam J.B.School	4	9
7.	Pahukata Practising School	3	8
8.	Pahukata Panigaon L.P.School	4	8
9.	Teliagaon L.P. School	3	9

Figure 4
Showing the correct responses of Q3 of Reading Tool 2



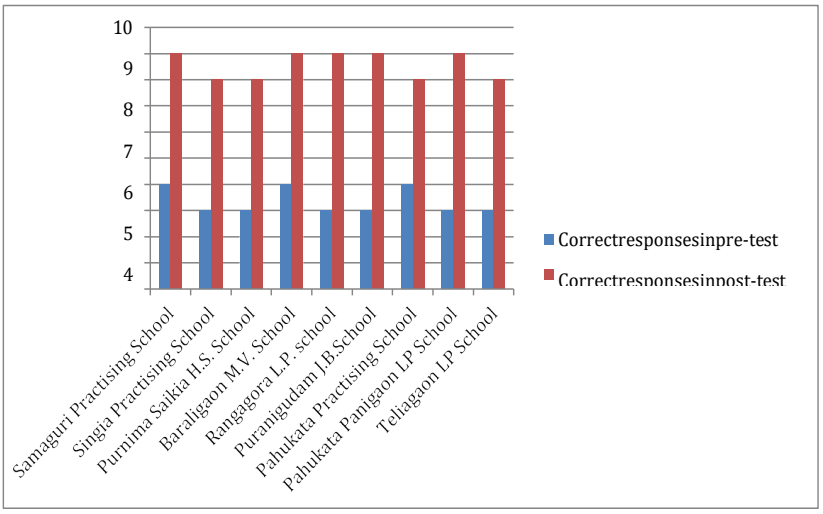
Q 4. মিচিংসকলে পালন কৰা উৎসটোৰ নাম কি?

a) বায়ুখ ***b)*** খেৰা ***c)*** ভাঠেলি ***d)*** আলি-আই-লিগাং

Table-5
Showing the correct responses of Q4 of Reading Tool 2

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	4	9
2.	Singia Practising School	3	8
3.	Purnima Saikia H.S.School	3	8
4.	Baraligaon M.V.School	4	9
5.	Rangagora L.P. School	3	9
6.	Puranigudam J.B.School	3	9
7.	Pahukata Practising School	4	8
8.	Pahukata Panigaon L.P.School	3	9
9.	Teliagaon L.P. School	3	8

Figure 5
Showing the correct responses of Q4 of Reading Tool 2



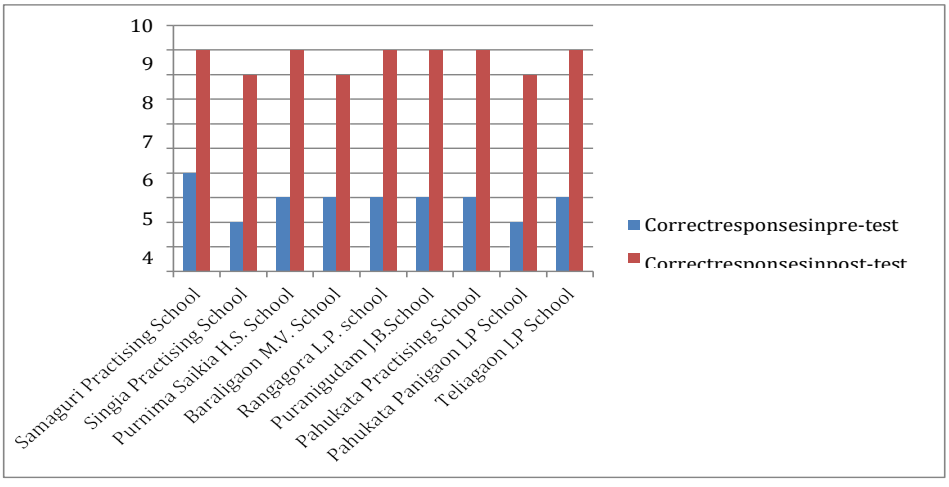
Q 5. জোনবিল মেলা কোনটো জনগোষ্ঠীৰ লোকে পালন কৰে ?

a) তিৰা ***b)*** ডিমাচা ***c)*** ৰাভা ***d)*** বড়ো

Table - 6
Showing the correct responses of Q5 of ReadingTool 2

Sl. No.	Name of the School	Correct responses in pre-test	Correct responses in post-test
1	Samaguri Practising School	4	9
2.	Singia Practising School	2	8
3.	Purnima Saikia H.S.School	3	9
4.	Baraligaon M.V.School	3	8
5.	Rangagora L.P. School	3	9
6.	Puranigudam J.B.School	3	9
7.	Pahukata Practising School	3	9
8.	Pahukata Panigaon L.P.School	2	8
9.	Teliagaon L.P. School	3	9

Figure 6
Showing the correct responses of Q5 of Reading Tool 2



Findings

After conducting the survey regarding reading skill of the students of elementary schools of Nagaon district, it was found out that most of the students at the elementary schools are not able to read fluently and accurately. Then after conducting the 7 day Reading Campaign for the sample students of the 9 lab area schools of DIET, Nagaon, as a pilot project, the investigators have drawn the following major findings:

Findings regarding low performance in reading by elementary level students

Students are not given proper practice of decoding and reading with comprehension.

Findings after conducting 7 day reading campaign

- Proper reading environment should be constructed in schools to improve students' reading skill.
- Students can read words properly if decoding is taught and practiced among them.
- Students' reading skill improves with practice.
- Students can read with comprehension if proper strategy is adopted to teach reading.
- Students' reading skill improves with practice.
- Students can read with comprehension if proper strategy is adopted to teach reading.

Suggestions

To improve the reading skills of students, the following strategies can be adopted:

- Proper practice of decoding should be done.
- Exposure to conjunct letters should b given importance.
- Blending of various words should be practiced among the students.
- Students should be taught to deduce meaning from the context.
- Loud reading should be practiced.
- Students should be taught to break up the reading into smaller sections.

Conclusion

Reading skill is the 3rd skill to be learnt after listening and speaking while learning a language. So, students should be able to read with comprehension. Considering the importance of reading skill, the 7day Reading Campaign was conducted as a pilot project in the lab area schools of DIET, Nagaon. If such projects or strategies be taken up by teachers or researchers, there will surely be a positive impact on the educational scenario of Assam.

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Navigating Stress in Parenting: An In-Depth Analysis of Challenges Faced by Parents of Children with Special Needs

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Abstract

Parenting children with special needs introduces unique challenges, demanding a nuanced exploration of stressors faced by these parents. This study aims to delve into the intricate landscape of stress experienced by parents in raising children with special needs, recognizing the multifaceted dimensions of their journey. The increasing prevalence of stress among parents of children with special needs necessitates a comprehensive investigation. By understanding the sources and nature of stress, we can develop targeted support systems to enhance the well-being of both parents and their children.A descriptive research design was employed, utilizing a survey method to capture the stress levels among parents. The study focused on parents of children with hearing impairment, intellectual disability, autism, and multiple disabilities. The research involved a purposive sampling technique, with 101 parents participating in the survey. The diverse sample represented parents across different age groups, economic backgrounds, and support systems. The inclusion criteria comprised parents whose children were availing of preschool services, allowing for a comprehensive examination of stress factors within this demographic.Descriptive research using the survey method facilitated the identification of stress factors within the selected domains: personal concerns, family involvement, and availability of resources.

The 'Scale on Domains of Stress,' a five-point rating scale, was developed to assess stress levels. Statistical measures, including Friedman's test, Mann-Whitney U test, and Kruskal Wallis test, were employed for quantitative data analysis.The study found no significant statistical difference among the domains of personal concerns, family involvement, and availability of resources in contributing to parental stress. However, nuances within personal concerns, varying levels of family support, and the nature of disabilities highlighted subtle distinctions in stress experiences among parents. This research underscores the need for tailored support systems, emphasizing the importance of a strong support network and accessible resources for parents of children with special needs. The study contributes insights into stress management strategies, fostering a more holistic approach to parenting challenges in this context.

Keywords: *Stress, children with special needs, personal concerns, family involvement, and availability of resources*

Introduction

Stress is a state of mental or emotional strain or tension resulting from adverse or demanding circumstances. It is prevalent to experience stress in today's highly challenging life. Stress can influence our behavior, thus leading to an unpleasant state of mind. Being in a state of stress does not give a positive feeling to the person experiencing it. Although stress is a psychological reaction, it affects us physiologically and our biological system. Parenting children with special needs presents unique challenges that often lead to heightened stress levels. According to Maslach (2003), stress arises from mental or emotional strain due to demanding circumstances, and it can negatively affect both psychological and physiological health. Research on the experiences of parents raising children with disabilities highlights that these parents face substantial emotional, financial, and physical burdens, as they are tasked with ensuring the well-being of their children while navigating the complexities of their care.

Causes of Stress among Parents of Children with Special Needs

Several factors contribute to the stress experienced by parents of children with special needs. These factors range from the financial costs of therapy and medical care to emotional turmoil caused by behavioral and developmental issues in the child. Sarant and Garrard (2013) found that parents of children with cochlear implants experienced stress related to their children's language development, behavior, and lack of social support, compared to parents of typically developing children. Similarly, stressors identified among parents of children with hearing impairments included communication difficulties, educational concerns, and the maintenance of hearing aidsDavis, N. O., & Carter, A. S. (2008).

The financial burden of raising a child with special needs also one of the most significant stressors reported by parents. Studies indicate that families often face higher out-of-pocket expenses for medical care, therapy, and specialized educational services. David AJ (2004) found that families with children with special needs typically have a lower rate of private insurance and often incur substantial financial hardship. Research by Kuhithau et al. (2005) also highlights that more severe disabilities are associated with a greater likelihood of financial strain. This financial pressure is compounded by the need to reduce work hours or even cease employment altogether to care for the child.

Parents also experience stress due to the behavioural and emotional challenges posed by children with special needs. Seltzer, M. M.et all. (2009) reported that mothers of children with autism experience chronic stress levels comparable to combat soldiers, with fatigue and work interruptions being frequent issues. Plant & Sanders (2007) and Hasting & Brown (2007) also identified that maladaptive behaviors in children contribute significantly to parental stress, with parents often feeling helpless in managing these behaviors. The constant need for caregiving and the inability to meet the child’s emotional and developmental needs exacerbate feelings of frustration and alienation.

The disability of a child can significantly affect the functioning of the entire family, often resulting in stress for parents. Seligman &Darling (1997) found that a child's diagnosis could disrupt family dynamics, leading to emotional strain among family members. The lack of social and professional support further increases stress, as parents may feel isolated and unsupported. Perry (1989) and Thompson (2006) reported that many parents, particularly mothers, face a lack of mutual approval and cooperation from extended family and professionals, which adds to their stress. Research has shown that mothers of children with special needs typically experience more stress than fathers. Mothers often bear a dual responsibility of caregiving and managing household duties, leading to elevated stress levels. This finding is consistent with the observation that mothers of children with disabilities are more likely to report anxiety, depression, and fatigue compared to fathers (Rodrigue, Morgan & Geffken, 1990; Dyson, 1997).

The type and severity of a child's disability also influence the level of stress experienced by parents. Research by McStay, R., Dempsey, I., & Paris, D. (2014) found that parents of children with intellectual disabilities (ID) reported higher levels of anxiety and mental stress compared to those of typically developing children. Similarly, studies by Rodrigue et al. (1990) and Roach et al. (1999) confirmed that parents of children with intellectual disabilities experience more stress than those raising non-disabled children. The type of disability plays a crucial role in determining the extent of parental stress, with more severe disabilities often leading to greater stress.While the stress experienced by parents is undeniable, many studies emphasize the importance of coping strategies and support systems in alleviating stress. Research by Sarant and Garrard (2013) found that strong social support networks, including assistance from family, friends, and professionals, can reduce stress levels among parents of children with cochlear implants. The availability of resources, both personal and external, such as counseling and therapy, can help parents manage their stress more effectively.Furthermore, research by Thompson (2006) emphasizes the need for parents to adopt stress management strategies and seek professional help when necessary. Providing parents with accessible resources and a strong support system can significantly improve their ability to cope with the challenges of raising children with special needs.

The literature reveals that parents of children with special needs face a wide range of stressors that can impact their emotional, financial, and physical well-being. These stressors are influenced by factors such as the type of disability, financial constraints, emotional challenges, and the availability of support systems. Addressing these stressors through targeted support systems and coping strategies is crucial for improving the well-being of parents and, by extension, the development of children with special needs.

Significance of the study

Parents play an important role in the academic as well as the overall development of their children. Family engagement in the academics of children ensures success. The involvement of the parents helps children with special needs in their academic pursuits. But it stresses the parents, as they have to ensure that their children perform at par with their non-disabled peers in an inclusive set-up. Researchers have identified several factors that contribute to parenting stress in parents of deaf children, including income, age of diagnosis, the extent of hearing loss, language abilities, mode of communication, and perceived social support.

Along with this, the issues like a classroom setting, curriculum, teaching methods, and interaction with others are some of the concerns of parents of children with hearing impairment. Hence, the researcher took up the study to identify the factors that cause more stress among parents of children with special needs. This study will also help the rehabilitation professionals extend a goal-directed help to combat the stress and provide good services. The tool developed could also be used for a larger population of parents at different places, thus bringing out a general rehabilitation and stress management strategy. Hence to identify a factor that causes more stress among parents of children with special needs, the researcher took up the study with the following objectives:

Objectives of the Study

1. To identify the most stressful factors among the selected three domains: personal concern, family involvement, and availability of resources in parents of children with special needs.
2. To identify whether parents with support will have more stress as compared to those without support.
3. To assess the stress levels of mothers of children with Hearing loss, Intellectual Disability, Autism, Multiple Disability, etc.

Hypotheses

1. There is no significant difference in the perceived stress levels among parents of children with special needs across the domains of personal concern, family involvement, and availability of resources.
2. There is no significant difference in the stress levels between parents with support and those without support among caregivers of children with special needs.
3. There is no significant difference in the stress levels of mothers across different types of disabilities, including Hearing loss, Intellectual Disability, Autism, and Multiple Disability.

Method

The present study aims to investigate the sources and levels of stress among parents of children with special needs. The details of the participants are given in Table 1.

Inclusion Criteria

- Parents of children with special needs (e.g., HL, ID, ASD, MD)
- Parents actively involved in caregiving and decision-making for their child with special needs.
- Parents who have been availing educational intervention for at least 6 months.
- Parents who are currently residing in Mysuru but natives of thestates (e.g., Karnataka, Kerala, Maharashtra) included in the study.
- Parents with children in the age range of 2–7 years.

Exclusion Criteria

- Parents of children whose primary diagnosis is unrelated to the focus of the study or falls outside HL, ID, ASD, or MD.
- Parents who have access to substantial professional caregiving support (e.g., hired caregivers or institutional care) and are not the primary caregivers.
- Parents with severe health conditions or psychological conditions that limit their participation or affect their stress responses unrelated to caregiving.
- Parents whose children are enrolled in schools or programs outside the preparatory school mentioned in the study.

Research Design

To achieve the study objectives, a descriptive research design was employed using a survey method. This design allows for the systematic collection and analysis of data to understand the phenomenon under investigation comprehensively.

Sampling Technique

Purposive sampling was utilized to select participants for the study. Parents of children with special needs who were availing services at a preparatory school in a National Institute in Mysuru were included. This method ensured that the sample represented individuals with relevant experiences related to the research topic.

Sample

The target population comprised parents of children with special needs enrolled in the preparatory school mentioned above. A total of 101 parents expressed willingness to participate, reflecting the diversity of backgrounds and circumstances among parents facing similar challenges.

Table 1

Details of Participants

Attribute: Provisional Diagnosis						
Categories	HL	ID	ASD	MD	Any other	
Number:	51	31	13	6	Nil	
Attribute: Age of the Children						
Categories:	2-3	3-4	4-5	5-6	6-7	7 and above
Number:	Nil	8	28	37	15	13
Attribute: Age of the mother						
Categories:	20-30		31-40		41-50	51-60
Number:	58		36		2	5
Attribute: State						
Categories:	Karnataka		Kerala		Maharash-tra	Any other
Number:	66		33		1	1
Attribute: Economic Background						
Categories:	Upper Class	Upper Middle Class	Middle Class	Lower Middle Class	Lower Class	
Number:	Nil	12	74	11	4	
Attribute: Support System						
Categories:	With Famil Support	Without Family Support				
Number:	43	58				
Attribute: Educational Qualification						
Categories:	School	Pre University Course	Graduate	PG		
Number:	42	37	14	8		

Data Collection Tools

A five-point rating scale named the 'Scale on Domains of Stress' was developed to measure stress levels across different domains. This scale, comprising 23 statements categorized into personal concerns, family involvement, and availability of resources, was designed based on a review of existing literature. The scale underwent validation by experts in special education, ensuring its reliability and relevance to the research context. To enhance accessibility, the questionnaire was translated into regional languages such as Kannada and Malayalam.

Procedure for Data Collection

Initially, the researcher provided an overview of the study's objectives to the parents of children with special needs at the preparatory school. They were informed about the voluntary nature of their participation and assured that their responses would remain confidential. Considering the participants' unique situations, such as extended periods away from their families, the researcher tried to streamline the data collection process and minimize disruptions to their daily routines.

Data Analysis

Quantitative analysis of the collected data was conducted to assess stress levels and identify patterns across different domains. Statistical measures such as mean, standard deviation, median, and tests including Friedman's test, Mann-Whitney U test, and Kruskal-Wallis test were applied to analyze the data comprehensively. These analyses provided insights into the factors influencing parental stress and the variations observed based on different variables.

Results and Discussion

Objective 1

To identify the most stressful factors among the selected three domains: personal concern, family involvement, and availability of resources in parents of children with special needs.

Findings related to objective 1

Results of Stress Related to the Three Domains: Personal Concerns, Family Involvement, and Availability of Resources

Initially, the data were analyzed across the three primary domains and compared descriptively, subjecting them to Friedman's test, a non-parametric alternative to one-way ANOVA with repeated measures. In this study, one-way ANOVA was utilized to determine whether the selected stress domains—personal concerns, family involvement, and availability of resources—would affect the parents' stress levels regarding children with special needs.

Table 2
Mean, Standard Deviation, Median, and Summary of Friedman's Test on the Three Domains: Personal Concern, Family Involvement, and Availability of Resources

Domains	Mean	SD	Median	p-value
Personal Concerns	63.59	17.56	65.71	.089*
Family Involvement	61.25	15.95	56.66	
Availability of Resources	60.35	16.69	64.00	

*Not significant as p-value is greater than 0.05.

The results indicate that there is no significant difference among the selected three domains concerning the stress levels of parents of children with special needs; thus, the null hypothesis framed is accepted. However, the mean result in personal concern is slightly higher than family involvement and availability of resources. This discrepancy could be attributed to personal concern encompassing questions about societal acceptance of the child's disability, the nature of the disability, personal well-being, and family acceptance. Similar findings were observed in previous research reports (Beckman, 1991; Dyson, 1991; Emerson, 2003; Bristol &Schopher, 1984; Hoppes& Hoppes, 1990), which indicated that parents of children with special needs experience higher levels of stress and complicated mental health compared to families of children with typical development.

Objective 2

There is no significant difference in the stress levels between parents with support and those without support among caregivers of children with special needs.

Findings related to Objective 2

Results Based on the Data about Stress Levels among Parents with and without Family Support

To assess parents' stress levels with and without family support across the domains, the researcher conducted further descriptive analysis. The Mann-Whitney U test was utilized to compare differences between two independent groups when the dependent variable is ordinal or continuous but not normally distributed. Here, parents' stress levels with and without family support are assessed under the three various domains.

Table 3

Mean, Standard Deviation, Median, and Summary of Mann-Whitney U Test on the Stress Levels of Parents With and Without Family Support across the Domains

	Mean	SD	Median	p-value
With Support	60.59	15.84	56.52	.253*
Without Support	62.90	12.99	61.73	

*Not significant as the p-value is greater than 0.05.

The results show a statistically insignificant difference, and the null hypothesis, thus framed, is accepted. However, even though it is not statistically significant, the level of stress among parents staying without support is higher (62.90). This underscores the importance of good support from family members for mothers. Previous studies (Ilias, Kartini, Subramaniam, Ponnusamy, &Normah, Che Din, 2008) have highlighted those factors beyond the child's disability, such as parental attributions, financial constraints, and spousal support, contribute to parents' stress levels.

Objective 3

To assess the stress levels of mothers of children with Hearing loss, Intellectual Disability, Autism, Multiple Disability, etc.

Findings relate to Objective 3

Results about the Nature of Disability and Its Impact on Stress among Parents of Children with Special Needs

To evaluate whether the nature of the child's disability influences the parents' stress levels, the Kruskal-Wallis test was used to compare stress levels across various disability groups. This non-parametric test helps determine whether there is a significant difference between the groups.

Table 4

Summary of Kruskal-Wallis Test Results on Stress Levels of Parents Across Different Disabilities

PD	N	Mean	SD	Median	p-value
HL	51	61.68	14.84	59.13	.682*
ID	31	62.3	15.19	62.60	
ASD	13	62.27	15.81	52.17	
MD	6	55.36	8.18	54.34	

*Not significant as p-value is greater than 0.05.

The results showed that there is no significant difference statistically; thus, the null hypothesis framed is accepted. However, even though the number of respondents for Autism Spectrum Disorder (ASD) and Multiple Disabilities (MD) is less, the stress level appears higher than for Hearing Loss (HL) and Intellectual Disability (ID). Previous studies on the nature of disabilities and stress levels have also revealed similar results, suggesting that a child's characteristics and behaviors related to the diagnosis may be the sources of stress, rather than the diagnosis itself.

In conclusion, although there was not a significant difference statistically, several noteworthy points emerged:

1. Among the three selected domains, personal concern scored higher than family involvement and availability of resources.
2. Parents without sufficient support from their families experienced more stress compared to those with support.
3. Parents of children with autism and multiple disabilities experienced more stress than those with hearing loss and intellectual disability.

Having children is a challenging task, but raising children with special needs presents additional challenges, leading to stressful situations for parents.

Conclusion

Parenting children with special needs presents unique challenges that demand a nuanced understanding of the stressors faced by parents. This study aimed to explore the intricate landscape of stress experienced by parents raising children with special needs, recognizing the multifaceted dimensions of their journey.

Through a descriptive research design employing a survey method, stress levels among parents were captured, focusing on those with children facing hearing impairment, intellectual disability, autism, and multiple disabilities. The study found that while there was no significant statistical difference among the domains of personal concerns, family involvement, and availability of resources in contributing to parental stress, subtle distinctions within these domains were observed. Notably, personal concerns scored higher than family involvement and availability of resources, highlighting the complex emotional and psychological aspects of parenting children with special needs.Additionally, the study revealed that parents without sufficient support from their families experienced higher levels of stress compared to those with

support. This underscores the crucial role of a strong support network in alleviating parental stress and enhancing well-being.Furthermore, the nature of the child's disability also influenced parental stress levels, with parents of children with autism and multiple disabilities reporting higher stress levels compared to those with hearing loss and intellectual disability.

While parenting children with special needs presents significant challenges, understanding the sources and nature of stress is crucial for developing targeted support systems. By providing tailored support and resources, including emotional and practical assistance, we can enhance the well-being of both parents and their children. This research contributes valuable insights into stress management strategies, fostering a more holistic approach to parenting challenges in the context of raising children with special needs.

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Enhancing Trigonometry Learning through Childhood Games: An Innovative Pedagogical Approach for Secondary Education

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Abstract

An important part of a child's growth is playing games. In addition to fostering cooperation, communication, and conflict resolution, games also foster creativity, critical thinking, and problem-solving skills. Children learn to plan ahead and adjust to changing circumstances through games. This paper highlights the use of various childhood games, with modifications, in mathematics education. The paper demonstrates that incorporating games and activities can make learning mathematics more enjoyable. It discusses how practice, motivation, comprehension, and the reduction of anxiety are key factors in using games to enhance the teaching and learning of mathematics.

Through this paper, the author tries to examine the effectiveness of using games as a tool to spark interest in learning trigonometry among class X students. To achieve this, five popular childhood games—Chip- chop, word puzzles, crossword puzzles, riddle-based puzzles and sudoku—are adapted and modified for use in the classroom during trigonometry lesson. Moreover, students who were apprehensive about the subject were used as a sample to evaluate the impact of these games. The feedback obtained indicates a boost in students' interest and motivation by removing the fear to learn trigonometry.

Keywords: *Childhood Games, NCERT, Class X, Trigonometry, Innovative pedagogies*

Introduction

Games play a crucial role in the development process of a child. It not only helps in cognitive development of a child by encouraging problem solving, critical thinking and creativity, but also helps in developing social skills, physical development, emotional growth, imagination and creativity. Games played during childhood can be a powerful tool for learning mathematics because they combine engagement with problem-solving, making the learning experience enjoyable and interactive. Games often helps learners visualize abstract mathematical concepts and build conceptual understanding. On the other hand, mathematics helps students develop not only basic arithmetic skills, but also the crucial capacities of logical reasoning, creative problem solving, and clear and precise communication (both oral and written). Understanding concepts in other academic areas, including Science and Social Science, as well as Art, Physical Education, and Vocational Education, requires a strong foundation in mathematics (NCFSE 2023). According to the NCFSE (2023), the current education

system faces several challenges in mathematics learning. Many students in early grades fail to achieve foundational literacy and numeracy, making it difficult for them to progress in mathematics and participate effectively in society. Mathematics education has often been overly procedural and robotic, neglecting the creative and aesthetic aspects of the subject. It also says that, the traditional assessment methods, which emphasize rote learning and mechanical drills, reinforce the perception of mathematics as rigid and computational. As a result, many students develop a fear of mathematics. NCFSE (2023) suggests that, interactive and engaging teaching methods, along with assessments that encourage understanding and creativity, are essential to make mathematics more meaningful and enjoyable for students. Researches generally indicate that mathematics lessons tend to involve excessive talking and writing, which contributes to negative attitudes and poor performance in the subject. Mathematics is often considered a subject that challenges and tests the brain. Therefore, by introducing games requiring mathematical solutions in the teaching learning process, the learner's logical thinking skills may be enhanced.

The National Education Policy (NEP), 2020 highlights the significance of conceptual understanding in education, especially in mathematics and science, advocating a shift from rote memorization to deep learning that fosters critical thinking, creativity, and problem-solving abilities. It also highlights the importance of essential life skills like communication, cooperation, and teamwork, asserting that education should not only focus on academic knowledge but also equip students with interpersonal skills for real-life situations. By nurturing these skills, NEP (2020) aims to prepare students for active engagement in society and the workforce, promoting holistic development that balances academic and life skills.

Orim, et al. (2011), discusses the limitations of conventisonal approaches for teaching mathematics, which often result in students developing negative attitudes and poor performance due to a lack of engagement. They highlight the benefits of incorporating games in mathematics education, which can make learning enjoyable, reduce anxiety, and enhance understanding by offering competition, immediate feedback, and practical applications of concepts. Despite their effectiveness, games are underused in classrooms because teachers perceive them as time-consuming. Russo et al. (2018) provided useful guidelines in this regard. They outlined criteria known as the Principles of Educationally-Rich Mathematical Games, which help teachers determine if a game is suitable for the subject and students. These principles focus on five key areas, viz. student engagement, balance of skill and luck, focus on key mathematical concepts, adaptability in teaching and learning and home-school connection. Manić, et al., (2022), in a study, exploring the incorporation of mathematical games like Bingo and Tangram in a primary school in Pirot, Serbia concluded that these games boost student engagement, motivation, and understanding of complex mathematical ideas. They pointed out that games can foster better communication and collaboration among students. However, they stressed the importance of ensuring that the games adhere to the "Principles of Educationally-Rich Mathematical Games"

to maintain their educational value. They also discussed that, by considering the five key principles of educationally enriching mathematical games, it is possible to evaluate a game's merit and determine whether it should be included in the teaching process. Chaurasia, (2020) studied that traditionally, the focus has been on developing students' mechanical skills and directly imparting mathematical knowledge. However, in constructivist approaches learners are encouraged to explore, think critically, and nurture their curiosity in a more democratic and participatory way. Therefore, the role of the mathematics teacher has somewhat shifted, moving from that of an instructor to a facilitator, providing support and guidance to help students achieve their learning goals.

The National Curriculum Framework (NCF), 2005 emphasized that the main objective of mathematics education is to develop a child's ability to think mathematically. It advocated for a more activity-based approach to teaching mathematics at all levels. The National Curriculum Framework for School Education (NCFSE), 2023 seeks to revamp mathematics education by making it more engaging, creative, and connected to real-world experiences. It stresses the importance of an activity-based teaching approach across all grades, incorporating interactive elements like games and discussions to move away from lecture- driven, rote learning. This approach aims to foster a deeper appreciation for the subject's relevance and aesthetic qualities. The NCFSE also emphasizes showcasing India's historical contributions to mathematics, through figures like Aryabhata and Ramanujan, to inspire learners.

Hokor, et al., (2021) stated that mathematical concepts are used in various fields such as economics, engineering, science, medicine, and business. Trigonometry plays a key role in the mathematics curriculum and is particularly significant in high school as it connects algebraic, geometric, and graphical reasoning. It also serves as a foundation for calculus and college-level courses like Newtonian physics, architecture, surveying, and engineering. The study examined high school students' errors displayed in solving trigonometry problems and their struggle with the reasoning required for trigonometry, as it introduces challenges by requiring them to connect triangle diagrams with numerical relationships and work with the symbols involved. Gur, (2009); Tyata, et al., (2021), stated that, students often view trigonometry as especially challenging and abstract compared to other areas of mathematics. Additionally, they highlighted that errors in learning trigonometry often stem from flawed teaching methods or previously ingrained habits. Students struggle with integrating both prior knowledge and new concepts, which affects their grasp of trigonometric ideas. Adhikari, et al., (2021) explored the difficulties that students encountered when learning trigonometry for the first time, utilizing an explanatory mixed research design. Their study revealed that students, particularly struggled with memorization, abstract concepts, and translating verbal problems into geometric figures. They recommended prioritizing conceptual understanding to improve student performance and reduce anxiety. Pant et al., (2023) argued that, students struggle with the fundamental concepts, leading

to errors when solving problems. These errors may stem from issues in procedural knowledge, conceptual understanding, or the connection between the two. To promote meaningful and lasting learning, teachers should incorporate students' real-life experiences through the use of materials, diagrams, and tools. Additionally, teachers must stay attentive to student activities in the classroom, as a positive teacher-student relationship can greatly enhance the learning of trigonometry. Foley, et al., (2017) stated that, mathematics as a subject is often stigmatized and is known to cause fear and anxiety for many students globally. Sharma, et al., (2022) stated that, games can be highly effective in addressing this issue and advancing student-centered teaching methods. Well-designed games integrate key design elements that can be leveraged to create engaging learning experiences.

This paper builds on the recommendations from the National Curriculum Framework, 2005 and NCFSE, 2023. Its objective is to look into the effects of incorporating games as a teaching tool into the secondary school mathematics curriculum and how this approach influences learning outcomes. This study primarily focuses on how school children acquire the broadly applicable concepts of trigonometry and the difficulties they have in effectively understanding it. It also explores the integration of childhood games infused with trigonometric concepts to help address some of the difficulties students face in learning trigonometry in class X.

Trigonometry in Mathematics Curriculum in India

Mathematics education at the secondary school level in India is primarily focused on preparing students for board examinations, particularly at the end of Class X. These exams play a crucial role in determining a student's future, as their results influence the choice of stream—science, commerce, or humanities and to pursue high income drawing higher education courses—and significantly affect career prospects. As such, the Class X board exam is considered a high-stakes test, shaping much of the secondary school curriculum. The NCERT's class X mathematics curriculum covers a wide range of mathematics topics, including algebra, geometry, trigonometry, statistics, and arithmetic. Trigonometry makes up 20% of the total content in these key subject areas. Out of all these mathematical topics, trigonometry was selected for the study since it is a new subject included in the mathematics curriculum, in class X, and it is observed that students struggled to understand the concepts.

Objectives

The objectives of this study are as follows:

1. To build fact-fluency among students.
2. To incorporate educationally-rich Mathematical Games aligned with Bloom's Taxonomy in the classroom.
3. To improve students' achievement in trigonometry through activities.
4. To enhance classroom engagement and incorporate motivational component among students with the help of games.

Methods and Procedure

In this study, four traditional childhood games were selected and modified to integrate trigonometry. Additionally, the author designed a new game, based on some of the "Principles of Educationally-Rich Mathematical Games" suggested by Russo et al. (2018). These five games are intended to be introduced sequentially during the teaching of Chapter 8, "Introduction to Trigonometry," from the NCERT Class X mathematics syllabus.

This chapter covers topics such as Trigonometric ratios of acute angles, Trigonometric ratios at specific angles and Trigonometric identities. The author created a series of five structured games, beginning with the Trigonometric Quadrant (a puzzle), followed by Chip-Chop with a Trigonometric Twist, a Crossword puzzle with Trigonometry, Trigonometric Identity Puzzle and concluding with the Trigonometric Sudoku. These games are designed in line with the cognitive domain learning objectives of the “revised Bloom's Taxonomy”. According to the Revised Bloom's Taxonomy, the cognitive process dimension consists of six levels, arranged from lower-order to higher-order thinking: Remember, which involves recalling facts and concepts; Understand, where students grasp the meaning of information; Apply, which entails using knowledge in new contexts; Analyze, where information is broken down to examine relationships; Evaluate, which involves making judgments based on criteria; and Create, where elements are combined to form new wholes.

Furthermore, mathematics instruction incorporating these games was administered to a selected group of 15 students from a class of 32 in Class X at a private school in the Kamrup (Metro) district of Assam. The selected group comprised seven boys and eight girls. The school was chosen randomly, and it’s name has been withheld to maintain confidentiality.

The five games were introduced in a sequential manner. The 15 students involved in the study had previously been taught the chapter, “Introduction to Trigonometry”, using traditional methods in their regular classes. These were some of the pupils who displayed a disinterest in the subject.

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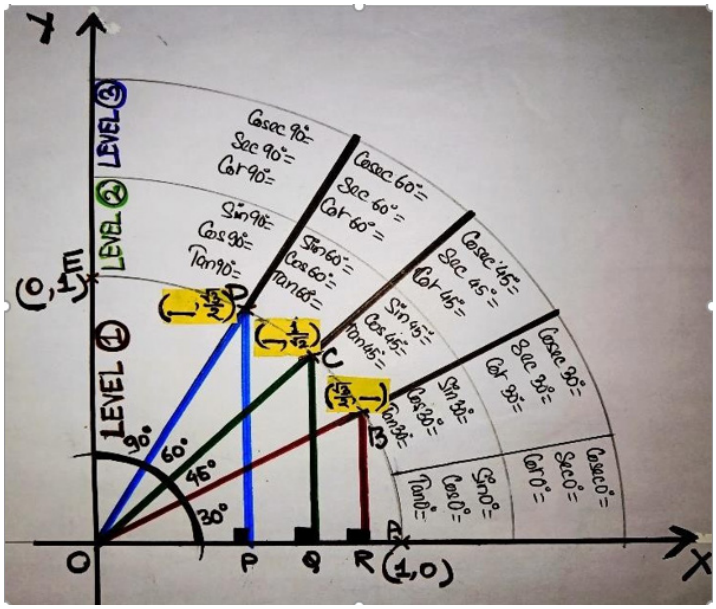
Game based on Understanding and Application objective

Leveraging prior knowledge helps students not only to grasp new material more thoroughly but also to incorporate it more seamlessly into their existing cognitive framework. The following game allows students to utilize their prior knowledge of Coordinate Geometry, as a foundation for developing new understanding in Trigonometry.

Game 1: Trigonometric Quadrant (a puzzle)

The group of 15 students was divided into three groups, and each group received a sheet containing the game design. This design included the coordinate axes, first quadrant of a unit circle with its center at point O and three right-angled triangles. The game featured three progressively challenging levels:

Level 1: Students calculated the coordinates of points B, C, and D using the Pythagorean theorem.
Level 2: Students calculated sinθ, cosθ, and tanθ for angles between 0° and 90° based on the triangles and given information.
Level 3: Students found the values of cosecθ, secθ, and cotθ using the results from the previous levels. The first group to complete all three levels was declared the winner.



Prior knowledge required to play this game

The students already possessed some prior knowledge, such as:

- They had previously studied coordinate geometry in Chapter 7 of the NCERT syllabus.
- They had already learned the Pythagorean Theorem and its practical applications in earlier classes.
- During regular lessons on the same topic, students were introduced to trigonometric functions, including sinθ = Perpendicular/Hypotenuse, cosθ = Base/Hypotenuse, tanθ = Perpendicular/Base, as well as cosecθ = 1/sinθ, secθ = 1/cosθ, and cotθ = 1/tanθ.

Learning outcomes of the Game

The game enabled students to leverage their prior knowledge of coordinate geometry to develop a deeper understanding of trigonometric values for specific angles as specified in the syllabus. Furthermore, through this game, students were able to independently derive the values of trigonometric functions for various angles. Game based on Knowledge objective:

Even after grasping the derivation of values of trigonometric functions at various angles, it is crucial for students to retain these values to solve problems and apply their knowledge when needed. To aid in long- term retention, two games were introduced in the lesson.

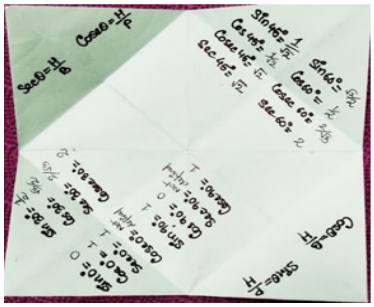
Game 2: Chip-chop with a trigonometric twist

Chip Chop, also known as a Cootie Catcher, is a popular paper fortune-telling game made with origami, widely played by children in India. By replacing the traditional color names and numbers with trigonometric ratios and values, this game can become an engaging educational tool for both students and teachers to use in the classroom.

This game requires two players. The teacher first demonstrated how to play, after which the students paired up to play the game. One student takes the role of the player, while the other acts as the fortune teller, holding the Chip Chop.

1. The fortune teller asked the player to pick a trigonometric function from the outer layer.
2. They spelled out the chosen ratio (e.g., "S-I-N-E-theta") while opening and closing the Chip Chop.
3. The fortune teller then showed the trigonometric ratios, i.e options like P/H, B/H, H/B, and H/P, under the folds, where, P= Perpendicular, H=Hypotenuse, B=Base.
4. The player selected the correct ratio for their chosen trigonometric function, and the Chip Chop is opened and closed again.
5. Next, the fortune teller revealed angles between 0° and 90°, and the player picked one, providing the value of their selected function at that angle.
6. Finally, the fortune teller opened the flap to reveal the answer.





Prior knowledge required to play this game

The students already had the required prior knowledge, to play this game including:

- The different trigonometric ratios outlined in the Class X mathematics syllabus.
- The trigonometric values at particular angles, which they had calculated in the previous game.

Learning outcomes of Game

This game made learning trigonometric ratios and the values of trigonometric functions for various angles, as outlined in the NCERT Class X syllabus, enjoyable and interactive. Students were able to identify and pair each trigonometric function with its correct ratio and corresponding value at specific angles. They could also play together without the need for teacher supervision.

Game 3: Crossword puzzle with Trigonometry

This puzzle is a variation of traditional word puzzles, where the usual letters are replaced with trigonometric functions, angles from 0° to 90°, and the corresponding values of these trigonometric functions.

Before solving the word puzzle, students were given clear instructions. They were asked to correctly match each trigonometric function with its corresponding angle and value. This matching could be done in multiple directions—horizontally (right to left), vertically (top to bottom), and diagonally.

Cosθ	60°	Tanθ	30°	$\sqrt{3}$	Cotθ
Tanθ	90°	0°	60°	Secθ	90°
2	45°	0	Sinθ	0°	0
Cotθ	45°	1	60°	1	Secθ
30°	Cosθ	90°	$\sqrt{3}/2$	45°	60°
$\frac{1}{\sqrt{3}}$	Cosecθ	45°	$\sqrt{2}$	0	$\sqrt{3}$

Prior knowledge required to play this game

- Students were already familiar with the values of trigonometric functions at specific angles, as outlined in the syllabus and also discussed in the previous games.

Learning Outcomes of Game

This game enabled students to identify and match the correct values of trigonometric functions at different angles, helping them to recall the trigonometry concepts previously discussed.

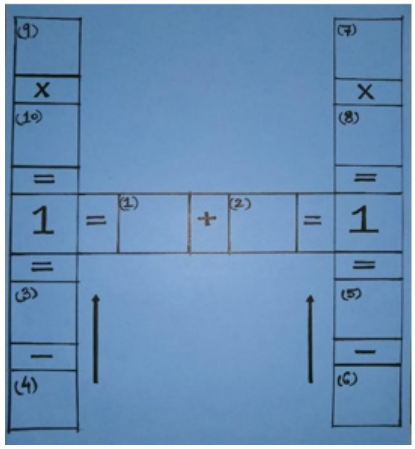
Game based on Application objectives

The following game emphasizes the Application level of Bloom's Taxonomy, serving as a recap of all the concepts previously covered in the chapter. The hints and clues, presented as riddles, are based on the chapter's earlier concepts, reinforcing the students' understanding.

Game 4: Trigonometric Identity Puzzle

In this puzzle, a grid with 10 blank spaces is provided, along with a list of 10 clues. Unlike traditional crossword puzzles, the answers will consist of trigonometric functions (such as sin, cos, tan, etc.) and the squares of some trigonometric functions.

Students were given a puzzle in the form of a grid, similar to a crossword, along with a list of clues. Instead of words, the answers were trigonometric functions such as sin, cos, or tan. Each clue was a riddle or problem, and the solution was the correct trigonometric function for a specific space in the grid. For example, space (1) had a corresponding riddle in the clues section. Using their prior knowledge, students had to solve the riddle and write the correct trigonometric function or value in the appropriate space. They continued this process until all clues were solved, successfully filling in the puzzle.



The clues are given below

1. I am the square of the ratio in a Triangle space. Perpendicular over the longest side you place. What am I?
2. Square me if you find me,
   I start at one but never exceed.
   From 0° to 90°, my values recede.
   What am I? Can you complete?
3. Square me if you are ready, I start with a zero,
   But as the angle grows, I reach the skies.
   At 90 °, I shoot to infinity, which you might consider as "not defined"
   What am I?
4. Square me, if you guess,
   In a triangle, I take my place,
   Base divided by hypotenuse,
   Flip the ratio, that's my name.
   What's my name?
5. I am the square of the inverse of tan,
   With base over perpendicular, that's me.
   What's my name, can you recall?
6. Solve this and you will find me,

   $$\frac{1+(\sin\theta)^2}{(\sin\theta)^2} - 1 = ?$$

7. I start at 1 and then I grow,
   From zero to 90 °, I climb up high,
   Undefined at 90 °, reaching the sky. What am I, can you imply?
8. My Ratio, you already know,
   When at 60 °, I am equal to 30° of what cos has to show.
   What am I?
9. You can't define me at 90°,
   But I stand as 1 at 0°, you know,
   What am I?
10. Sin(90 −θ) is equal to me,
    Simplify the expression $\frac{\tan\theta}{\sec\theta}$ and you can guess me.

Instruction

- Move along the arrows.

Prior Knowledge required to play this game

- The students were already familiar with trigonometric functions, trigonometric ratios, and the corresponding values of these functions at specific angles.

Learning outcomes of the Game

- The game allowed students to apply the knowledge they had already learned or developed. It also introduced them to the new topic of trigonometric identities in a more enjoyable and engaging manner.

Game based on Evaluation objectives

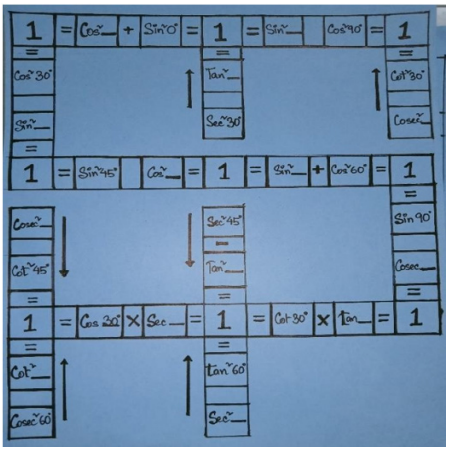
This game highlights the Evaluation level of Bloom's Taxonomy, allowing students to verify the trigonometric identities by using specific angles as examples. This approach lessens their reliance on memorization without understanding, as they can independently verify the identities and grasp their applications.

Game 5: Trigonometric Sudoku

Sudoku is traditionally played on a partially completed 9x9 grid. The grid consists of nine 3x3 subgrids. The goal is to place a number from 1 to 9 in each row, column, and subgrid without repeating any of the numbers. However, in this version, the author has adapted the puzzle to include trigonometric identities from the Class X NCERT Mathematics syllabus, introducing a mathematical twist to the classic game. In this game, students were provided with a Sudoku puzzle in the form of a grid. Instead of numbers, they were required to fill in angles in the blank spaces. Additionally, some operational signs were missing in certain boxes, and students had to complete these based on their prior knowledge of values of trigonometric function at specific angles. The sum of each side needed to equal 1, which is already given. Arrows were also provided to indicate that students should fill in the blank spaces along the direction of these arrows.

Instructions

- "☐" The rectangular boxes are to be filled with operational signs such as: ×, +, and =.
- Move along the arrows.



Prior Knowledge required to play this game

- Students were already knowledgeable about trigonometric functions, ratios, and the corresponding values of these functions at specific angles. In the previous game, they had also been introduced to trigonometric identities.

Learning outcomes of the Game

- This game allowed the students to verify the trigonometric identities they had already learned, by applying the values of trigonometric functions at specific angles, such as 0 °, 30 °, 60°, 45°, and 90°.

Results and Discussions

After incorporating games into the lessons, noticeable changes were observed in the students' behavior and learning. The students who played the games were more active and focused on the topic. They also asked more questions than the other students in the class. The students were more motivated and excited to learn trigonometry. It was also observed that those who played the games had a better understanding and learned the topics faster. Additionally, their motivation to learn mathematics increased. These successful outcomes encouraged the author to advocate for game-based instruction in other areas of mathematics as well.

Students were found enthusiastic about the games and engaged in playing activities like Chip-chop with a trigonometric twist and Cross word puzzle with Trigonometry among themselves without any supervision from the teacher or other instructors. They expressed curiosity about how the first game, Trigonometric Quadrant (a puzzle) linked coordinate geometry to trigonometry in an enjoyable way, indicating a heightened interest in the subject among the students. Additionally, those who previously feared the subject began to develop a liking for it; when asked, they remarked that trigonometry no longer felt the same as it did before the class.

Conclusion

It has been observed that students readily engage with games, and these activities greatly improve different aspects of learning mathematics. They enhance students' focus, promote better communication and teamwork, and simplify understanding of the subject. Additionally, these games help to reduce the fear associated with the subject. It has also been observed that students can build new knowledge from their prior understanding through playful methods and engaging activities. Since the games used were familiar to the students, they were more interested and could play independently. Therefore, common games can be adapted and modified to fit the subject matter. However, teachers should be mindful, as excessive competition or distraction from key mathematics concepts can limit students' progress in the subject. These games can also be integrated into the assessment process for students. It has

been observed that students often feel anxious about assessments after learning new materials, but if assessments are conducted through games, it can alleviate the stress and fear associated with exams. This method not only reduces test anxiety but also makes the assessment process more enjoyable and interactive for learners.

Recommendations

Here are some recommendations for enhancing the secondary stage mathematics education through the use of games in the teaching-learning process.

1. Games can be adopted as a pedagogical approach in the classroom for learning mathematics.
2. To improve the students' understanding of mathematics, games from their childhood or past experiences can be modified and included to the lessons.
3. Assessments can be conducted through games to alleviate the stress and fear associated with exams.
4. Innovations in Mathematics teaching to be encouraged amongst teachers.

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Riddle-Based Approach to Teaching Mathematics at the Middle Stage in the Context of Assam

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Abstract

Riddles can be an effective tool for teaching mathematics, as they help to capture the attention of students, increase attention span, and improve retention across the curriculum. In Assam, children have been introduced to riddles from an early age as a way of learning and memorising facts, a practice deeply rooted in the culture. By incorporating this indigenous practice, educators can make learning more enjoyable and culturally relevant. This method helps students find mathematics more approachable and discover new ways to understand the subject.

The National Curriculum Framework (NCF 2005) highlights that many students lose interest in mathematics by the secondary level. The National Curriculum Framework for School Education (NCFSE 2023) promotes a holistic approach to mathematics, integrating real-life applications and experiential learning to enhance engagement. It encourages flexibility, interdisciplinary teaching and teacher capacity building to make mathematics more relatable and enjoyable for diverse learners. The National Education Policy (NEP 2020) proposes reshaping the curriculum and pedagogy by recommending a shift from content- based learning to experience-based learning. It emphasizes strengthening the foundation of quality education by focusing on deeper cognitive understanding and moving away from rote learning.

In this paper, the author discusses innovative approaches to teaching mathematics at the middle stage through the use of riddles, specifically in the context of Assam. By incorporating these riddles into the classroom, teachers can enhance students' understanding of mathematical concepts. The paper also explores how integrating riddles with traditional teaching methods can make mathematics more engaging and effective.

Keywords: *Riddle, Mathematics Education, Innovative Practice, Middle-stage, Assam*

Introduction

India has a rich history of contributions to mathematics, starting with geometry and arithmetic around 800 BCE, exemplified by the Baudhāyana-Pythagorean theorem. Indian mathematicians advanced the numeral system by developing the concept of zero as a number, leading to the globally influential Indian numeral system. Key contributions include Aryabhata's sine function, Brahmagupta's

rules for negative numbers, precise calculations of π, foundational formulae in combinatorics, solutions to various equations, and early developments in calculus, including infinite series expansions of trigonometric functions by Madhava's school (NCFSE 2023). The NCFSE 2023 further emphasises that curriculum and pedagogy from the Foundational Stage should be deeply rooted in India's local context and culture to enhance relatability and engagement for students. By integrating traditions, language, and indigenous knowledge, education can foster creativity and critical thinking. This approach aligns learning with societal and scientific needs, promoting meaningful education (NCFSE 2023).

The NEP 2020 states that "It is recognized that Mathematics and mathematical thinking will be very important for India's future and India's leadership role in the numerous upcoming fields and professions that will involve artificial intelligence, machine learning, data science, etc."

The specific aims of Mathematics Education are to develop:

- Capacities such as finding patterns, making conjectures, justification with logical reasoning, creativity, problem solving, computational thinking, and clear communication (both oral and written).
- Conceptual and procedural knowledge of numbers, operations, geometry, algebra, probability, and statistics.
- Values such as rigor and integrity in communication and formulation of arguments; and dispositions such as curiosity, wonder, and perseverance.

Bhatia (2023) highlighted that learners are more engaged with innovative ideas. He noted a significant gap between mathematical teaching and its real-life applications, emphasizing the need to focus on everyday objects and lives reality. Innovative teaching methods can alleviate math anxiety and clarify concepts, fostering interest in topics like real numbers, variables, and geometric shapes. Jain et al. (2023) suggested that Mathematics can be presented in various forms as an abstract science, as applications, and as social, cultural and historical dimensions. Similarly, diverse directions are necessary for effective teaching and learning. Mathematics will certainly flourish in this new period, as the NEP 2020 has a clear vision for research, creativity, and innovation. Kundu (2023) emphasizes the need for innovation in mathematics education, highlighting that, teachers often prioritize procedural knowledge over conceptual clarity. He notes a decline in student interest by the secondary level and discusses the NEP (2020) shift towards experience-based learning, propose various methods to enhance teaching and learning for both students and teachers. Patel (2011) discusses innovative practices in teaching methods, strategies, and pedagogic resources and outlines the innovative process as consisting of three steps: the conception of an idea, its proposal and adoption.

While many ideas for changing mathematics instruction have been conceived, the innovations discussed are new in practice rather than in concept. Zhanar (2024) explored innovative methodologies for teaching fundamental mathematics concepts, emphasizing a comparative analysis across various educational settings. The research examines how different pedagogical approaches affect students' understanding and application of basic mathematical principles and identify key factors that enhance effective mathematics education in both traditional and technology-enhanced classrooms. Vijayabarathi et al. (2013) emphasizes that education is based on societal needs and aims to develop habits, attitudes, and skills for a fulfilling life, rather than merely storing information. They advocate for learner-centred teaching methods that foster engagement and active participation and shift from traditional lecturing to more interactive approaches. To implement these methods effectively, teachers should possess strong subject knowledge, communication skills, and respect for students' opinions, while employing various interaction analysis techniques for enhanced teaching. National Council of Teachers of Mathematics (2000), in its foundational document outlines key principles and standards for teaching mathematics in schools. It emphasizes the importance of creating a learning environment that encourages inquiry, problem-solving, and real-world applications. The standards, according to NCTM, promote learner-centred approaches that cater to diverse student needs, fostering a deeper understanding of mathematical concepts. Ganter, et al. (2009) discuss innovative teaching strategies specifically designed for middle school mathematics education. It highlights the effectiveness of project- based learning and technology integration in enhancing student motivation and conceptual understanding. The authors advocate for collaborative teaching practices that promote critical thinking and problem-solving skills. Kaur (2018) examines teachers' perceptions of innovative teaching methods in mathematics and highlights the positive impact of hands-on activities and collaborative learning on student engagement and understanding. The research underscores the need for professional development to equip teachers with effective strategies for implementing these methods in the classroom.

In the Middle Stage, the focus of mathematics curriculum shifts towards abstract concepts learned in the Preparatory Stage to make them more broadly applicable. Algebra is introduced at this stage, enabling students to create rules that help them understand, extend, and generalize patterns. More abstract geometric concepts are also introduced, and connections with algebra are explored to solve problems and puzzles (NCFSE, 2023).

Mathematics plays a crucial role in achieving the overall aims of school education. Integrating riddles across the curriculum can simplify the concepts of different subjects, enabling students to engage in "learning by doing." By creating and solving riddles, students develop key mathematical skills such as problem-solving, visualization, optimization, representation, and communication, which facilitate the development of mathematical thinking.

Although resources such as textbooks are available to teachers, many students still perceive mathematics as difficult, challenging, and even intimidating due to gaps in the teaching-learning process and psychological barriers. Therefore, teachers are required to develop effective instructional strategies to enhance the teaching and learning process in mathematics classrooms. Innovative methods, such as incorporating riddles, can play a crucial role in making mathematics more engaging and accessible for both students and teachers. Hence, we must rethink our approach to teaching mathematics so that students view it as an integral part of their lives and enjoy it, with a greater emphasis on reasoning and creative problem-solving.

In Assam, various indigenous riddles have been passed down through generations. By presenting these riddles in an innovative written form, they can be applied to different mathematical concepts, enhancing students' critical thinking. This approach would offer valuable practice for middle-stage students. The author has given five riddles, as exemplar, related to the context of Assam to incorporate into the mathematics teaching-learning process for the middle stage. Through these riddles, demonstration of how learning mathematics can become easier, more meaningful and enjoyable for students has been done.

Objectives

The objectives of this study are as follows:

1. To enhance students' understanding of mathematical concepts by introducing riddles.
2. To make mathematics more engaging and effective through the use of riddles.
3. To incorporate riddles into the mathematics curriculum for middle-stage students.

Methodology

An attempt to incorporate culturally rooted riddles into the teaching –learning process in Mathematics is made at the Middle Stage. The following steps can be undertaken to implement riddles in the context of the teaching-learning process for middle-stage mathematics: (i) create a riddle according to the lesson, (ii) give your students a few minutes to understand each and every word of the given riddle, (iii) let them grasp what the given riddle means, (iv) discover the mathematical concepts behind it, (v) help them if they encounter any difficulties, (vi) guide them to see mathematics from a different perspective, (vii) let them become accustomed to this approach, (viii) encourage them to create riddles in their own way, (ix) help them to be creative and explore with them, (x) let them discover how rich and meaningful our indigenous practices are, (xi) observe how they relate these riddles in their daily life, (xii) observe how this transforms their experience from learning mathematics just for the sake of exams to learning by loving it, (xiii) encourage them to reflect on it and express themselves through it, (xiv) observe them in understanding mathematical concepts better than before.

The riddles should be written clearly on a large chart or on the blackboard with neat and clean handwriting. Let the students read each word of the riddle carefully, and ask them to point out any words they don't understand. Encourage them to read the riddle multiple times, as repeated readings will help them grasp the concept behind it. Use different terminology in the riddles, as this will encourage the students to actively engage with the material in the classroom. Then, ask the students to explore the mathematical concept behind the riddle carefully and attempt to solve it.

Riddle 1: The following is an example of an Assamese riddle through which the concept of "Prime Numbers" are to be transacted.

Original Riddle (in Assamese)	Roman Script	Meaning (in English)
সংখ্যাৰ মাজত এটা বিশেষ সত্তা, বন্ধু মাত্ৰ দুজন, সেয়ে সুৰক্ষা, এজন এক, আনজন তেওঁ নিজেই, বুজিছানে তুমি, কি সেই সংখ্যা ?	Xongkhyar majot eta bixex xotta, Bondhu matro dujon, xeiye xurokhya. Ejon ek, aanjon teu nijei, Bujisane tumi, ki xei xongkhya?	In the world of numbers, there is a special one, With only two friends, it feels secure. One is 'one', and the other is itself, Do you know what this number is?

Solution of the Riddle

The solution to the riddle is "Prime Numbers" (পৰিমেয় সংখ্যা).

A prime number is a special number that has exactly two distinct positive divisors: one and itself. But "1" is not a prime number.

Example of Prime Number

2 is a prime number because it can be divided by only two numbers i.e., 1 and 2 itself, without leaving a remainder.

- $2 \div 1 = 2$
- $2 \div 2 = 1$

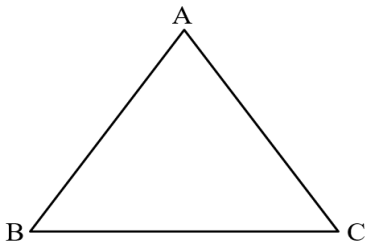
In the same way, 3, 5, 7, 11, 13, 17, 19, etc. are prime numbers.

Riddle 2: The following is an example of another Assamese riddle through which the concept of "The Triangle and its Properties" is to be transacted.

Original Riddle (in Assamese)	Roman Script	Meaning (in English)
মই এক জ্যামিতিক আকাৰ, ইতিহাসত অতি পুৰণি, তিনিটা বাহু, তিনিটা কোণ আৰু তিনিটা শীৰ্ষবিন্দুৰে মই ধনী, মোৰ অন্তস্থ কোণৰ যোগফল সদায় এশ আশী ডিগ্ৰী হয়। পুৰণি যোগৰ পৰা মোৰ সন্মান অক্ষয়। মই কোণ, মোক চিনিবা নিশ্চয়।	Moi ek jyamitik aakar, itihaxot oti puroni, Tinita bahu, tinita kon aru tinita xirxobindure moi dhoni. Mur ontostha konor jogaphol xodai axo axi degree hoi, Puroni jugor pora mur xonman akshaya. Moi kun, muk chiniba nischoy.	I am a geometric shape, ancient in history, With three sides, three angles, and three vertices, I carry much glory. The sum of my interior angles is always one hundred and eighty degrees, My honour remains eternal through the ages with ease. Who am I? Surely, you'll recognize me.

Solution of the Riddle

The answer to the riddle is a triangle **(**ত্রিভূজ**).**



Explanation:

- A triangle is a geometric shape with three sides, three angles and three vertices.
- The sum of the interior angles of a triangle is always 180 degrees (180°).
- Triangles are an ancient and important shape in geometry, present in history and used in various structures and theories.

In the ΔABC,

- $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ are three sides of the triangle.
- $\angle BAC$, $\angle ABC$ and $\angle BCA$ are three interior angles of the triangle.
- A, B and C are three vertices of the triangle.
- The sum of $\angle BAC$, $\angle ABC$ and $\angle BCA$ of ΔABC is always 180° *i.e.,* $\angle A+\angle B+\angle C=180°$

Riddle 3: The following is an example of an Assamese riddle through which the concept of "Linear Equation in One Variable" and "Fractions" are to be transacted.

Original Riddle (in Assamese)	Roman Script	Meaning (in English)
এজোপা গছত এজনী চৰাই পৰি আছিল। চৰাইজনীৰ ওচৰলৈ এজাক চৰাই উৰি আহিল। চৰাইজনীয়ে চৰাইজাকক সুধিলে " তোমালোকে কিমান আহিছা?" তেতিয়া চৰাইজাকে কলে, "আঁমি আহিছো যিমান, আৰু সিমান আঁহিব, তাৰে আধা, তাৰ আধাৰো আধা, তুমি হ'লে এশ হোৱা।" এতিয়া তোমালোকলৈ প্ৰশ্নটো হ'ল যে, চৰাইজাকত মুঠ কিমানটা চৰাই আছিল।	Ejupa gosot ejoni chorai pori asil. Choraijonir usoroloi ejak chorai uri ahil. Choraijonie choraijakok xudhile, "tumaluk kiman ahisa?" Tetia choraijake kole, "ami ahisu jiman, aru ahibo ximan, tare adha, xei adharu adha, tumi hole axo hua." Etia tumalukoloi prosnoti hol je, choraijakot muth kiman chorai asil?	A bird was perched on a tree. A flock of birds flew towards her. The bird asked the flock, "How many of you are there?" The flock replied, "We are as many as will come, plus half of that, and half of that half, and with you, it makes a hundred." Now, the question for you is: How many birds were there in the entire flock?

Solution of the Riddle

Let the number of birds in the flock be x.

According to the flock's statement:

Total number of birds, $x + x + \frac{x}{2} + \frac{x}{\frac{2}{2}} + 1 = 100$ or, $x + x + \frac{x}{2} + \frac{x}{4} + 1 = 100$

Where, x is the number of birds in the flock

$\frac{x}{2}$ is half of them,

$\frac{x}{4}$ is half of that half,

1 is the bird already sitting on the tree.

Step-by-step calculation:

$$x + x + \frac{x}{2} + \frac{x}{4} + 1 = 100$$

or, $\frac{4x+4x+2x+x+4}{4} = 100$

or, $\frac{11x+4}{4} = 100$

or, $11x + 4 = 100 \times 4$

or, $11x + 4 = 400$

or, $11x = 400 - 4$

or, $11x = 396$

$$\text{or,} \quad x = \frac{396}{11}$$

$$\text{or,} \quad x = 36$$

Final answer:

There are 36 birds on the flock.

Riddle 4: The following is an example of another Assamese riddle through which the concept of "Polygon" is to be transacted.

Original Riddle (in Assamese)	Roman Script	Meaning (in English)
বহুভূজৰ জগতত মোৰ স্থান অতি উচ্চ। প্রতিটো বহিষ্ঠ কোণ ৬০ ডিগ্রীয়ে মাত্র গঠিত।যোগফলটো গঠিত হয় ছজ্ম ডিগ্রীতে নির্ধাৰিত। মই কোণ, কিমান বাহু মোৰ সঠিক নির্ণয়, গণিতৰ পৃষ্ঠাত মোৰ অমূল্য পৰিচয়।	Bohubhujar jagatat mor sthan oti uchchha, Pratitu bohistha kon 60 degreeye matra gothita, Jogaphalto xodai hoy 360 degreete nirdharita. Moi kun, kiman bahu mor xothik nirnoy, Gonitor pristhat mor amulya porichoy.	In the realm of polygons, my position is supreme, Each of my exterior angles is precisely 60 degrees, The sum always remains fixed at 360 degrees, without fail. Who am I, and how many sides do I possess in detail, In the pages of math, my value shines bright!

Solution of the Riddle

The answer to the riddle is a hexagon (ষষ্ঠভূজ).

Explanation:

- A regular polygon where each exterior angle is 60 degrees is a hexagon.
- The sum of the exterior angles of any polygon is always 360 degrees.
- To find how many sides it has, we use the formula for the exterior angle of a regular polygon:

$$\text{Exterior Angle} = \frac{360°}{\text{Number of sides}}$$

Since the exterior angle is 60 degrees:

$$60^{0} = \frac{360°}{\text{Number of sides}}$$

- Therefore, the polygon is a hexagon with 6 sides, namely $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DE}$, $\overline{EF}$, and $\overline{FA}$.

Riddle 5: The following is an example of another Assamese riddle through which the concept of "Linear Equation in One Variable" and "Percentage" are to be transacted.

Original Riddle (in Assamese)	Roman Script	Meaning (in English)
এদিন ৰামক সুধিলো হাঁহি হাঁহি, "তোমাৰ হাতত কিমান টকা আছে আজি ?" ৰামে কলে "কালি যিমান আছিল, তাৰ তিনগুন আজি মোৰ। যদি এই দুয়োটা যোগ কৰা, পাবা ১১৬০ টকাৰ ২০ শতাংশৰ সমান। " বুজি পোৱা যদি কিমান আছিল কালি মোৰ ধন। এই সাঁথৰটো সমাধান কৰিবলৈ লাগিব গণিতৰ পঠন।	Edin Ramok xudhilu hahi hahi, "tomar hatot ase kiman toka aji?" Rame kole, "kali jiman asil, tar tinigun aji mor, Jodi eii duyuta jog kora, paba 1160 tokar 20 xotangxor xoman." Buji pua jodi kiman asil kali mor dhon, Ei xathortur xomadhan koriboloi lagibo gonitor pothon.	One day, I asked Ram with a smile, "How much money do you have today?" Ram replied, "Whatever I had yesterday, I have three times that today. If you add both amounts together, you'll get 20% of 1160." If you can figure out how much money I had yesterday, You'll need the help of math to solve this riddle.

Solution of the Riddle

Let x represent the amount of money Ram had yesterday.
According to Ram's statement, the amount he has today is three times what he had yesterday, so today's amount is $3x$ and the sum of yesterday's and today's amounts is equal to 20% of 1160.
So, $x + 3x =$ 20% of 1160

Step-by-step calculation:

From the riddle, we know that:

$$x + 3x = 20\% \text{ of } 1160$$

First, calculate 20% of 1160 :

$$20\% \text{ of } 1160 = \frac{20}{100} \times 1160 = 232$$

So, the sum of yesterday's and today's amount is:

$$x + 3x = 232$$
$$\text{or, } 4x = 232$$
$$\text{or, } x = \frac{232}{4}$$
$$\text{or, } x = 58$$

Final answer:
Yesterday Ram had 58 rupees.
Ram now has 174 rupees, three times his amount of 58 rupees from yesterday.

Similarly, other riddles can also be used to teach various mathematical concepts at the middle stage, such as Classification of Numbers, Ratio and Proportion, Perimeter and Area, Factorisation and more.

Conclusion

Innovation involves approaching problems from a fresh perspective and developing creative solutions. This process enhances learning by encouraging students to engage in higher-order thinking to solve complex challenges. In mathematics classes, it is crucial to keep students interested and engaged. By introducing simple innovations, we can motivate students and improve their learning experience.

One such innovative approach is incorporating riddles into the classroom. This method complements traditional mathematics teaching while promoting student-centered learning. By capturing and sustaining students' attention through engaging topics, riddles make understanding mathematical concepts more enjoyable and meaningful.

After introducing riddles into the classroom, students' mental processes and competencies will be enhanced, enabling them to think, learn, reason, and solve problems more effectively. This approach cultivates a problem-solving attitude and ignites critical thinking abilities, allowing students to connect new riddles with the prior knowledge they have gained. It not only increases students' interest in attending class, but also transforms their perception of mathematics from a challenging subject to an engaging, interactive experience. As a result, they listen more attentively and focus fully in class, laying a stronger foundation for future learning.

This study shows that various riddles are popular in the cultural practices of Assam, and these riddles can be effectively used as tools in the teaching-learning process of mathematics. The key is to find ways to incorporate mathematical concepts into these riddles. While it requires some effort from teachers to connect this cultural practice to classroom instruction, including these riddles can occasionally distract students from the core content. Additionally, it may be time-consuming to complete the syllabus. However, by knowing when and how to introduce these riddles, such limitations can be addressed. Although it takes some effort to find appropriate riddles, once identified, they can become a lasting part of the teaching process.

Recommendations

Here are some recommendations for enhancing middle stage mathematics education through the use of riddles, making the teaching-learning process more meaningful and enjoyable.

1) Integrate riddles as an innovative pedagogical tool in the teaching learning of mathematics.
2) Culturally relevant riddles to be integrated in teacher education programs – both pre-service and continuous professional development for effective use in the classroom.
3) A repository of culturally relevant riddles may be prepared by States for making them available to teachers and these will be able to shift learning from memorization to a deeper understanding of concepts, making mathematical learning joyful rather than burdensome.

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Visual Storytelling as a Catalyst for Inclusive English Language Learning: A Pedagogical Exploration

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Abstract

Visual storytelling has gained prominence as an innovative approach in inclusive education, addressing diverse learning needs and fostering creativity. With its potential to bridge gaps in comprehension, enhance engagement, and support students with varying abilities, visual storytelling proves particularly effective in the pedagogy of English. This approach integrates multimodal texts, images, and narratives in learning, which enhances comprehension and engagement among diverse learners, including those with learning disabilities and language barriers. This paper explores the role of visual storytelling in creating an inclusive learning environment, focusing on its impact on English language instruction. The discussion highlights strategies, tools, and benefits, while presenting empirical evidence and theoretical insights to underline its value in promoting inclusive education.

Keywords: *Visual Storytelling, Inclusive Education, English Pedagogy, Multimodal Learning, Differentiated Instruction, Educational Innovation.*

Introduction

Inclusive education aims to provide equitable learning opportunities for students with diverse backgrounds, abilities, and needs (UNESCO, 2020). Traditional teaching methods often fail to address these varied learning requirements, particularly in language instruction. English pedagogy, characterized by its linguistic and cultural diversity, requires innovative strategies to enhance accessibility and engagement. Visual storytelling has emerged as a powerful tool in this context, leveraging multimodal learning to cater to diverse learners. Education today emphasizes inclusivity, aiming to accommodate learners with diverse needs and backgrounds. One approach gaining traction is visual storytelling, which integrates visual elements like illustrations, infographics, and videos with narrative techniques to create engaging and accessible content. Its potential in English pedagogy is significant, as it bridges linguistic and cultural barriers while addressing varying cognitive abilities.

Inclusive education focuses on fostering equitable opportunities for all students, irrespective of their abilities, socio-economic status, or linguistic backgrounds. For English educators, this demands innovative methods to make language accessible and relatable. Visual storytelling, grounded in theories of multimodal learning and universal design for learning (UDL), has emerged as a robust solution.

This paper examines the growing relevance of visual storytelling in inclusive education, with a specific focus on English pedagogy. By integrating theoretical perspectives and practical applications, the study underscores the potential of visual storytelling to transform language learning experiences.

Objective

To analyze the significance of visual storytelling in the pedagogy of English and its theoretical basis for addressing diverse learning needs of students and to foster creativity.

Methodology

The research is based on descriptive and analytical method. Relevant information has been collected from sources such as books, journals, case studies and research papers for a pedagogical and a theoretical analysis.

Understanding Visual Storytelling in Education

Visual storytelling combines narrative techniques with visual elements such as images, videos, and illustrations to convey information effectively (Kress & Van Leeuwen, 2021). Unlike traditional narratives, visual storytelling leverages multimodality, which aligns with contemporary learners' preferences for interactive and visually rich content. Visual storytelling involves using images, videos, and graphic narratives to convey information and foster understanding. It leverages visual literacy, the ability to interpret and make meaning from visual elements, as a critical component of learning (Serafini, 2014). In the context of education, visual storytelling aligns with constructivist principles, encouraging learners to actively engage with content and construct knowledge through exploration and interpretation. Some features of visual storytelling include integration of relatable stories to enhance engagement; use of diagrams, images, and videos for simplifying complex concepts. And enhance active participation of students with the help of tools like storyboards and digital platforms. These features make visual storytelling particularly relevant for inclusive education by addressing different learning styles—visual, auditory, and kinesthetic—and providing multiple entry points for understanding (Mayer, 2020).

Theoretical Foundations of Visual Storytelling

In order to delve deep into the theoretical perspectives of visual storytelling the following may be considered.

Multimodal Learning

Multimodal learning combines textual, auditory, and visual inputs to enhance comprehension and retention. According to Mayer's Cognitive Theory of Multimedia Learning (2009), learners process information more effectively when

it is presented through dual channels—verbal and visual—than through a single mode. Visual storytelling aligns with this principle by presenting narratives enriched with visuals, thereby reducing cognitive load and improving engagement. Mayer's Cognitive Theory of Multimedia Learning (CTML) posits that learners have separate channels for processing verbal and visual information. Multimodal learning offers a powerful approach to enhance comprehension and retention by leveraging the cognitive processing capabilities of different channels. Mayer's Cognitive Theory of Multimedia Learning provides a well-established framework that underscores the importance of integrating visual, auditory, and textual inputs in educational design. Research supporting Mayer's theory shows that multimodal environments, when designed with consideration for the principles of cognitive load and multimedia learning, can significantly improve learning outcomes. As technology continues to shape educational practices, multimodal learning will remain a critical tool in creating more effective and engaging learning experiences. Multimodal learning integrates various sensory inputs to promote understanding. Studies have shown that learning materials that utilize both auditory and visual modalities tend to yield better outcomes than materials that rely solely on one type of input (Moreno & Mayer, 2007). For instance, a study by Plass, Homer, and Kinzer (2014) demonstrated that students who engaged with multimedia instructional content that combined text, audio, and video performed significantly better on tests measuring comprehension and retention compared to students who received instruction through text alone.

Mayer's theory suggests that when designed appropriately, multimedia can help learners build connections between new information and their prior knowledge, enhancing cognitive processing. Furthermore, multimodal learning supports active engagement, as learners are more likely to interact with content that incorporates multiple senses, leading to greater motivation and deeper learning (Mayer, 2009).

Universal Design for Learning (UDL)

The UDL framework emphasizes creating flexible learning environments to accommodate diverse learners. It advocates multiple means of representation, engagement, and expression (CAST, 2018). Visual storytelling fulfills these criteria, offering varied entry points for learners with different needs, including those with disabilities or limited English proficiency.

Universal Design for Learning (UDL) is a framework that aims to create inclusive learning environments by providing multiple means of engagement, representation, and expression. The UDL framework is particularly relevant to visual storytelling as it advocates for the use of various media and technologies to cater to the diverse needs of all learners. In the context of English pedagogy, visual storytelling provides a multisensory approach that can enhance comprehension, retention, and engagement for students with varying learning styles and needs.

The three main principles of UDL—multiple means of engagement, multiple means of representation, and multiple means of expression—are closely aligned with

the features of visual storytelling. First, visual storytelling captures students' attention and motivates them by combining visual elements with storytelling, which can be more engaging than traditional text-based instruction. Second, it offers varied forms of representation, allowing students to access content through images, videos, and graphics, in addition to written text. Lastly, it provides students with opportunities to express their understanding creatively, either through digital media, spoken word, or other visual formats.

UDL's focus on flexibility and adaptability in learning environments makes visual storytelling an ideal tool for creating inclusive English lessons that cater to a wide range of learners, including those with disabilities, language barriers, or different cognitive processing needs.

Social Constructivism

The use of visual narratives aligns with Vygotsky's Social Constructivism (1978), which emphasizes learning through interaction and context. Visual storytelling provides a shared medium for discussion, allowing learners to construct meaning collaboratively while bridging linguistic and cultural gaps. Lev Vygotsky's social constructivist theory emphasizes the role of social interactions and cultural tools in cognitive development. According to Vygotsky (1978), learning is a social process, where individuals construct knowledge through interactions with others and their environment. In the context of visual storytelling, the visual elements serve as cultural tools that mediate learning. They provide a shared space for students to interact with content in a manner that transcends linguistic barriers. Visual storytelling supports Vygotsky's concept of the Zone of Proximal Development (ZPD), which refers to the space between what a learner can do independently and what they can do with assistance. Visual narratives can scaffold learning by providing a context in which students can engage with complex English language concepts and narratives through visual aids, thereby making them more accessible.

In the inclusive classroom, Vygotsky's principles suggest that visual storytelling can facilitate peer interactions, where learners collaboratively interpret and create stories using both visual and verbal elements. This collaborative process is key to fostering an inclusive environment, as it allows students with diverse learning needs to contribute their perspectives and understandings in meaningful ways.

Gardner's Multiple Intelligences

Howard Gardner's theory of multiple intelligences (1983) posits that intelligence is not a single, uniform ability, but rather a range of distinct modalities. Gardner identified eight types of intelligences: linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal, intrapersonal, and naturalistic. In the context of visual storytelling, the most relevant intelligences are linguistic, spatial, and interpersonal.

Visual storytelling inherently engages spatial intelligence, as students interpret and produce visual elements such as images, videos, and diagrams. It also taps into linguistic intelligence as students connect words to images and narratives, enhancing their language skills through contextualized storytelling. Furthermore, the collaborative nature of visual storytelling nurtures interpersonal intelligence by encouraging students to work together, share their interpretations, and co-create narratives. By addressing the diversity of intelligences, visual storytelling allows for a more inclusive approach to teaching English. Students who may struggle with traditional linguistic tasks, for instance, can engage with language through visual representation, offering them alternative pathways to understanding and expressing ideas.

Visual Storytelling and Inclusive Education

Inclusive education emphasizes strategies that accommodate the needs of all learners, particularly those with disabilities, language barriers, or socio-economic challenges (Ainscow, 2020). Visual storytelling supports this goal by fostering engagement, accessibility, and cultural inclusivity. Visual aids simplify abstract concepts, making them accessible to students with learning disabilities. Non-verbal cues in visual narratives support English language learners (ELLs) in understanding new vocabulary and grammar. Stories from varied cultural contexts promote inclusivity and understanding. Interactive elements sustain attention, particularly for neurodivergent learners (Goldman et al., 2021). For example, digital tools like Canva, Pixton, and Storybird enable educators to create customizable visual stories tailored to individual learning needs.

Visual storytelling is inherently inclusive, as it uses visuals to convey meaning that transcends language barriers. This is particularly relevant in classrooms where learners may struggle with English proficiency, dyslexia, or other learning disabilities. When it comes to addressing linguistic diversity in multilingual classrooms, visuals act as a universal language. As Dewan (2021) notes, “Images have the power to communicate complex ideas in a simple, accessible manner” (p. 45). Visual storytelling can scaffold English language learning by linking images to vocabulary and grammar concepts. Visual storytelling as an approach supports learners with disabilities, such as autism spectrum disorder (ASD) or dyslexia, often benefit from visual aids. Visual storytelling provides structured and predictable narratives that aid comprehension. Studies indicate that visual narratives enhance the reading skills of learners with dyslexia by reducing their reliance on text alone (Smith et al., 2020). Visual storytelling enhances engagement and fosters intrinsic motivation. According to Kress and van Leeuwen (2006), multimodal texts engage learners by combining textual, visual, and spatial elements, making learning more interactive and enjoyable. This is particularly beneficial in English classrooms, where traditional methods may fail to capture students' interest. In English pedagogy, visual storytelling can simplify complex texts and abstract literary themes. For example, graphic novels such as

Persepolis by Marjane Satrapi have been used to teach themes like identity and culture through visual narratives, making them accessible to learners with varying linguistic proficiencies. Visual storytelling accommodates learners with specific challenges, such as dyslexia or limited English proficiency. By presenting information visually, it reduces cognitive load and provides alternative pathways for understanding (Rello & Baeza-Yates, 2017). Visual narratives often reflect diverse perspectives, promoting cultural inclusivity in the classroom. Texts like The Arrival by Shaun Tan allow students to explore themes of migration and belonging through a visual medium, creating a shared space for discussion and empathy.

Visual Storytelling and Pedagogy of English

The pedagogy of English involves teaching skills such as reading, writing, speaking, and listening. Visual storytelling aligns seamlessly with these objectives, offering innovative strategies to enhance teaching outcomes. Visual narratives encourage students to analyze and interpret stories, improving their reading comprehension. By incorporating audio-visual elements, visual storytelling improves listening skills. Role-playing based on visual narratives also enhances oral communication abilities. English classrooms often comprise students from diverse cultural backgrounds. Visual storytelling introduces multicultural narratives, fostering inclusivity and broadening learners' perspectives. A study conducted in an urban primary school demonstrated that students exposed to visual narratives showed a 30% improvement in vocabulary retention compared to those taught using traditional methods (Smith et al., 2022).

Visual storytelling is inherently inclusive, as it uses visuals to convey meaning that transcends language barriers. This is particularly relevant in classrooms where learners may struggle with English proficiency, dyslexia, or other learning disabilities. Reiterating Dewan's (2021) view on how images can simplify ideas which otherwise may seem abstract and complex is crucial in this regard. Visual storytelling can scaffold English language learning by linking images to vocabulary and grammar concepts. Visual storytelling provides structured and predictable narratives that aid comprehension. Studies indicate that visual narratives enhance the reading skills of learners with dyslexia by reducing their reliance on text alone (Smith et al., 2020).
Visual storytelling fosters intrinsic motivation. According to Kress and van Leeuwen (2006), multimodal texts engage learners by combining textual, visual, and spatial elements, making learning more interactive and enjoyable. This is particularly beneficial in English classrooms, where traditional methods may fail to capture students' interest.

Complex grammar rules can be simplified using visual narratives. Comics and infographics, for example, can illustrate sentence structures, tenses, and punctuation in an engaging format. When it comes to development of writing skills visual it is seen that storytelling inspires creativity in writing. By analyzing visual narratives, students learn to construct coherent plots and descriptive language. As Wilson (2019) observes, "Visual prompts ignite students' imagination, leading to richer and more

authentic writing" (p. 76). Cultural awareness stories are cultural artifacts. Visual storytelling introduces students to diverse cultures through imagery, fostering global awareness and empathy. This is especially important in teaching English as a global language.

Using graphic novels in English classrooms helps bridge the gap between textual and visual literacy. Graphic novels, such as Maus by Art Spiegelman, allow students to explore challenging topics like history and identity through a combination of text and visuals. Similarly, visual adaptations of literary works, such as Shakespeare's Romeo and Juliet, make classic texts comprehensible for students with varying literacy levels. Teaching Shakespeare's Macbeth through graphic adaptations can make the text accessible to struggling readers

A study by Smith and Johnson (2020) explored the use of visual storytelling in a middle school English classroom with diverse learners. The findings indicated that students with learning disabilities demonstrated improved comprehension and participation when graphic novels were incorporated into the curriculum. Tools like Storybird and Canva enable students to create their own visual narratives, fostering creativity and critical thinking (Robin, 2016). Storyboards encourage students to sequence events visually, aiding comprehension and retention.

This technique is particularly beneficial for learners with attention deficits or language barriers. Digital tools like storyboards help students create their narratives, fostering writing skills (Tomlinson, 2020). In a study conducted for a mixed-ability English class, the use of digital storytelling tools increased participation among students with learning disabilities, fostering a more inclusive environment (Smith & Brown, 2021). Incorporating digital tools such as storytelling apps, animation software, and multimedia platforms can significantly enhance the effectiveness of visual storytelling in the English classroom. For instance, platforms like Adobe Spark or Storybird allow students to create digital stories using a combination of text, images, and sound. These tools provide an interactive environment where students can experiment with different forms of storytelling, while simultaneously improving their language skills.

Inclusive classrooms often comprise students with diverse abilities, including those with dyslexia, autism spectrum disorder (ASD), or limited English proficiency. Picture books such as The Very Hungry Caterpillar by Eric Carle introduce young learners to storytelling through vivid illustrations, supporting vocabulary development and language acquisition. Research by Rello and Baeza-Yates (2017) found that dyslexic students showed significant improvements in reading fluency and comprehension when exposed to visually enriched texts. These findings highlight the potential of visual storytelling to address specific learning challenges. Visual storytelling addresses these needs by offering alternative pathways for comprehension. For example, dyslexic learners benefit from the use of visually rich materials that reduce reliance on textual information (Rello & Baeza-Yates, 2017).

Apart from these encouraging collaborative storytelling is another effective strategy. In this approach, students work together to create stories using a mix of visual and textual elements. This fosters communication skills, teamwork, and creativity, while also supporting language acquisition in an interactive manner. Group projects can focus on creating a visual narrative that tells a story related to the lesson theme, whether it's a historical event, a literary analysis, or a personal experience.

One of the primary benefits of visual storytelling in English pedagogy is its potential to enhance comprehension. Visual elements provide contextual cues that help students decode complex language structures and vocabulary. For example, an image accompanying a word or phrase can provide students with a clearer understanding of its meaning. This visual representation supports students in making connections between abstract language concepts and concrete experiences. Moreover, visual storytelling increases student engagement by tapping into their creativity and emotions. The use of compelling visuals alongside narratives can evoke empathy, stimulate curiosity, and foster a deeper connection to the content. In an inclusive classroom, this level of engagement is crucial for maintaining the attention and interest of all students, including those who may struggle with traditional text-heavy methods.

Visual storytelling is particularly effective for students with diverse learning needs, including those with learning disabilities, language delays, and other challenges. Students with dyslexia, for example, may struggle with reading, but can still engage with visual stories to grasp key concepts. Similarly, English language learners (ELLs) can benefit from visual storytelling by using images and videos to contextualize new vocabulary and grammatical structures. Incorporating visual storytelling into English pedagogy also supports students with auditory processing disorders, as it allows them to access information through visual means rather than relying solely on spoken language. This approach fosters a more inclusive environment, where all learners have an equal opportunity to succeed.

Visual storytelling also plays a significant role in promoting cultural awareness and sensitivity. By using visuals, educators can present diverse perspectives and narratives that reflect various cultures, experiences, and identities. This is particularly important in the teaching of English, as literature and language are often deeply connected to cultural contexts. In an inclusive classroom, visual storytelling allows students to explore stories from different cultural backgrounds in ways that are accessible and relatable. This helps students develop empathy and a broader understanding of the world, essential skills for creating an inclusive and globally aware learning community. For visual storytelling to be effectively integrated into the pedagogy of English, teachers must be equipped with the necessary skills and knowledge. This involves training teachers in both the use of digital tools and in understanding the theoretical frameworks that support inclusive education. Additionally, curriculum design should be flexible, allowing for the inclusion of visual storytelling as a regular teaching method.

Challenges and Limitations: A Way Forward

While visual storytelling holds immense potential, its implementation in English pedagogy faces certain challenges. While visual storytelling offers numerous benefits, it also presents challenges. Teachers may face a lack of resources or training in using visual media effectively. Moreover, there is a risk of oversimplification, where complex literary themes may be diluted in the process of visualization. Addressing these challenges requires professional development and access to quality visual materials.

Dearth or lack of access to digital tools in under-resourced schools is another issue. Educators require training in creating and integrating visual stories effectively. Excessive use of visuals may overwhelm students with cognitive impairments. Addressing these challenges requires collaborative efforts from policymakers, educators, and technology developers. Not all schools have access to the technology or materials required for creating and displaying visual narratives. Effective use of visual storytelling requires teachers to be trained in design and multimedia tools. For that effective teacher training programmes are crucial. Another challenge to be reckoned is that developing visual materials can be time-intensive, limiting its feasibility in resource-constrained environments. In some cases cultural sensitivity could posit as a hindrance. Visuals must be carefully chosen to avoid cultural biases or stereotypes, which could alienate certain groups of learners.

Thus, in order to meet these challenges the curriculum of educational institutions can designed accordingly. Incorporating visual storytelling activities into the English curriculum, aligning them with learning objectives and assessment criteria can be seen as a plausible strategy. Workshops can be organized to train teachers in creating and using visual storytelling tools effectively. Collaborative learning environments may be promoted. Students can be encouraged to do group projects by creating visual stories, to bolster peer learning and teamwork. And given the changing times students can be encouraged to deploy digital tools for creating and sharing visual narratives.

Conclusion

Visual storytelling emerges as a transformative approach in inclusive education, particularly in the pedagogy of English. By addressing diverse learning needs, fostering engagement, and promoting cultural inclusivity, it paves the way for equitable and effective education. However, realizing its full potential requires addressing implementation challenges and investing in teacher training and technological infrastructure. Visual storytelling is an emerging trend that holds immense potential to transform inclusive education especially in teaching of English. By combining visual and textual elements, it enhances comprehension, engagement, and cultural inclusivity, making learning accessible to diverse learners. While challenges exist, strategic investments in resources, training, and collaboration can overcome these barriers. Visual storytelling not only aligns with the principles of UDL

and multimodal learning but also empowers educators to create equitable and dynamic learning environments for all students. Visual storytelling represents an innovative and effective approach to inclusive education, particularly within the context of teaching English. By drawing on theoretical frameworks such as Vygotsky's social constructivism, Gardner's theory of multiple intelligences, and Universal Design for Learning, it becomes clear that visual storytelling can offer significant benefits for learners of all abilities. It fosters engagement, comprehension, and creativity, while also supporting diverse learning needs. As visual storytelling continues to emerge as a prominent trend in education, it is essential for educators to embrace its potential and integrate it into their teaching practices. By doing so, they can create a more inclusive, dynamic, and effective learning environment for students, ultimately enhancing the pedagogical experience in the English language classroom.

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A descriptive study on the effect of menstrual cycle on the academic achievement of adolescent girls of Kendriya Vidyalaya, Central University, Tezpur

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Abstract

The menstrual cycle is a natural physiological process that affects a significant portion of the female population, particularly adolescents. This paper explores the relationship between the menstrual cycle and academic achievement among adolescent girls. Building on existing literature, we have examined how various menstrual cycle phases—menstruation, the follicular phase, ovulation, and the luteal phase—might impact cognitive functions, mood, and ultimately academic performance. Factors such as hormonal fluctuations, physical discomfort, and psychological effects will be analyzed to understand their implications for educational outcomes.

Keywords: *Menstrual cycle, academic performance, adolescence*

Introduction

The menstrual cycle has long been a subject of interest in various fields, including sports science and physiology. Recent researches has shed light on the potential impact of the menstrual cycle on the academic performance of female students.

Several studies have examined the relationship between the menstrual cycle and exercise-induced fatigue, suggesting that fluctuations in hormones such as estrogen and progesterone can affect physical performance. (Pereira et al., 2020). Similarly, research has investigated the influence of the menstrual cycle on work performance, with mixed results. (Gamberale, 1985)

While the impact of the menstrual cycle on physical tasks has been explored, less attention has been paid to its potential effects on cognitive and academic performance. However, a growing body of evidence suggests that the menstrual cycle may indeed play a role in girls' academic achievement.

A review of the literature suggests that the fluctuations in female sex hormones during the menstrual cycle can have both physiological and psychological implications that may influence academic performance. For example, changes in hormone levels have been linked to variations in mood, energy levels, and cognitive function, all of which could impact a student's ability to focus, retain information, and perform well on academic tasks (Pereira et al., 2020)

The idea that female students do less well during the premenstrual and menstrual stages has been bolstered by (Rudd, 1984). Similarly, (Kimura, 1994) examined the data showing that variations in oestrogen levels directly affect cognitive performance during the menstrual cycle. Significant gains in spatial ability have been found by (Silverman and Phillips, 1993) during the menstrual period when oestrogen levels are lowest in the monthly cycle.

The menstrual cycle has a significant impact on students' academic achievement. Menstruating women who experience heavy and painful periods face additional challenges that impact their social and academic lives. Additionally, dysmenorrhea is the most prevalent gynaecological issue affecting female teenagers and is the main reason for temporary absences from school, which has a detrimental effect on their social, intellectual, and athletic lives.

Numerous studies have examined how the menstrual cycle affects girls' academic performance. A study by (Kuhlmann et al.,2019) found that girls experienced a decline in cognitive tasks during the luteal phase compared to the follicular phase. Additionally, a survey conducted by (McNeely et al.,2016) noted that 64% of respondents reported at least minor difficulties with their studies during menstruation. However, the findings vary significantly across individual experiences and cultural contexts, suggesting that personal coping mechanisms, the availability of resources, and societal attitudes toward menstruation also play crucial roles.

Statement of the problem

The law of nature is change. There will always be change. Every living thing experiences growth and development as time goes on. A baby develops into a young person, who then progressively approaches puberty. The teenage person develops into an adult. The adult eventually ages into old age. The teenage years are among the most important. The body goes through massive changes that turn a young person become an adult. The person reaches reproductive maturity and is capable of bearing children.

Puberty is one of the changes that take place during the adolescent stage. Puberty affects both boys and girls equally. For girls, the menstrual cycle begins when they reach puberty. The start of the menstrual cycle causes the body to undergo several hormonal changes. As the menstrual cycle is accompanied by symptoms such as anaemia, weakness, and physical pain, girls tend to develop anxiety towards the monthly menstrual cycle (Nillni, 2011); (Tanton, 2021); (Mann, 2023). Their physical and emotional health are significantly impacted by this. It appears that this shift that occurs during a particular time each month has an impact on girls' academic achievement.

As the menstrual period is known to affect women’s lives, the study aimed to determine the impact of the menstrual periods on the adolescent girls of VIII A of Kendriya Vidyalaya, Central University, Tezpur.

Objectives

The purpose of the study is to investigate the effects of the menstrual cycle of adolescent girls on their attendance and their academic achievement in Kendriya Vidyalaya, Central University, Tezpur. Therefore, the following objectives can be framed as follows:

1. To study the effect of menstrual cycle on the attendance of girls of class VIII A
2. To study the effect of menstrual cycle on the academic performance of girls of class VIII A

Delimitation of the study

The limitations of the study are as follows-

1. The study was conducted among the girls of Kendriya Vidyalaya, Central University, Tezpur.
2. The subjects were in VIIIth standard, section A, and were among the age group of 13-15 years of age
3. The study was focused on the interrelationship between their menstrual cycle and the academic achievement of the subjects.

Sample size

A total of 62 girls were selected through convenience sampling to draw a homogeneous sample willing to participate in the study. The researcher interacted with the students of VIIIth standard and decided to select only one section out of the two sections.

Methodology

The interview approach was employed in this study, which contributed to a clearer understanding of the goal of the investigation. Here, a group of teenage girls were asked questions, and they responded to each one according to their own beliefs and experiences. Therefore, the major goals of the interviewing technique were to get unknown information from the participants and to create a relaxed environment so that the subjects would open up and provide real information. The questions were broken down into different categories, such as behavior during the menstrual cycle, emotional symptoms, management system during the cycle, behavioral symptoms during the cycle, social adjustment during the cycle, attitude toward physical activities during the cycle, and academic adjustments during the cycle.

Questions asked

- Do menses come regularly every month?
- Does menses cause health issues?
- What are the health issues that occur during the menstrual cycle?
- Do you prefer to come to school during menses?

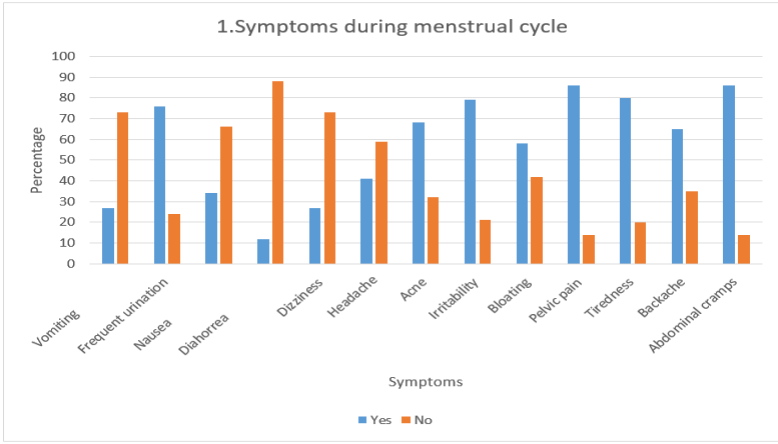
- Do you face difficulty adjusting in the class during menses?
- Do you have adjustment problems with boys during menses?
- Do you feel shy because you are going through your menstrual cycle?
- Are the toilet facilities proper in school?
- Is there a restroom in school?
- Is there a facility for providing/buying sanitary napkins in school during an emergency?
- Do you prefer to miss school during periods?
- Do you purposefully remain absent during periods?
- Do you feel it becomes difficult to compete with other classmates (boys) in studies due to menses?
- Do you take half-day leave due to weakness during periods?
- Do you sometimes feel the menstrual cycle hinders your academic performance?
- Do you have mood swings during the menses?
- Do you prefer to do physical exercises during menses?
- Do you feel lethargic?
- Do you see menses as a problem?
- Does menses make you less productive during the month?

Results obtained

The following results were obtained after the interview process. The questions were grouped under various categories such as behavior during the menstrual cycle, emotional symptoms, management system during the cycle, behavioral symptoms during the cycle, social adjustment during the cycle, attitude toward physical activities during the cycle, and academic adjustments during the cycle.

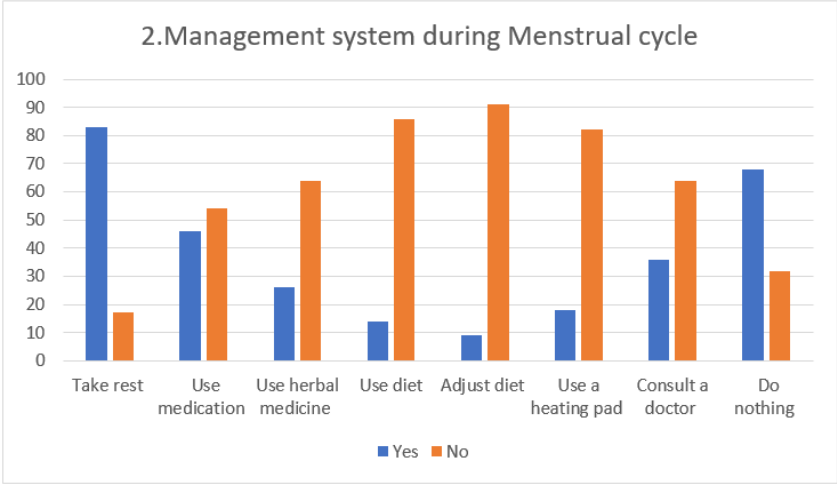
1.Symptoms during menstrual cycle

Almost all the subjects admitted that they undergo various health symptoms such as vomiting, nausea, dizziness, headache, tiredness etc. where pelvic pain (86%), abdominal cramps (86%), irritability (86%), frequent urination (76%) and tiredness (80%) were the dominating symptoms among the subjects.



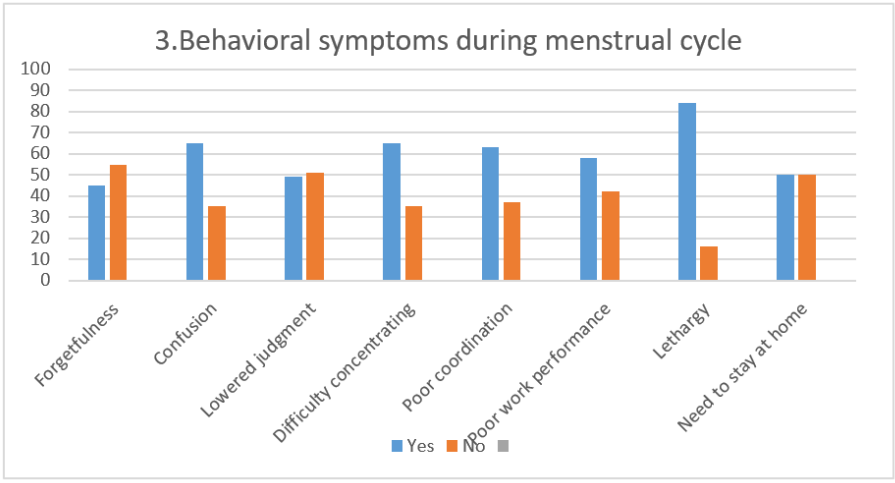
2.Management system during Menstrual cycle

The subjects stated that to manage their health symptoms they took various measures to relieve their symptoms. Some used herbal medicines (26%); some preferred using a heating pad (18%), very few liked to adjust their diet (14%), while the majority said they did nothing (68%) or preferred taking rest (83%) during the specific period of the month.



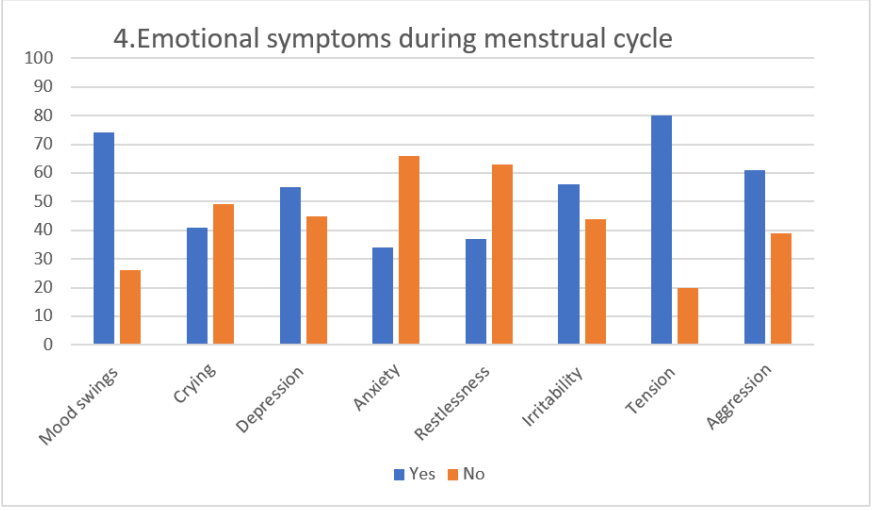
3.Behavioral symptoms during Menstrual cycle

Various behavioural symptoms were seen during the menstrual cycle such as forgetfulness (45%), difficulty concentrating (65%), lowered adjustment (49%), poor co-ordination (63%), poor work performance (58%), feeling lethargic (84%) and need to stay at home (50%) were a few symptoms among the subjects.



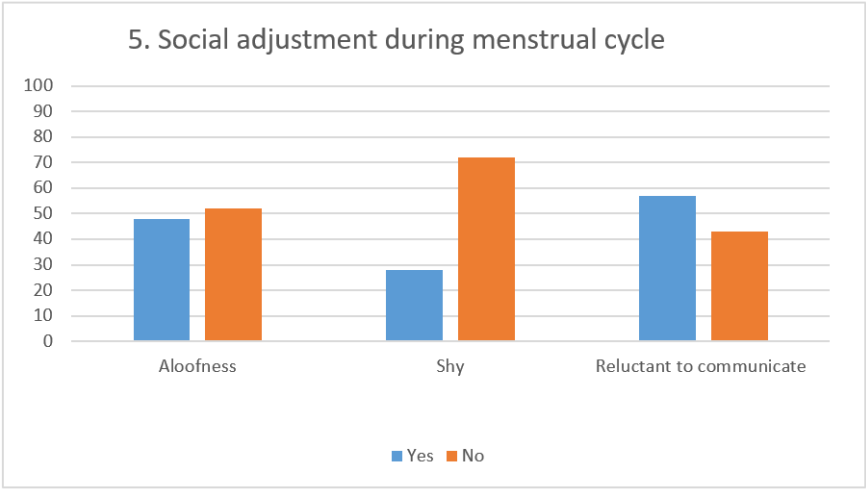
4.Emotional symptoms during menstrual cycle

Hormones greatly affect the behaviour and emotions of an individual. During the menstrual cycle, hormonal changes occur which create several emotional symptoms during the menstrual cycle. The subjects showed symptoms of mood swings (74%), crying (41%), depression (55%), anxiety (34%), restlessness (37%), irritability (56%), aggression (61%) and tension (80%) were some of the dominant symptoms.



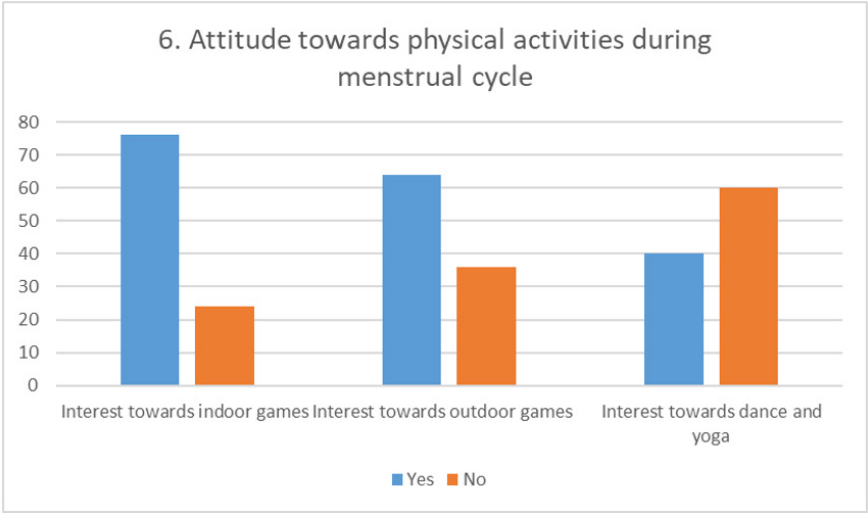
5.Social adjustment during menstrual cycle

The subjects portrayed symptoms of social adjustment such as aloofness (48%), feeling shy (28%), and reluctance to communicate (57%) during the menstrual period.



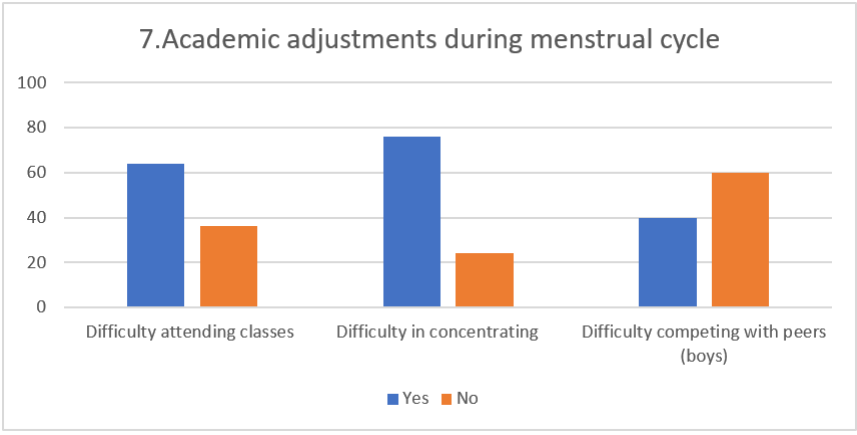
6.Attitude towards physical activities during menstrual cycle

The subjects showed decreased attitudes towards physical activities such as interest in indoor games (76%), outdoor games (64%), dance and yoga (40%), etc. Although they had a keen interest in physical activities, they felt reluctant to participate in those activities during the menstrual cycle.



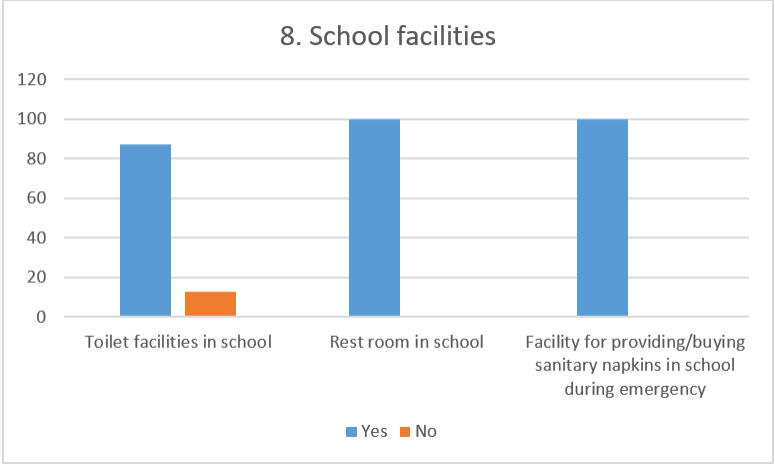
7.Academic adjustments during menstrual cycle

The main objective of the case study is to check the effect of the menstrual cycle on the academic achievement of adolescent girls. It was seen that the menstrual cycle greatly affected their academic achievement. They showed difficulty concentrating (76%), difficulty attending classes (64%), and difficulty competing with peers (boys) (40%).



8.School facilities

On interacting with the students regarding the school facilities in school, the respondents mentioned that there were proper toilets with running water (87%), while some mentioned difficulty using the toilets during menstrual cycle days (13%). Moreover, all the respondents said that there were proper facilities for restrooms and provisions were there for arranging/buying sanitary napkins on the school premises.



Discussion

This study examined the association between the menstrual cycle and physical conditions, emotional behavior, social behavior, attitude towards academics and people, habits, and academic performance among the female students of VIIIth standard girls of Kendriya Vidyalaya, Central University, Tezpur. A total of 62 adolescent girls were selected with the ages ranging between 13- 15 years of age. The study was conducted between the period of 04/09/2023 to 30/11/2023 i.e., approximately 3 months. As the subjects were undergoing their menstrual cycles, the observations were conducted during the different days of each month for 3 months. The subjects were asked various questions to which they responded based on their personal experience.

The subjects expressed that almost all of them experienced health issues which added discomfort to their regular activities. The majority of the subjects preferred to rest and thus remained absent during the menstrual cycles to overcome the discomforts. Symptoms such as headaches, vomiting, frequent need for urination, tiredness, and lethargy were seen among the different subjects. The findings of this study correlate with (Yamazaki & Tamura, 2017); (Pereira et al., 2020).

The participants said that they used a variety of methods to alleviate their health issues. The majority stated they did nothing or wanted to rest at the designated time of the month, while others employed herbal remedies, others preferred to use heating pads, and very few liked to change their diet.

Lethargy was the most common behavioral symptom among the subjects during the menstrual cycle, along with forgetfulness, trouble concentrating, decreased adaptability, poor coordination, and lethargy.

Hormonal changes during the menstrual cycle cause a variety of emotional symptoms, including crying, depression, anxiety, restlessness, irritability, aggression, mood swings, and tension, with feeling about things being the most prevalent symptom. Hormones have a significant impact on an individual's behavior and emotions. The findings of this study correlate with (Luo D, 2024); (Yamazaki & Tamura, 2017).

During the menstrual phase, the individuals displayed signs of social adjustment, including shyness, aloofness, and a reluctance to communicate. The findings of this study correlate with (Luo D, 2024); (Kochhar, 2022); (Sundari T, 2022).

The individuals' attitudes toward physical activities, including their interest in dance, yoga, and outdoor and indoor games, have declined. Even though they were interested in physical activities, they were hesitant to engage in them while they were menstruating. The findings of this study correlate with (Chen, 2022); (Prado et al., 2021).

The primary goal of the case study is to examine how the menstrual cycle affects the academic performance of teenage girls. It was shown that their academic performance was significantly impacted by the menstrual cycle. They demonstrated trouble focusing, attending class, and competing with their peers (boys). The findings of this study correlate with (Sundari T, 2022).

The students were asked about the school's amenities and they mentioned that there were functional restrooms with running water, however, some reported having trouble using them on days when they were menstruating. Additionally, every responder stated that the school had adequate restroom facilities and provisions for providing and purchasing sanitary napkins.

Suggestions

The case study suggested that there is a relationship between the menstrual cycle, academic performance as well the attendance of the female students of the VIIIth standard girls of Kendriya Vidyalaya, Central University, Tezpur. The following suggestions can be suggested for the above-stated cause:

- First and foremost, the health of the female students should be considered. They should be provided with nutritious food as most of the girls are seen to have iron and hemoglobin deficiencies in their bodies. They should be provided with multivitamins and minerals so that they can withstand the weakness during the menstrual cycle. If they feel strong from within, they can feel confident to attend school and devote their attention to academics.
- The facilities of the toilets at home and school should be such that the subjects get sufficient water for their needs. A clean and hygienic toilet can protect a female from various infections as they are prone to it such as uterine tract infections etc. Using dirty toilets can make females susceptible to diseases miss out on school and lag in academics.
- The parents, teachers, and students should be made aware of menstrual hygiene. They should be provided with knowledge about the benefits of using sanitary napkins. Awareness should be provided about menstrual hygiene in schools. When girls follow such hygienic means during their menstrual cycle, they will be able to fight various health issues.
- Each school should have facilities of sick room so that if the students feel unwell, they can go and rest. The girls have this idea that if suddenly they feel unwell, they will not find facilities during school hours for rest. So, they prefer being absent during those days.
- Mental and emotional strength is a driving factor for fighting the problems. The girls should be taught that the menstrual cycle is a part of the growth and development of the body. They should be taught to accept the changes in the body.

Conclusion

From the case study, it was seen that the menstrual cycle caused a lot of health symptoms, emotional changes, social symptoms, behavioral changes, and adjustment symptoms which affected their attendance. They expressed the feeling of discomfort attending classes during the menstrual cycle and preferred to stay absent during those specific days of the month. Further, the subjects seemed to experience

difficulties in academics during the menstrual cycle which affected them to a certain extent, yet their overall performance cannot be directly related to the menstrual cycle because during the other days of the month, the subjects paid extra attention and they academic performance and the results were according to their level of expectation. On the contrary, some subjects believed that their academic performance was affected due to the menstrual cycle. Thus, the case study that was conducted on the adolescent girls of Kendriya Vidyalaya, Central University, Tezpur, cannot be generalized to relate the effect of the menstrual cycle on the academic achievement of the adolescent girls of the age range 13-15 years.

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