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Effect of Multiple Intelligences-Based Teaching on Secondary School Students' Learning Attainments

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Abstract: The main objectives of this experimental research study were to examine and compare the effects of multiple intelligence-based instructions (MIBI) and traditional-based instruction (TBI) on students' learning attainments. The research was carried out by applying a pretest-posttest controlled group design on 10th-grade students. A self-developed test comprising 25 items was given to both groups of students prior to and after the intervention. In order to analyze the study data statistically, independent and paired sample t-tests were utilized. The study found that multiple intelligences-based instruction groups outperformed traditional group students. It is recommended that teachers should plan personalized learning design that caters to their students' unique intelligences. Teachers may work with individual students to identify their strengths and challenges across students' different intelligences. To ensure that many intelligences are covered throughout the curriculum, teachers can work together with colleagues in different subject areas to include a variety of activities and assessments that suit different intelligences.

Keywords: Multiple Intelligences, Traditional Teaching, 10th Grade Students, Learning Attainments

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Introduction

The Teaching methods employed in learning have been the most essential component in bridging the theory and practice gap. Learning–teaching procedures are always being updated in order to produce persons who can keep up with the current world, and these processes also serve as trailblazers in the transition process. The change process is shifting from the perspective of a student receiving knowledge directly to one in which the student acquires knowledge on his or her own, processes the knowledge a student internalized, and produces new knowledge utilizing what he or she has learned, considering that learning is a process that requires active participation.

A Teacher today faces more pupils with a considerably larger diversity of understandings, talents, languages, ethnicities, and family finances than the teacher of the past, forcing an urgent need to rethink class planning and delivering lectures from a more inclusive viewpoint (Causton-Theoharis & Theoharis, 2008).

More than ever, educators must figure out how to accommodate variations or satisfy the requirements of students while assisting them in realizing their full potential. Many educators still follow the traditional classroom paradigm that relies on a chalkboard, as noted by Dryden (2005). Thus, in order to comply with the demands put forth by the new educational system, teaching and learning practices should be adapted to a novel conceptual framework. The greatest need for teachers is to impart knowledge outside the conventional boundaries of linguistic and logical-mathematical intelligence.

Teachers are anticipated to possess the capacity to adjust their teaching activities and strategies to align with the unique attributes of the learners, incorporating the idea of multiple intelligences (MI) in the learning process in the classroom. The emergence of the multiple intelligences theory (MIT) in 1983 created considerable curiosity in the field

of education. MIT has globally impacted educators, learners, and instructors (Rousseau, 2021). It marked a significant departure from the conventional notion that individuals possess only a single, general intelligence (Baum et al., 2005). Gardner (1983; 2006) posited that nine intelligences are available in every person, each manifesting in diverse ways. With the help of this idea, students can learn in a way that matches their potential.

Numerous education specialists emphasize the significance of engaging students' varied talents by recognizing their unique intelligence with the aim of enhancing their learning (Wu & Alrabah, 2009; Gurbuz, 2010). Teacher training programs continue to emphasize the significance and benefit of Multiple Intelligences (MI) theory as a foundation for tailored lesson plans (Sheahan et al. 2015; Shearer, 2020; Armstrong, 2018; Abenti, 2020). Numerous researchers advocate for enhancing teachers' understanding of students' engagement strategies offered by MI theory (Attwood, 2022).

Howard Gardner (1983), a Psychologist, asserts in his theory of multiple intelligences that distinct forms of intelligence exist that operate independently of one another. According to Gardner (1983), every individual possesses a unique combination of these intelligences, which determines their learning style, interests, and career choices. Therefore, educators should recognize and support these various intelligences in their instructional activities and learning engagements in the classroom to cater to the diverse learning needs of students. The MI theory has been influential in education and has contributed to a greater awareness of the need to consider individual differences in teaching and learning.

Gardner's Multiple Intelligences

- Linguistic intelligence: This form of intelligence encompasses a keen sensitivity to spoken and written language. People with higher linguistic intelligence surpass in the art of employing words with excellence in verbal communication and written expression.
  Examples: Authors, poets, journalists, speakers, and translators.
- Logical-mathematical intelligence: Individuals endowed with logical/mathematical intelligence think logically and use numbers effectively. People with this intelligence do their best in abstract thinking, pattern recognition and problem-solving.
  Examples: Scientists, mathematicians, programmers and engineers.
- Spatial visual intelligence: This intelligence enables an individual to manipulate visual information in the environment accurately. It includes skills in mental imagery, understanding of spatial relationship between objects of same and different types and spatial reasoning. Individual with this intelligence excels in skills of drawing spatial technicalities and interpreting of maps.
  Examples: Navigators, pilots, artists, and architects.
- Bodily kinesthetic intelligence: This is the intelligence that enables an individual to use its body organs skillfully for problem solving or self-expression. It encompasses mastery of physical coordination both in gross and motor skills. People owning this type of intelligence excels in sports, crafts, dancing and in all those activities that need control and precision.
  Examples: Players, craftsmen, surgeons, actors.
- Musical intelligence: Musical intelligence relates to the ability to appreciate, compose, or perform music. It involves sensitivity to pitch, melody, rhythm, and tone. Individuals with this intelligence are often musically inclined and excel in playing instruments, composing, or understanding musical structures.
  Examples: Musicians, composers, conductors, and music therapists.
- Interpersonal intelligence: This type of intelligence involves the capability to comprehend and engage proficiently with others. It encompasses qualities like empathy, effective communication, and a deep understanding of social dynamics. Individuals endowed with this intelligence demonstrate proficiency in discerning emotions, motivations, and intentions in others, rendering them adept in social interactions and leadership positions.
  Examples: Counselors, teachers, therapists, politicians, and salespeople.

- Intrapersonal intelligence: Intrapersonal intelligence is the capability of a person to comprehend one's own internal thoughts and to manage and control one's own feelings. It is the ability to reflect on one's own motivations, interests, and state of self-awareness. People with high intrapersonal intelligence possess high reflectiveness and a clear sense of self.
  Examples: writers, philosophers, spiritual leaders and psychologists.
- Naturalistic intelligence: Naturalistic intelligence is characterized by a high degree of sensitivity to and understanding of the natural world, which includes both plants and animals. An individual with this intelligence is able to identify and classify many animals as well as comprehend their behaviours and traits. People with this level of intelligence frequently have a keen sense of their surroundings and a strong love for the natural world.
  Examples: Environmentalists, zoologists, farmers, and botanists.
- Existential intelligence: Existential intelligence is defined as the capacity to reflect upon and discuss deep existential and philosophical questions about life and death as well as the ultimate meaning of it all. Individuals with high existential intelligence exhibit a higher sensitivity to these profound issues and are inclined towards reflection, introspection, and exploring the nature of reality and human experience.
  Examples: Philosophers, lecturers, religious scholars, and theologians.

Statement of the Problem

In our country, we usually teach using traditional methods in our classrooms, and we are reluctant to implement innovative ideas. The theory of multiple intelligences, developed by Gardner (1983), offers instructors/teachers valuable insights into diverse strategies for improving the teaching-learning experiences. Earlier descriptive, observational studies such as (Beloff, 1992; Benett, 1996; Furnham, 2001; Neto et al., 2008; Furnham & Shagabutdinova, 2012) predominantly focused on self-assessing intelligence.

In most of the previous studies, data were collected through questionnaires. Questionnaire studies restrict the depth of information that can be gathered; respondents may not fully agree with any of the given options or feel forced into selecting an answer that does not specifically reflect their views. Experimental studies on multiple intelligences are relatively rare, although it is a crucial area ripe for exploration. Consequently, there was a strong motivation for the researchers to undertake an experimental research study assessing the influence of instruction supported by multiple intelligences theory on 10th-grade students' learning attainment.

Study's Objectives

1. To analyze the multiple intelligences-based teaching effect on grade 10th students' learning attainment.
2. To examine the tradition-based instruction effect on grade 10th students' learning attainment.
3. To examine and contrast the influence of multiple intelligence-based instruction and traditional-based instruction on the learning attainment of grade 10th students.

Null Hypotheses

1. Multiple intelligences-based teaching does not significantly affect grade 10th students' learning attainments.
2. Traditional-based instruction has no effect on grade 10th students' learning attainments.
3. There is no difference between the effect of multiple intelligences and traditional-based teaching on grade 10th students' learning attainment.

Study's Significance

The aim of this research is to familiarize students, instructors, administrators, and parents with multiple intelligences theory and its application in the teaching-learning process.

The study is beneficial to teachers and students because it helps them understand the factors that contribute to academic performance. Respecting each student's unique differences is essential for teachers if they hope to see their students succeed academically. The study's findings can provide teachers a chance to be aware of students' multiple intelligences. This research helps teachers and students understand how they are intelligent and how the

use of a new technique can make the Class more dynamic, engaging, and capable of activating students' learning needs.

Method

Participants

Secondary school students studying in grade 10th (enrolled in 2023) were the population of interest of this study. 60 students at a local school participated in the study. Two equivalent groups were randomly formed from the participants.

Research design

A pretest-posttest control group, the true experimental design, was employed because it is the most effective technique for establishing a cause-and-effect relationship.

Utilizing random assignment exclusively is the sole method for evaluators to guarantee genuine comparability between groups, ensuring that any disparities in observed outcomes are not ascribable to external variables or pre-existing discrepancies (Gribbons & Herman, 2019).

Multiple intelligences-based instructional/teaching methods and traditional instructional/teaching methods are the independent variables, while the students' test scores (learning attainment) are the dependent variables in the study.

Pretest Posttest Control Group Design

step 1	step2	step3		Pre-test	Treatment	Post-test
Sixty students' selection through Test conduction	Arrangement of the list is in ascending order	Random selection to equate both groups	Experimental group (Multiple intelligences based teaching)	01	X	02
			Control group (Tradition based Teaching)	01	Nil	02

Procedure

In order to establish two comparable groups, participants underwent pre-tests. Based on their pre-test scores, they were then randomly and evenly distributed into two groups: the experimental group and the control group, each comprising 30 participants. Both groups remained entirely separate and independent from each other. Over a span of six weeks, two units of general science were taught. The experimental group received multiple intelligences-based instruction, while the control group was taught using the traditional instructional method by the same teacher.

Instrument

A standardized type MCQs' test self-developed comprising 25 items was prepared for the participants. Individuals were required to choose the most suitable response from provided options and complete the blanks. The test took 40 minutes to complete. The only change in the pre-test and post-test was the arrangement of questions.

Test Validity

To guarantee the validity of the tests the researcher consulted research experts, subject specialists and secondary school teachers who were teaching general science. The test was finalized in the light of the feedback of the experts.

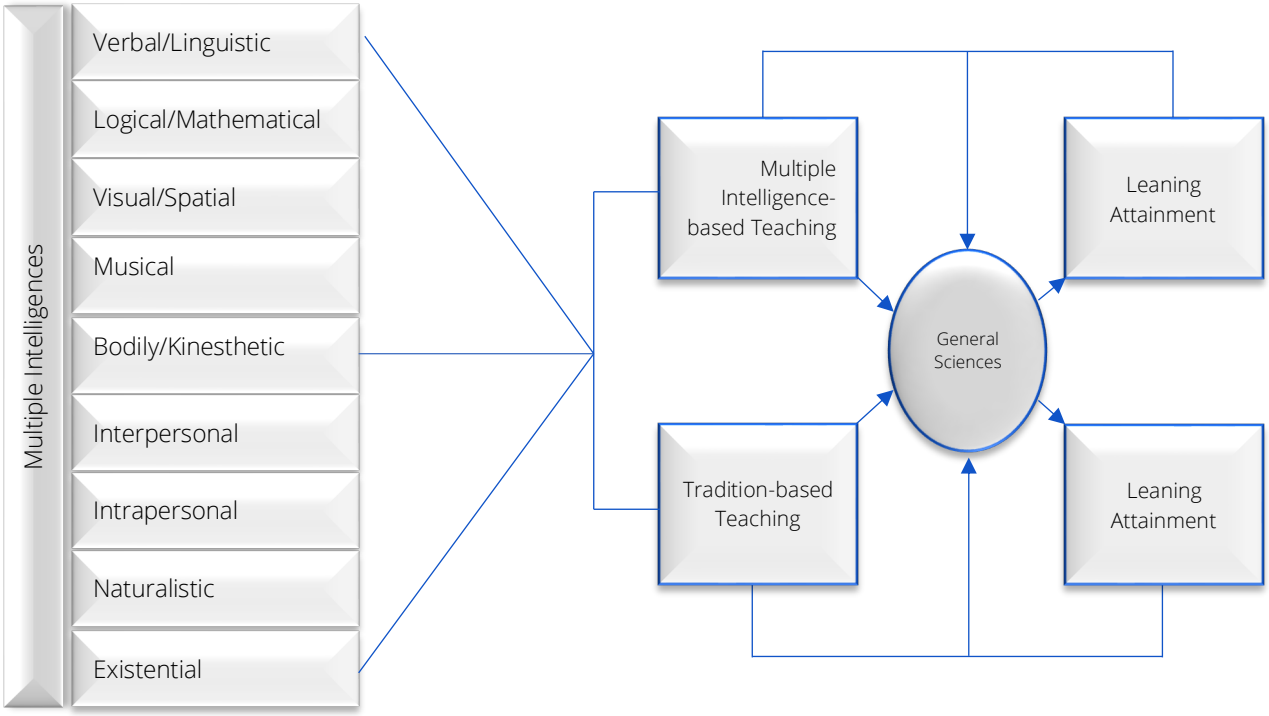
Test Reliability

After finding out validity the test was administered to 30, grade 10th students, rather than the sample of the study as a pilot test. The data was processed through SPSS and Cronbach Alpha was found out. The Alpha value of the test was 0.83, the test and retest technique for finding out the reliability was also conducted. The coefficient correlation value 0.79; between the two score after test retest indicated that the test is reliable.

Data Analysis

A pre-test was conducted before the experiment started; on the basis of test scores obtained by the students, they were distributed into two equivalent groups (experimental and control). After treatment, which continued for six weeks, the post-test was conducted. To find out the difference between the pre-test and post-test mean scores of the same group, a paired sample t-test was used; to investigate the difference between the experimental and controlled group mean scores, an independent sample t-test was applied.

Conceptual Framework



Data Analysis and its Interpretation

Table 1

Mean Comparison of Control and Experimental Group (Pre-test)

	N	M	SD	Df	t	p	LL	UL
Control Group (Pre-test)	31	20.00	5.08	60	.52	.60	3.40	1.98
Experimental (Pretest)	31	19. 29	5.50	60				

Table 1 displays the results derived from the independent sample t-test conducted on the pre-test scores of the controlled and experimental groups. The control group's mean score is 20.00 with a standard deviation (SD) of 5.08, while the experimental group's mean score is 19.29 with a standard deviation of 5.50. The computed t-value is 0.52, and the p-value is 0.60. The p-value is >0.05, which indicates that no statistically significant difference is evident between the controlled and experimental groups on pre-test scores prior to the conduction of the experiment, suggesting that both groups were initially comparable.

Figure 1

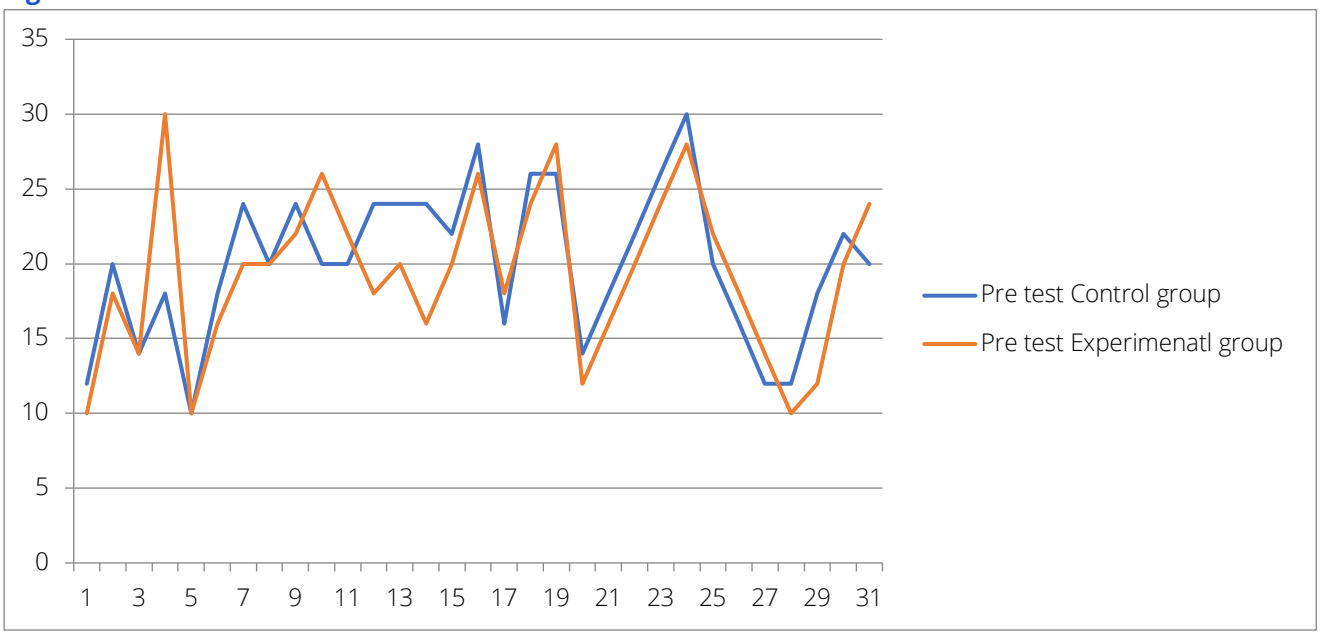


Table 2

Mean Comparison of Pre and Post-test of Control Group (Paired Sample Statistics)

	N	M	SD	Df	t	p	LL	UL
Control Group (Pre-test)	31	20.00	5.08	60	14.64	.00	7.86	5.94
Control Group (Posttest)	31	26. 90	6.17	60				

Table 2 illustrates the findings obtained by applying the paired sample t-test on the pre-test and post-test mean scores of the controlled group. The pre-test mean score for the controlled group is 20.00 with a standard deviation of 5.08, while the post-test mean score is 26.29 with SD=6.17. The computed t-value is 14.64, and the p-value is .00. The p-value is <0.05, which suggests a difference statistically significant between the pre-test and post-test mean scores of the controlled group, but this change is not greater than the change that occurred in the pre-- and post-test scores of the experimental group.

Figure 2

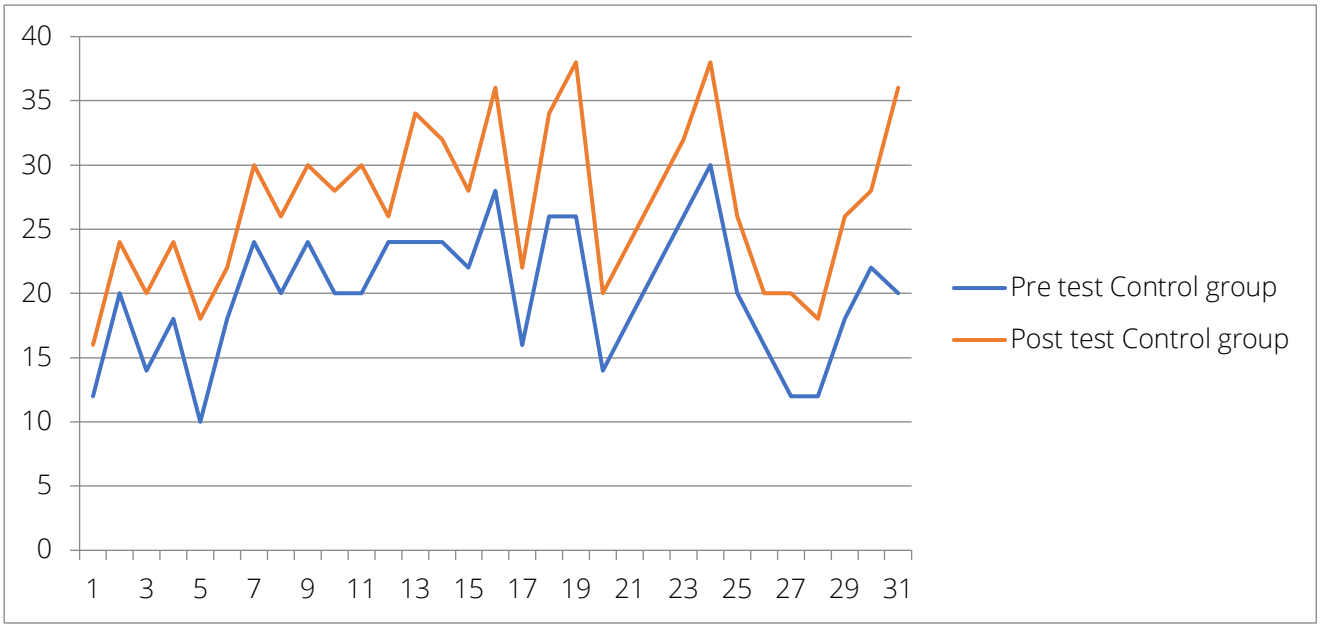


Table 3

Mean Comparison of Pre and Post-test of Experimental Group (Independent Sample t-test)

Variable	N	M	SD	Df	t	p	LL	UL
Experimental 1	31	19.29	5.50	60	15.48	.00	23.87	18.31
Experimental 2	31	40. 38	6.87	60				

Table 3 presents the findings of the paired sample t-test conducted on the pre-test and post-test mean scores of the experimental group. The pre-test mean score for the experimental group is 19.29 with a standard deviation (SD) of 5.50, while the post-test mean score is 40.38 with SD=6.87. The computed t-value is 15.48, and the p-value is 0.00. The p-value is <0.05, which indicates that a statistically significant difference is evident between the pre-test and post-test mean scores of the experimental (treatment) group. This suggests that employing multiple intelligence teaching methods contributed to the improvement of students' test scores. Hence, the null hypothesis that multiple intelligences-based teaching does not significantly affect grade 10th students' learning attainments is rejected.

Figure 3

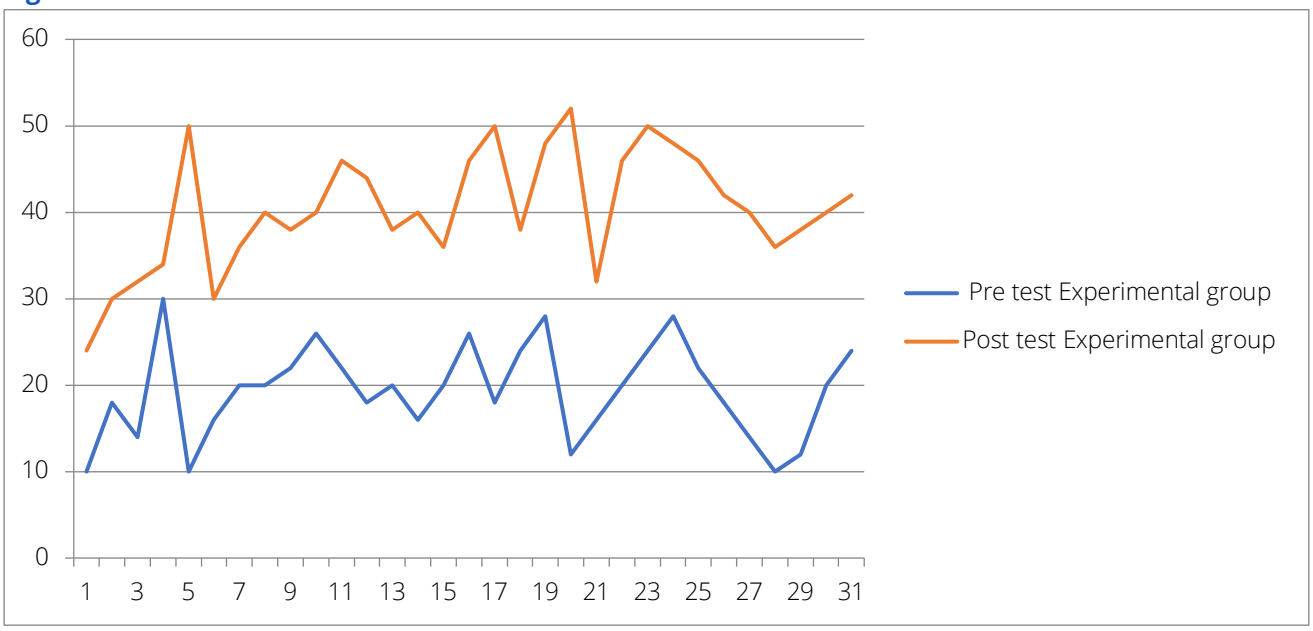


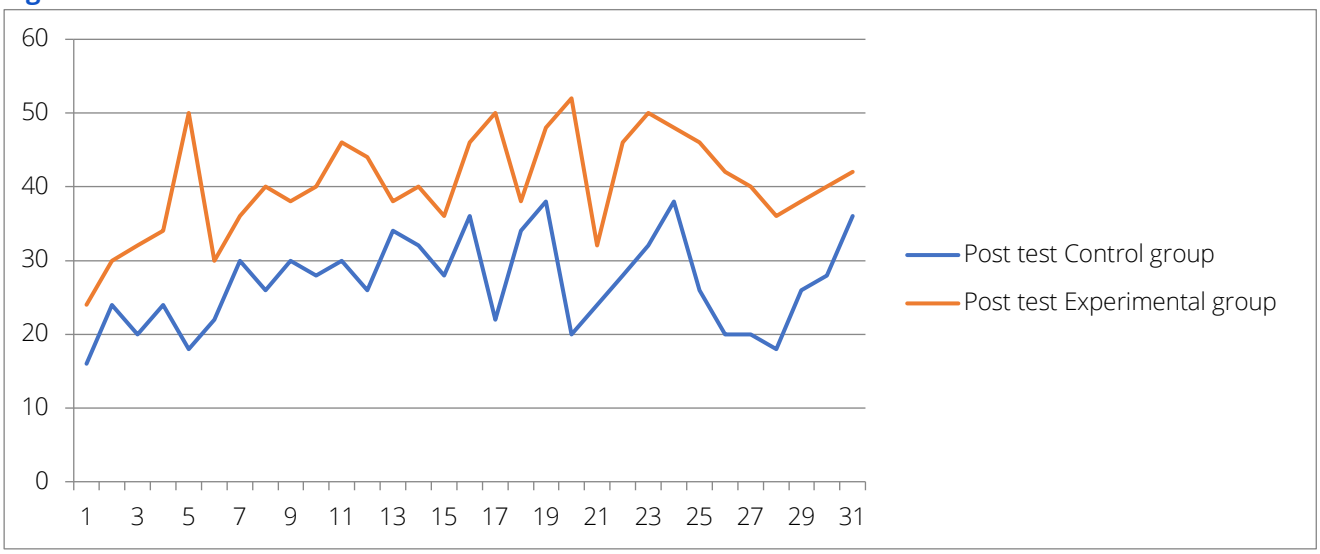
Table 4

Mean Comparison of Post-Test of Control and Experimental Group (T Sample Statistics)

Variable	N	M	SD	Df	t	p	LL	UL
Control 2	31	26.90	6.17	60	8.12	.00	10.16	16.80
Experimental 2	31	40.38	6.87	60				

Table 4 illustrates the results of the independent sample t-test applied to the post-test scores of the experimental and control groups. The control group's post-test mean score is 26.90 with a standard deviation (SD) of 6.17, while the experimental group's post-test mean score is 40.38 with SD=6.87. The computed t-value is 8.52, and the p-value is 0.00. As the p-value is <0.05, it indicates a statistically significant difference favouring the experimental group regarding post-test mean scores. This suggests that the performance of the group instructed through the multiple intelligence method is better than that of the group taught through the traditional teaching method. Thus, the null hypothesis that there is no difference between the effect of multiple intelligences and traditional-based teaching on grade 10th students' learning attainment is rejected.

Figure 4



Findings and Discussion

After analysis of data, it was disclosed that the treatment group (experimental group), which received instruction through a multiple intelligences teaching method, demonstrated a noteworthy enhancement in their test scores (learning attainment) in comparison to the control group. The inferential analysis results indicated significant positive changes in the test scores of the treatment group, signifying notable improvements in their performance.

Consequently, the initial hypothesis that multiple intelligence-based instruction/teaching has no effect on students' learning attainment was rejected. It is noteworthy to mention that, albeit to a lesser extent, the control group also exhibited an improvement in performance compared to the experimental group. This suggests that employing the multiple intelligence methods has positively influenced and heightened students' motivation to engage with the subject matter.

Applying the newly integrated approach activities are planned to engage students across their various intelligences, thus increasing their curiosity and interest for further learning. The findings of the study are in consonance with those of Ayesha and Khurshid (2013), who found that academic accomplishment and multiple intelligences are interconnected constructs in the process of teaching & learning.

The data analysis also revealed participants' adaptability in addressing possibilities and challenges. They demonstrated a capacity to provide clear solutions in some instances and adopt a specific and methodical approach in others. In such cases, teachers should incorporate tasks and activities that engage both intuitive intrapersonal intelligence and a concrete-sequential, step-by-step problem-solving approach, considering cause-and-effect aspects using logical/mathematical and other intelligence.

The study's findings exposed that if a teacher thinks differently and helps students to free them from their close-mindedness, the results will be quite surprising because students learn well when they learn independently and are trained to explore and apply their own potential/intelligence for learning. In order to help pupils understand a subject that often requires their weaker intelligence, teachers might demonstrate to them how to utilize their more celebrated intelligence (Lazear, 1992). The teaching becomes more interesting and attractive if it can involve all types of intelligence and if instructional materials for the students were created by merging aspects of many teaching approaches.

This research study brings awareness to the readers about learning through multiple intelligences. Students have many capabilities, but they are ignored by their teachers or by themselves intentionally or unintentionally therefore they should be provided exiting and meaningful activities; if students are provided opportunities matching their higher intelligences they enjoy their learning.

Application of MI theory in Class

Theory of Multiple Intelligences is applied in education to design instructional strategies that take into consideration the students various learning needs.

1. Design different activities that gratify different intelligences: Teachers can design activities that cater to different intelligences, such as writing essays for linguistic intelligence, solving math problems for logical-mathematical intelligence, drawing maps for spatial intelligence, dancing or acting for bodily-kinesthetic intelligence, singing or playing instruments for musical intelligence, working in groups for interpersonal intelligence, reflecting on personal experiences for intrapersonal intelligence, and exploring the natural environment for naturalist intelligence.
2. Provision of choice and flexibility: students can be given the option for preparing assignments, projects and presentations which allow them to use their unique intelligences. For instance, giving students the choice to create a video, make a poster or write a poem to demonstrate their understanding of a theme.
3. Personalized learning: Teachers can plan personalized learning design that caters to their unique intelligences. Teacher may work with individual students to identify their strengths and challenges across students' different intelligences.
4. Use of different techniques for assessments: Different types of assessments can be used by the teachers that cater to different intelligences. For example, using role-playing for interpersonal intelligence, multiple-choice questions for logical-mathematical intelligence, self-reflection for intrapersonal intelligence and essays for linguistic intelligence.
5. Work together with other educators: To ensure that many intelligences are covered throughout the curriculum, teachers can work together with colleagues in different subjects' areas to include a variety of activities and assessments that cater to different intelligences.

Recommendation for Future Research

This study investigated the effect of multiple intelligences-based teaching on secondary school students' learning attainment and recognized that multiple intelligences-based teaching is a key factor influencing students' learning performance. The researcher applied true experimental research design and collected data through pre and post-tests from the participants, which posed limitations due to restricted student choices. Future studies can be carried out by applying diverse research methods such as qualitative, quantitative, observatory, case studies involving different age group students and different contexts in order to provide a comprehensive understanding of the theory of multiple intelligences and its predictive power of students learning attainments. So that more suitable educational policies could be developed for its proper implementation and to achieve excellent results in the education sector.

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