

Connectivity and Application of the Principle of Multiple Intelligences in the Three Domains of Learning Mathematics

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ABSTRACT

The study aimed to examine how Gardner's Multiple Intelligences applied to Ghana's Senior High School's core mathematics curriculum and instruction. The Core Mathematics curriculum was the primary document reviewed for the study. The action verbs used in the objective, section teacher-learner activities section, and the evaluation section of the core mathematics syllabus were identified and grouped with respect to the multiple intelligences. The analysis revealed that the mathematics curriculum was linked to several intelligences, although some intelligence was underserved. The Senior High School Mathematics Curriculum fails to consider diverse learning styles and preferences. It should provide a diverse range of topics using various instructional techniques. However, children with different intelligences should not experience mathematics as a hindrance. A re-evaluation is necessary to address these issues.

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1. INTRODUCTION

Long acknowledged as a foundational topic, mathematics continues to be helpful in developing numerate, organized, logical, accurate, and practical individuals. Mathematics is the only subject that develops all three domains of human learning: Cognitive, Affective, and psychomotor [1]. Most countries have made it one of their main pedagogical focuses to help learners excel in mathematics because many people think that students' mathematical performance is essential for the future of both the students and the nation [2]. Over the past 20 years, mathematics education has undergone significant change in many nations. The focus of the mathematics curriculum has changed as a result of the need for

pupils who are literate in mathematics and capable of navigating the technological world of today [3]. Mathematical concepts are learned through building or constructive processes, and however less focus has been placed on how different students approach this task. Notably, the impact of preferred learning styles on the creation of mathematical concepts and their implications for mathematics education have received little attention [4].

For a long time, intelligence was thought to be assessed by IQ tests, with various bits of intelligence being referred to as a person's quantifiable intellectual potential. Every person has a unique set of "Intelligence," according to Howard Gardner's theory in his book "Frames of Mind: The Theory of Multiple Intelligences [5], [6]. The idea went against the popular belief that there is just one type of intelligence, known as the single "g" for general intelligence, which primarily emphasizes cognitive skills [7].

In contrast to having one general intelligence, people have a collection of eight intellectual skills that they may use to learn, according to the Multiple Intelligence (MI) idea. Language, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic are Gardner's eight multiple intelligences. Cognitive psychology is one of the ideas that meshes nicely with the Multiple Intelligences theory. Even though cognitive learning has been heavily criticized for focusing more on recalling facts, the testing system must not be seen as only paper and pen tests or bookish [8]. Cognitive psychology is a learning theory that deals with how the mind stores and processes information or knowledge. Assessment in education should take a variety of formats, including presentations, role plays, practicals, and observation, among others, because so many intelligences cannot be measured by traditional paper examinations [9].

According to the MI hypothesis, every learner possesses a special kind of intelligence. This brings to light the Zoltan Diene principle of multiple embodiments, which emphasizes employing a variety of approaches for personal conceptual comprehension, is brought to light as a result [10]. Through the use of problem-solving techniques, the current Ghanaian teaching syllabus for core mathematics aims to improve students' conceptual understanding [11]. More importantly, the curriculum aims to provide students with the basic mathematical knowledge and skills needed to succeed in their chosen careers in the future, as well as a foundation for advanced mathematics courses for those who may choose to pursue that path. As people have different levels of cognition, many factors need to be considered in the core subject of mathematics.

Children with high levels of bodily-kinaesthetic intelligence use their bodies to generate and communicate ideas in a wide variety of ways. They might skilfully use their fingertips to stamp out information, trace facts with other parts of the body, or manipulate a variety of physical objects to express different facts. Instructional strategies using a range of manipulatives allow for the expression of both visual and bodily-kinaesthetic intelligence. Even experienced mathematicians may use this intelligence to build models for their academic projects.

Einstein, in his theorizing, is "visual and motor" or "muscular" rather than verbal [12], posited that the student's drive, perseverance, and self-assurance must be invested in the learning of a new subject. Some students have the opinion that they cannot be motivated to study anything if they are not initially interested in it, and they will never be

interested in it. As people learn more about the work, they must notice a shift in their degree of interest. The level of interest a student has in a task relies in part on how much they value achieving the goal and if they have successfully done similar activities in the past. By helping students track their progress toward goals and acknowledge the success they are making, teachers may set up circumstances where students can study the impact of perseverance. Students can look at the effects of changing how they define success and failure in mathematics.

It was commonly accepted during the psychometric and behaviorist eras that intelligence was a single hereditary quality and that with the proper knowledge, individuals could be educated to learn anything. However, Gardner was persuaded that this conception of intelligence was incorrect by his studies into the emergence and decay of cognitive and symbol-using abilities. Numerous studies have examined Gardner's multiple intelligences in relation to learning styles and their implications for mathematical achievement and higher education. In Ghana, for instance studies have shown that have identified the pre-service teachers in the departments of elementary, scientific, and social science teacher education who exhibited the most common learning styles and numerous intellectual domains [9], [13].

In regards to the variables of gender and discipline, studies have looked into the learning styles, personality types, and multiple intelligence domains of pre-service teachers from different fields. The Multiple Intelligences of Pre-Service Science Teachers at Ghanaian Colleges of Education were investigated [14]. Additionally, Kwao and Ankomah [13] looked at multiple intelligences among elementary school students and found that different people have different approaches to learning mathematics. Some people can recall what they have seen the best. Some people are skilled writers. Some people may be adept at problem-solving yet struggle to grasp mathematical formulas. Some students may be highly skilled with their hands or may have a creative or artistic flare, but they may struggle with more formal mathematical instruction and might not think of themselves as competent learners.

It is necessary to look at ways to make accommodations for these unique learning styles in the classroom in order to fulfill the educational demands of these pupils and offer a more inclusive mathematics curriculum. Additionally, we might be interested in helping our students recognize and value their preferred learning styles and expand the ways they approach learning mathematics. It is interesting to observe that much of the recent research on MI theory and its application in the classroom seems to be concentrated outside of the Ghanaian classroom context.

Although Western nations are frequently held up as the gold standard for education, these nations are underrepresented in the three domains of MI theory and application. Uncertainty surrounds the cause of this disparity. However, it is still true that the Ghanaian educational system's classes at all levels continue to place a strong emphasis on linguistic and logical-mathematical intelligences. One has to question if Ghanaian and other Western cultures that are not included in a lot of the current MI theory studies may be reluctant to accept MI theory and its application in courses at all academic levels and across a wide range of disciplines because they are too wedded to outdated educational practices. The

existing core mathematics curriculum for senior high schools in Ghana has to be assessed to see if it sufficiently meets the requirements of all students, which is particularly important given how poorly senior high school pupils do in mathematics. Therefore, the purpose of this study is to ascertain how Gardner's Multiple Intelligences relate to Ghana's Senior High School's core mathematics curriculum and what effect they have on math instruction. Through its findings, the study hopes to make up for the insufficient prior research and broaden the scope of mathematics education. The research explicitly sought to accomplish the following goals: 1. to ascertain the relationship between Gardner's Multiple Intelligences and Ghana's senior high school core mathematics curriculum, and 2. to ascertain the effects of multiple intelligences on mathematics teaching and learning.

According to Gyang, referenced in Mereku [15], arithmetic was the only subject taught in Ghana's elementary schools before the country's independence. The main topics taught were mechanical number facts and measuring tables. Arithmetic, algebra, and geometry were the three primary disciplines of the mathematics curriculum at the secondary school and teacher training school levels. 'School Arithmetic' and 'School Algebra' by Channon and Smith (1938, 1948), as well as 'School Geometry' by Durell, were the primary texts used to teach them [16]. The way mathematics was taught and learned worldwide underwent a shift in the 1960s following Ghana's independence. Numerous novel mathematical ideas, as well as fresh approaches and methods for tackling mathematical issues, have been discovered.

A meeting of African ministers of education was organized in 1961, according to UNESCO (1961), as reported in Mereku [15], to renew and rearrange the colonial curriculum that was left behind for Africans in order to make it worthwhile. As a consequence, the Africa Mathematics Program (AMP) was established. Through the synthesis of expertise from Africa, America, and the United Kingdom, AMP was able to produce math books that enhanced the teaching of mathematics throughout Africa, particularly in English-speaking nations. The first mathematics series created was the Entebbe Math Series, which was eventually transformed into the Joint School Project (JSP) for secondary schools.

To create numerous mathematics textbooks tailored for the Ghanaian environment, local Ghanaian publishers were hired. These publications included the West African School Mathematics (AWAM) for middle schools, Modern Mathematics for Elementary Schools (Book 1 to Book 8), and the New Mathematics for Primary Schools (NMPS). For the three West African nations that participated in the project—Ghana, Liberia, and Sierra Leone—the AMP later evolved into the West African Regional Mathematics Programme (WARMP). According to Brantuo et al. [17], the Ghana Mathematics Series (GMS) textbooks and Teacher's Handbooks, which were utilized throughout the nation for thirty years, were produced by the WARMP.

In 1987, Ghana initiated a significant educational reform that completely altered the school system. Modern mathematics was introduced as a result of the reform with the goal of making mathematics more understandable and less computational to teach and learn. The performance of students in mathematics remained subpar despite the addition of new content and instructional methods. Unfortunately, virtually little has been achieved despite

a number of measures aimed at raising student performance. Abreh et al. [18] investigated trends in Senior High School student's performance in Ghana's WASSCE and discovered that ineffective teaching practices are a factor in student failure.

As part of its efforts to enhance teacher quality, the government of Ghana has put in place a number of measures to guarantee that instructors possess the appropriate set of pedagogical abilities in addition to their subject-matter expertise [19]. Because the teacher is the single most crucial factor in determining what a student should know, the emphasis has been placed on teacher quality. According to Yurekli et al [20], the role of the teacher in the classroom cannot be stressed because they are at the core of successful mathematics teaching. If the instructor chooses to adopt child-centered ways of teaching and learning, the student will gain and learn more [21]. Therefore, it is encouraged for math teachers to employ engaging and active teaching strategies that students will enjoy and adopt as a way of life [22]. The foundation of Ghana's new mathematics curriculum is problem-solving, problem-based learning, inquiry methods, and other cutting-edge teaching strategies. In order to make what they learn in class more applicable to their daily life, teachers should encourage their students to engage in hands-on activities in the classroom [1].

The theoretical underpinning of this study is the the Multiple Intelligences (MI) theory of Howard Gardner. In the psychometric and behaviorist eras, it was widely believed that intelligence was a single inherited trait and that humans, who were born knowing nothing, could be taught anything if given the correct information [23]. However, as a result of his studies into the growth and deterioration of cognitive and symbol-using capacities, Gardner [5] concluded that this conception of intellect was incorrect. A fresh approach to understanding intelligence was put out by Howard Gardner in 1983 and has subsequently been adopted into educational programs. Gardner broadened the definition of intelligence by fusing biological and cultural study.

According to Gardner [5], culture has a significant impact on how intellect develops. With the help of eight intelligence criteria or "signs," including the possibility of brain damage indicating the existence of idiots, savants, prodigies, and other exceptional people, and the existence of idiots, savants, prodigies, and other exceptional people, Howard Gardner first published his theory in the book "Frames of Mind: The Theory of Multiple Intelligences" in 1983. An identifiable core operation or set of operations; a distinct development history and a definable set of 'end-state' performances; an evolutionary history and evolutionary plausibility; support from experimental psychological tasks; support from psychometric findings; susceptibility to encoding in a symbol system. Several of these criteria had to be met in order for candidates to be given the title "intelligence." Gardner listed eight different types of intelligence.

The multiple intelligences research conducted by Howard Gardner has had a significant impact on educational philosophy and practice. A number of educational theories have accepted it, but more crucially, teachers and policymakers have used it to address problems with education [23]. The identification of diverse student learning strategies has been made more accessible for educators by Gardner's hypothesis of multiple intelligences. Students apply course content based on their general intelligence and preferred learning style [24]. According to Gardner's theory of multiple intelligences (MI),

integrating dominant intelligences with learning styles improves students' learning processes. In accordance with Gardner's theory, it is critical to determine each person's learning preferences and numerous intelligence types since doing so enables them to recognize and improve upon their specific strengths and limitations [25].

The different intelligences hypothesis enables alternative entrances to content that are suited for the diverse student types in the classroom [26]. A range of teaching activities and techniques are employed in the classroom to assist in fulfilling the specific needs of pupils since the idea of multiple intelligences indicates that a single teaching strategy cannot satisfy the demands of all students at once. It explains how students apply their various intelligences to solve a problem and offers teachers a framework for handling mathematical knowledge and expressing it in different ways [26]. The use of multiple intelligences to increase student's mathematical thinking and problem-solving skills and the development of mathematics success have been linked in several studies. Eight different categories of intelligence are identified by Howard Gardner in his book "Frames of Mind," published in 1983 [5].

Verbal-Linguistic

The ability to understand information acquired via the use of language, including reading, writing, and speaking, is a component of this intelligence. It requires knowing how to use the language properly, as well as how words are used in speech and writing. It entails comprehending linguistic sociocultural subtleties, including idioms, wordplay, and linguistic humor. This intellectual level is characterized by highly developed reading, speaking, and writing abilities, as well as a propensity for verbal thought. They frequently participate in group discussions, debates, public speaking, creative writing, and joke-telling.

Logical-Mathematical

To find and understand the different patterns that occur in our lives, such as thinking patterns, numerical patterns, visual patterns, and so on, this intelligence uses mathematics, logic, and arithmetic. As we try to understand the connections between the observed patterns, they move from concrete patterns in the real world to increasingly abstract patterns. People who prefer to think conceptually and abstractly tend to have a logical or mathematical bent, and they typically can spot patterns and correlations that others miss. They like doing scientific experiments and have exceptional problem-solving skills.

Visual-Spatial

This intelligence includes both the mental representations we can create and the knowledge we get from the forms, images, patterns, designs, and textures that we can perceive with our outward eyes. High achievers in this intelligence like painting, sketching and making complex patterns and designs. They like to assemble jigsaw puzzles, look at maps, and travel to new places.

Intrapersonal

Our capacity for self-reflection, which enables us to view our own lives from a viewpoint other than our own, lies at the heart of this intelligence. Our knowledge of the inner self, emotions, values, and beliefs, as well as our many sincere spiritual endeavors, are all examples of this introspective intelligence. With this level of intelligence, people may avoid social situations and prefer working alone.

Bodily-Kinesthetic

Movement and bodily awareness are used to carry out this approach of knowing. Along with this knowledge comes increased physical awareness. These people take pleasure in dancing, role-playing, physical activity, and making things with their hands.

Interpersonal

It is the knowledge that comes by relating to and engaging with people, usually in a group. This form of knowing also enables the development of a wide range of social skills necessary for successful interpersonal interactions and communication. People with high intelligence tend to be very social, show much empathy for others, and have a deep understanding of opposing viewpoints.

Musical

This cognition encompasses all facets of sound, including vibrational patterns, music, tones, rhythms, and tones. These people are able to see, recognize, and manipulate patterns as well as think musically. They like listening to music and rhythms, and after hearing anything just once, they can frequently imitate a melody or rhythm.

Naturalistic

The complete range of understanding that arises in and through our encounters with the natural world, such as our awareness, appreciation, and comprehension of the natural environment, is encompassed by the naturalist intellect. It requires skills like the ability to distinguish between different species, connection with the natural world and its phenomena, and the capacity to recognize and classify a wide range of flora and fauna. They are enthralled with the outdoors, including all kinds of plants, animals, and wildlife.

2. METHOD

The research was a non-experimental survey that was primarily concerned with Form 1 through Form 3 senior high schools in Ghana's core mathematics teaching syllabus. Students in this group often range in age from sixteen to eighteen. The Ghanaian Ministry of Education's Curriculum Research and Development Division created the core mathematics curriculum in 2010 [11]. Since the Free Senior High School (FSHS) policy was implemented, senior high school has evolved into the place where Ghanaian students go to end their formal education and begin their chosen vocations, as well as a base for those who choose to continue their education.

Because core mathematics is a required subject for all students in senior high schools in Ghana, that curriculum was specifically chosen for the study in order to provide a more comprehensive understanding of how the mathematics curriculum relates to Gardner's multiple intelligences. Reviewers looked at whether Ghana's senior high schools' core mathematics curriculum (syllabus) was built on Gardner's theory of multiple intelligences in order to further overarching national objectives. The emphasis was on the broad goals and objectives presented to see if they support the learner's development of these intelligences. The student is required to show a number of action verbs from the curriculum by the course's conclusion.

The data for the study was obtained from the Core mathematics curriculum for SHS students in Ghana. The researcher selected the curriculum's observable action verbs. The Objectives, Content, Teaching, Learning Activities, and Assessments sections of each topic contained these verbs. For these curriculum elements and the eight multiple intelligences, a matrix table was made. According to the trait of the observable action associated with each multiple intelligence, each recognized verb was assigned to that intelligence [11].

Table 1 displays the results

Three mathematics tutors at the Akrokerri College of Education were given the table with the results to verify and solicit their inputs in order to ensure the validity and reliability of the data. These tutors have extensive knowledge and experience in curriculum theory in mathematics education, as well as a deeper understanding of Gardner's multiple intelligences. They provided input, and the data was examined.

Table 1. Showing the observable action verbs in the curriculum and their respective Multiple Intelligences

Gardner's Multiple Intelligences	Objective	Content	Teaching and Learning Outcome	Assessment	Total			
Linguistic/ Verbal	Write	Explain	Present	Read	Discuss	write	Interpret	
	Read	Discuss	Describe	Write	List	read	State	
	Present	State		Describe	State	Describe	List	
	Describe	Define		Explain	Interpret	Explain	Define	
	Interpret							
	9	2	8	8	27			
Logical-Mathematical	Subtract	Calculate	Add	Increase	Add	Determine	round off	Use
	Add	Solve	Subtract	Reflect	Subtract	Verify	Approximate	Determine
	multiply	Factorize	multiply	Apply	Multiply	Use	Subtract	Apply
	Divide	Depreciate	Round off		Approximate	Find	multiply	Find
	Approximate	Increase	Simplify		Estimate	Revise	estimate	
	Simplify	Decrease	Solve		Measure	Compute	add	
	Analyze	Deduce	Calculate		Simplify	Deduce	Solve	
	Investigate	Verify	Depreciate		Solve	Discover	Simplify	
	Determine	Find	Approximate		Calculate	Apply	Factorize	
	Compute	Recall	Find		Factorize	Investigate	Calculate	
Use	Apply	Decrease		Derive	Depreciate	Verify		
	22	14	22	15	73			
Intra-Personal	Imply	Express	Imply	Examine	Express	Imply	Express	
	2	2	1	2	7			
Interpersonal	Rationalize	Share	Rationalize	Equate	Rationalize	Guide	Relate	
	Respond	Relate	Relate	Exchange	Relate	Assist		
			Correspond		Share			
	4	5	5	1	15			

Gardner's Multiple Intelligences	Objective	Content	Teaching and Learning Outcome		Assessment	Total
Bodily Kinaesthetic	Perform	Construct	Operate	Develop	Perform	Construct
	Develop	Undertake	Construct	Construct		Make
	Practice		Reverse	Practice		
	5	3		4	2	14
Musical	0	0	0	0	copy	Record
					2	2
Spatial	Represent	Form	Convert	Convert	Plot	Convert
	Draw	Change	Represent	Represent	Study	Represent
	Translate	Convert	Change	Locate	Illustrate	Draw
	Create		Draw	Shade	Form	Shade
				Draw	Translate	Translate
	7	4	10	6		27
Naturalistic	Distinguish	organize	order	Identify	Order	Sort
	Compare	Identify	Compare	Recognize	Distinguish	Map
	Select	Recognize	Differentiate		Compare	
	Classify	order				
	8	5	5	5	3	21
Overall Total	56	35	55	55	39	186

3. RESULTS AND DISCUSSION

3.1. Results

A summary of the observable action verbs in the curriculum and their respective Multiple Intelligences is shown in Table 2.

Table 2. Summary of the number of verbs and percentage of each intelligence in the Core Mathematics Curriculum

Gardener's Multiple Intelligences	Objective		Content		T & L		Assessment		Total	
	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%
Verbal-Linguistic	9	4.8	2	1.1	8	4.3	8	4.3	27	14.5
Logical-Mathematical	22	11.8	14	7.5	22	11.8	15	8.1	73	39.2
Intrapersonal	2	1.1	2	1.1	1	0.5	2	1.1	7	3.8
Interpersonal	4	2.2	5	2.7	5	2.7	1	0.5	15	8.1
Bodily-Kinaesthetic	5	2.7	3	1.6	4	2.2	2	1.1	14	7.5
Musical	0	0.0	0	0.0	0	0.0	2	1.1	2	1.1
Spatial-Visual	7	3.8	4	2.2	10	5.4	6	3.2	27	14.5
Naturalistic	8	4.3	5	2.7	5	2.7	3	1.6	21	11.3
Total	57	30.6	35	18.8	55	29.6	39	21.0	186	100.0

Table 2 shows that 186 different observable action verbs were identified in the core mathematics curriculum. Out of this, 27(14.5%) were identified as having Verbal-Linguistic intelligence. As many as 73(39.2%) were found under Logical-Mathematical intelligence. A lower figure of 7(3.8%) was found under Intrapersonal intelligence. For Interpersonal intelligence, 15(8.1%) verbs were identified. Bodily-Kinaesthetic intelligence had 14(7.5%) of the verbs. Also, 2(1.1%) verbs were identified under Musical intelligence, whereas 27(14.5%) verbs were recorded under Spatial-Visual intelligence. Naturalistic intelligence had 21(11.3%) of the verbs.

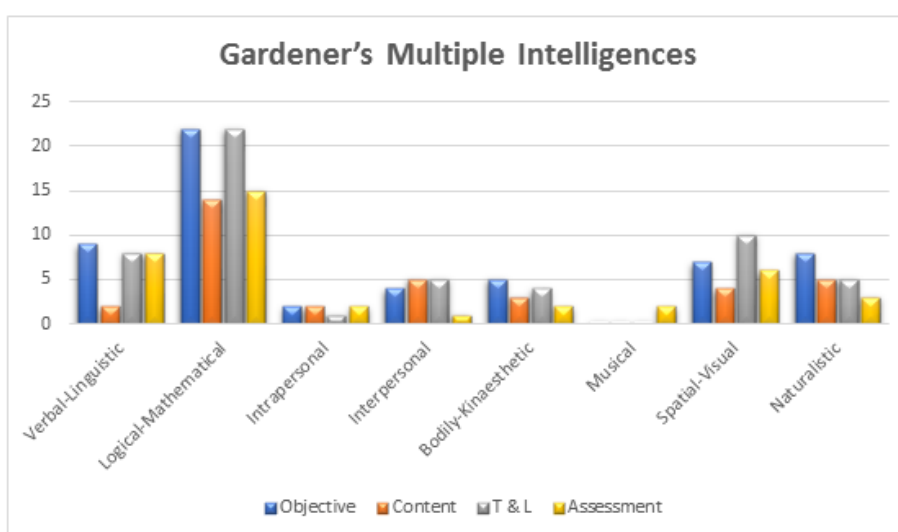


Figure 1. The summary of the action verbs used in the syllabus with the Gardener's Multiple Intelligences

Figure 1 presents the summary of the action verbs used in the syllabus in relation to the Gardener's Multiple Intelligences. For the Objective part of the curriculum, 57 (30.6%) verbs were identified, whereas 35 (18.8%) of the verbs were recorded under the Content part. The Teaching and Learning (T&L) activities part had 55 (29.6%) of the verbs, while the Assessment part had 39 (21.0%) of the verbs.

In terms of verbal-linguistic intelligence, the objective section had 9 (4.8%) verbs, the content part contained 2 (1.1%) verbs, the teaching and learning activities part contained 8 (4.3%) verbs, and the assessment part contained 8 (4.3%) verbs. 22 (11.8%) of the verbs for logical-mathematical intelligence were discovered in the Objective section, 14 (7.5%) in the Content part, 22 (11.8%) in the Teaching and Learning activities portion, and 15 (8.1%) in the Assessment part.

Two (11.1%) of the verbs for intrapersonal intelligence were documented under the Objective part, two (11.1%) were recorded under the Content part, one (0.5%) was discovered under the Teaching and Learning activities portion, and two (11.1%) were recorded under the Assessment section. A total of 4 (2.2%) verbs were recorded under the Objective component of the inter-personal intelligence scale, 5 (2.7%) under the Content section, 5 more (2.7%) under the Teaching and Learning activities scale and just 1 (0.5%) under the Assessment scale.

Bodily-Kinaesthetic intelligence was represented by 5 (2.7%) verbs under the Objective section, 3 (1.6%) verbs under the Content section, 4 (2.2%) verbs under the Teaching and Learning section, and 2 (1.1%) verbs under the Assessment section. Only 2 (1.1%) verbs related to musical intelligence were recorded under the Assessment part, while no verbs were found under the Objective, Content, or Teaching and Learning parts. The verbs for spatial-visual intelligence were distributed as follows: 6 (3.2%) verbs under the assessment, 10 (5.4%) verbs under the T&L, 7 (3.8%) verbs under the Objective portion, and 4 (2.2%) verbs under the Content part. Finally, there were 8 (4.3%) verbs under the objective, 5 (2.7%) under the content, 5 (2.7%) under the T&L, and 3 (1.6%) under assessment for naturalistic intelligence.

The first research topic focused on how Gardner's Multiple Intelligences (MI) relates to the Ghanaian Senior High School Mathematics Curriculum. The study discovered that each of the eight multiple intelligences had some association with one or more of the action verbs out of the one hundred eighty-six (186) observable action verbs identified across the four parts (objective, content, teaching, and learning activities, and assessment) of the senior high school curriculum (Table 1). Thus, it can be said that Howard Gardner's Multiple Intelligences profoundly connects with the primary mathematical curriculum of Senior high schools in Ghana.

The second research question aimed to investigate the impacts of these multiple intelligences on the teaching and learning processes of mathematics. Table 2 illustrates how the eight intelligences overlap in terms of teaching and learning across the four curriculum areas. The curriculum's objectives outline what the learner will be able to perform both during and after education. Therefore, using these intelligences helps to address each student's unique learning challenges. The majority of students will be able to

demonstrate the required objectives at the end of the course, as this gives the teacher the opportunity to individualize the training.

The teaching and learning activities are created to promote the highest level of student engagement. When a teacher integrates multiple intelligences, they may use a range of instructional tactics to provide learning solutions and offer supervised chances for students with different learning styles to gain as much mathematical knowledge and comprehension via their activities as feasible. Multiple intelligences can explore different mathematical solutions using a range of techniques, enabling them to make their observations and discoveries. The instructor also has the option to evaluate pupils using a number of assessment tools that span several intelligences in order to gauge their learning. Therefore, it can be seen that Gardner's Multiple Intelligences, by addressing the specific needs of students, have a positive influence on the teaching and learning of mathematics.

3.2. Discussion

Students learn in a variety of ways in every classroom. The learning styles and aptitudes of each student offer both possibilities and difficulties. According to Howard Gardner, these mental traits and preferences constitute intelligence. The conclusions of the show that the senior high school mathematics curriculum incorporates all eight multiple intelligences through its objectives, content, teaching and learning activities, and evaluations. This complies with the Principles and Standards for School Mathematics published by the National Council of Teachers of Mathematics (NCTM) in 2000.

Nearly 40% of the intelligences covered by the curriculum are logical-mathematical. This is understandable, given that one of the main objectives of the mathematics curriculum is to provide students with the logical, abstract, computational, and problem-solving abilities required to tackle real-world situations. The following intelligence is verbal-linguistic intelligence, which made up over 15% of the curriculum's list of intelligence. The mathematics curriculum in senior high school is heavily weighted toward these two intelligences. This supports [5] claim that the educational system frequently prioritizes a small set of intelligences, primarily logical/mathematical and verbal/linguistic, at the cost of other intelligences that are crucial for a more complete development of the human being. He thinks that many pupils' most considerable abilities are often found in other intelligences, which are typically ignored in many institutions.

The results showed that, in a mathematics classroom, the curriculum nearly wholly fails to meet the demands of children who have musical intelligence. This results from the fact that musical intelligence only made up a little more than 1% of the curriculum's list of intelligences. This will eventually have an impact on a student's ability to pursue a musical profession. The student will keep performing poorly in mathematics and will eventually fail the course, which is necessary for further study.

The results indicate that there is minimal place in the curriculum for students with Intrapersonal intelligence to enhance their capacity for self-reflection in a mathematics class. This may have an impact on the national curriculum's aim of giving students a platform to become self-conscious and aware of their emotions, values, beliefs, and attitudes in order to succeed in their chosen jobs and everyday lives.

According to the research, pupils who lack any of the primary intelligence that the mathematics curriculum values are unlikely to make much progress in mathematics. According to Gardner (1983), giving children the chance to study via their strengths would make them more effective learners across the board.

4. CONCLUSION AND IMPLICATIONS

According to Gardner's hypothesis of many intelligences, current definitions of intelligence are insufficient to describe the diverse spectrum of human skills accurately. The approach proposes that schools should provide "individual-centered education," with curricula customized to each child's requirements, as opposed to depending on a homogeneous curriculum. Ghana's mathematics curriculum for senior high school does not adequately consider the many pupils' learning styles and preferences. The curriculum must be created in such a way as to give a diversity of topics that equally tap into the many intelligences for a core subject like mathematics. The cornerstone of satisfying the requirements of each learner is this.

Furthermore, by considering the various learning styles of their students, math teachers must make sure that their lessons are more inclusive. To meet the requirements of each student, teachers must use a range of instructional techniques. Helping students recognize and appreciate the distinctiveness of their learning styles is powerful because it gives them a base or point of entry from which to develop. Students can increase their capacities to memorize facts, conceptualize the meaning of concepts, develop thinking strategies, solve problems, and engage intensively and creatively in mathematics when teachers encourage the use of a variety of intelligence strengths in mathematics learning.

The demands of the populace's education must continue to be met if policymakers are to guarantee a well-developed human resource for the goals of Ghana's socioeconomic progress. However, children whose main intelligences may not be in line with what the core mathematics curriculum supports should not experience mathematics as a hindrance to their learning. Mathematics is regarded as vital to the development of the nation's human resources. Ghana's Senior High School core mathematics curriculum does not give pupils with learning styles other than the typical linguistic and logical one adequate freedom to grow and identify their career interests. Academics after senior high school require a passing grade in fundamental mathematics. Numerous students failed to meet this requirement, but not because they lacked academic aptitude; instead, it was because the mathematics curriculum did not adequately consider their dominant intelligence. To fix these issues, the mathematics curriculum has to be re-evaluated. This will address high school seniors' historically poor performance in mathematics on the standardized test (WASSCE).

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