The Effects of Multiple Levels of Intelligences in an Algebra 1 Classroom

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Abstract

The goal of this research study was to adjudicate if implementing Howard Gardner's multiple levels of intelligence into every lesson would enhance student achievement levels in an Algebra 1 College Preparatory class. This was conducted through incorporating one level of the eight levels of intelligence into every class through small group work in stations. Achievement levels were measured through various forms of collected data that expressed student understandings in-class versus student understandings on the summative assessments. The data samples included: assessments, (i.e. summative and formative assessments), observable data, video recordings, a daily log book, student surveys, and checklists kept during the observation periods. The data was collated into a coding workbook for further analysis to conclude the resulting themes of the research. These themes include 1) there was no correlation to multiple levels of intelligence enhancing student achievement, 2) bodily-kinesthetic intelligence showed to be the intelligence that had the most improvement on test questions and 3) out of all of the intelligences, interpersonal intelligence enhanced student understanding in-class.

Keywords*: Differentiation, Multiple Levels of Intelligence, station work, Algebra 1.*

Context of the Study

This research study reviewed the effects of implementing multiple levels of intelligence on an Algebra 1 College Preparatory class. Throughout the research period and data collection process, students were exposed to different types of Howard Gardner's 8 levels of intelligence in every class. My research question was: Will implementing multiple levels of intelligence into every class enhance student achievement in an Algebra 1 classroom? The goal of the study was to determine which intelligence was most useful in improving students' assessment scores and to decipher whether these intelligences, as a whole, enhance student achievement. This study was conducted within a county vocational school in Southern New Jersey. The school community is identified as a suburban rural mix with a population that exceeds 43,000 students (Office of Education, n.d.). Specifically, an Algebra 1 College Preparatory course of 22 students with great cultural diversity was examined. The primary ethnicity is Hispanic/Latino leading with an average of 55.6%, followed by Hispanic/Black/Latino students with an average of 16.7%, then white and black/white students taking an average of 11% per ethnicity and ending with black students with an average of less than 1% (NJ School Performance Report, 2022).

Literature Review

The History of Multiple Intelligence

Intelligence is the combination of the ability to grasp information experienced with the ability to apply those experiences to other circumstances (TamilSelvi & Geetha, 2015). This definition is one that is extremely broad, disregarding that everyone learns differently. There is not one correct way to learn. Since there are many ways to view, understand and go about various types of experiences (the sole concept of intelligence), there is justification that carries over similar propositions within education. The idea that there are different ways to gain intelligence starts with the theory of Multiple Intelligences (MI) and develops into differentiation and new theoretical perspectives, such as the Cattell-Horn-Carroll (CHC) theory (Lynch & Warner, 2012).

In the 1980s, Howard Gardner discussed how there is not one specific type of learner and focuses his theory of intelligence suggests that cognition is acquired in many forms (Beliavsky, 2006). The theory of

MI emphasizes that intelligence is not “book learning, narrow academic skill or test taking smarts”, but offering support to minimize obstacles that students may face when learning (Tamilselvi & Geetha, 2015, p. 2). These supports can be offered through implementing a differentiated instruction, specifically individualized instruction, that meet the needs of bodily-kinesthetic, linguistic, intrapersonal, interpersonal, mathematical/linguistic, spatial, musical and naturalistic learners (Beliavsky, 2006; Davis, 2017). While it may not be practical to construct a lesson around all of these supports, offering a handful of them has proven to enhance student learning throughout core subjects, i.e. mathematics (Maharani et al., 2020; Al-Hosni et. al., 2021). Approaching instruction at an angle where all students are learning in the best suited environment for their needs, will assist in the delivery and retention of the lesson.

Gardner’s theory of MI served as a foundation to many advanced theoretical approaches, such as the Cattel-Horn-Caroll (CHC) theory that was created in the early 1940s (Gardner, 1993; McGrew & Wendling, 2010). The CHC theory proposes that learning is a compound amalgamation of factors that include the students' environment, life experiences, education, genetics, etc. (Lynch & Warner, 2012). In the early 1990s, nearly forty years after the CHC theory was initiated, the Three Stratum Factor Analytic Theory began, expanding the intellingences into ten total broad abilities (Caroll, 2005; Lynch & Warner, 2012). This theory noted that there are three stratifications to intelligences that start with narrow abilities, leading into broad abilities and ending with general intelligences (2012). Within this structure, there are known to be 70 different factors that affect learning leading into 10 specific abilities. Howard Gardner’s Multiple Intelligences theory, along with Cattle’s, Horn’s and Carroll's CHC theory all provide evidence that learning is a broad spectrum of abilities that is individualized to each learner.

Differentiation: Meeting the needs of every student through MI

Differentiation is individualized instruction that recognizes how learners can be successful, recognizing that there is not one specific type of learner. Gardner’s theory of Multiple Intelligences is just one form of differentiation. The keynote of supporting students by meeting their learning needs remains constant as the focus of differentiation (Eysink & Schildkamp, 2021; Al-Hosni et al., 2021).

Planning and preparation, along with progress monitoring are seen to be the most commonly used methods that ensure academic achievement throughout differentiation (2021; Altintas & Ozdemir, 2015). This can be measured through observable data, pre assessments, formative assessments and summative assessments (Roiha & Polso, 2021). Overall, differentiation should provide the students with enriched challenges at their ability to learn combined with a constant foundation for success (Eysink & Schildkamp, 2021).

Measuring MI

Assessments serve as a tool to allocate differentiation in the classroom, ranging anywhere from pre assessments to formative assessments to summative assessments. Similarly to differentiation, the effects of MI can be assessed through various types of assessments. MI is useful because it allows educators to teach various representations of information to all students, assessing their understanding in a targeted individualized approach (Beliavsky, 2006; Simper 2020). Not only does this expand their learning, but it also teaches students how to problem solve, how to create multiple outlooks of a situation and how to understand other viewpoints in the real world (2006).

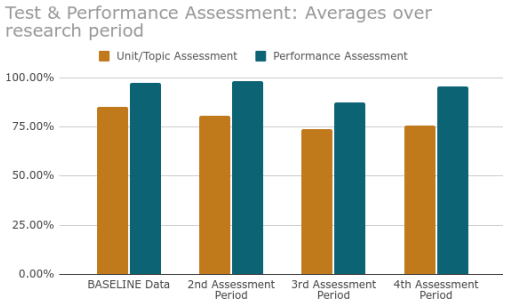
Pre assessments lead to differentiated instruction through assessing prior knowledge and adapting the instruction to specific learning needs (Eysink & Schildkamp, 2021). Pre assessments allow the educators to properly proactively plan their instruction (Roiha & Polso, 2021). These assessments will indicate not only the students' understandings but can assist in avoiding any misconceptions the future lessons may lead to. Formative assessments can be directly aligned with differentiation and serve as indicators of the students' understanding within the lesson (Roiha & Polso, 2021). Formative assessments should contain five very crucial components: goal setting and success criteria, proactively taking action in the classroom, collecting data, acknowledging how each student learns best and involving students in this process through feedback and reflections (Eysink & Schildkamp, 2021). Having a formative assessment that did not align with the standards, students' learning needs and the instruction will serve as an obstacle and a set back within the learning process (Doubet, 2012). It provides students, teachers and parents with school performance levels and feedback through exit slips, whiteboard work, note taking review, etc. (Roiha & Polso, 2021). Summative assessments similarly measure a student's progress; however, the progress is measured at a very specific time. Summative assessments typically take place at the end of a unit in the form of a test or project (2021).

Results

Three major themes emerged from this research, 1) there was no correlation to multiple levels of intelligence enhancing student achievement, 2) bodily-kinesthetic intelligence showed to be the intelligence that had the most improvement on test questions and 3) out of all of the intelligences, interpersonal intelligence enhanced student understanding in-class.

No Correlation between Multiple Levels of Intelligences and Student Achievement

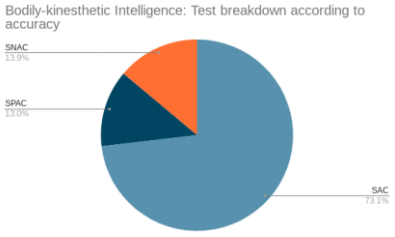
The implementation of MI provides classroom teachers with a useful tool for differentiating instruction to meet the needs of the students; however, incorporating these intelligences into every lesson did not show student achievement. Students were given a baseline summative assessment prior to the start of the implementation of intelligences, resulting in a class average score of 85.09%. From the baseline test to test 2, there was nearly a 5% decrease in student achievement after incorporating MI into every lesson. Moving forward to the next summative assessment, an additional intelligence was added in, mathematical-logical intelligence. The average score for this test (test 3) decreased further to 74.01%, displaying nearly a 6% decline in improvement. Finally, the last summative assessment average resulted in an average of 75.91%, exhibiting a minimal increase in assessment scores. According to the averages above on each assessment, there was not a consistent increase or decrease in improvement.



Bodily-Kinesthetic: Largest impact on student achievement out of all intelligences

At the end of each unit, the students took a summative assessment to measure student achievement levels according to the intelligence that was implemented for that lesson. While there was no direct correlation to multiple levels of intelligence, bodily-kinesthetic intelligence had a greater impact on student understanding than others.

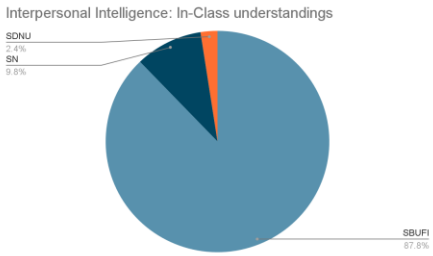
To measure this finding, each question on the summative assessment, aligned directly with one of the 5 lessons taught within that unit. With that being said, the intelligence that was implemented within that lesson was directly measured with the students ability to correctly answer the content question on the summative. Below, the pie chart shows the effectiveness of Bodily-Kinesthetic intelligence, as it scored the highest in student understanding. The pie chart is broken into three categories: Student Answer Correct (SAC), Students Partially Answered Correct (SPAC), and Student Did Not Answer Correctly (SNAC). Once they were organized and accounted for per intelligence per test, those tallies were added together for totals of all four tests. Student achievement was measured through the student's ability to correctly answer the questions (SAC) with Bodily-kinesthetic intelligence reaching approximately 73% of the students falling into SAC.



Interpersonal Intelligence: Improving in-class understanding out of all intelligences

There was a distinct deviation between the level of intelligence that showed improvement in student understanding in class versus on the test. In class, students were given formative assessments to show their understanding of each class. This was measured to show the effectiveness of the intelligence that was implemented directly within that class. Out of all eight of the intelligences, interpersonal intelligence represented the most significant understanding in the classroom.

The students' understanding in-class were measured through exit slips and worksheets that were collected. The daily logs kept note of whether each student understood the lesson through providing the students scores from their formative assessments that measured their understanding that day. This information was then organized per intelligence that was taught for that assessment and tallied into three categories: Student Better Understood From Intelligence (SBUFI), Student was Neutral (SN) and Student Did Not Understand (SDNU) per intelligence, seen below. Monopolizing the SBUFI category to analyze how frequently the students were able to understand in-class.



Interpersonal intelligence had approximately 88% of students at SBUFI. Interpersonal intelligence had nearly a 20% increase in student improvement in-class. Not only did interpersonal intelligence have the largest average of students who understood better, it also had the smallest average for students who did not understand better at nearly 7%.

Conclusions

To review, there was no direct correlation to student achievement in regards to the 8 levels of intelligence as a whole. The differentiation technique should be utilized as a crutch rather than a sole tool to depend on within the lesson. When breaking down specifically the single most useful intelligence for student achievement, bodily-kinesthetic intelligence showed the highest level of student improvement within the summative assessment. Students perform better on assessments when they are able to relate the content learned previously to tangible actions or items. Finally, in-class understandings are increased through implementing interpersonal intelligence. Students learn better in class when they are able to communicate with one another and support each other.

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