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The Role of Multi-Sensory Learning in Elementary Classrooms on Student Development

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Abstract

The purpose of this phenomenological study is to examine the role of multi-sensory learning in the development of elementary-age students. Through the role of day-long classroom observations and educator interviews, firsthand information was gathered related to how this teaching style is presented within the classroom, and how this method is beneficial for students. Through this research and analysis, the enhancement of developmental domains can be seen through different academic disciplines. These interviews and observations also provided insight into resources for educators for the future implementation of this strategy in the classroom.

Keywords: multi-sensory learning, elementary-age students, developmental domains, academic disciplines

Multi-sensory learning is an approach to teaching students that engages them by activating more than one of their senses. This teaching and learning approach serves as a way for children to engage with the curriculum in a variety of ways, which can support retention and comprehension of the subject matter being presented. By allowing students to explore learning through different senses, they can understand what method is best suited for them, which can guide differentiated instruction in the classroom. This can assist in the overall academic

achievement and development of students. The role of multi-sensory learning on student development is being explored to analyze and examine the role in which this teaching style has in the classroom, and how learning through a variety of senses and methods can enhance their development in the cognitive, social-emotional, physical, communicative, and sensory domains.

Literature Review

ELA (English Language Arts)

Multi-sensory learning, reading achievement, and spelling achievement are often studied together. Recent research has been centered around the development and enhancement of test scores and overall retention and usage of reading, spelling, and writing skills. Schlesinger and Schlesinger (2017) found that multi-sensory teaching methods allowed for better letter-naming skills and sound production, reading, and spelling when student work was compared to those who did not receive this method of instruction. A sensory-rich classroom setting in which multi-sensory learning is utilized allows for the language and communication skills of the students to flourish and develop, increasing their overall retention of grammar rules and improving their phrasing while they speak (Suanda et al., 2016). Measures have also shown

that this multi-sensory learning environment increases the test scores of students' grapheme-to-phoneme correspondence (Kast et al., 2011). Labat and colleagues (2015) discovered that teaching the alphabetic principle while engaging multiple senses allowed for an increase in test scores, as well as better encoding of the principle after testing.

Math

It is common for educators to utilize manipulatives for a hands-on approach to teaching math concepts to elementary school students. Research within the past twenty years has shifted towards the infusion of manipulatives that are both physically present in the classroom, and the use of manipulatives that are on technological platforms. These varying platforms for manipulatives are centered around the engagement of students, as well as ensuring mastery and standards are met in the classroom. Rains and colleagues (2008) found that virtual and physical manipulatives in a mathematics lesson produce greater achievement of mathematical concepts in elementary students compared to the students who did not receive this multi-sensory approach in both physical and virtual manipulatives. The rise of STEM (Science, Technology, Engineering, and Math) and STEAM (same as STEM but with Art included) curricula began in 2001, and this infusion of hands-on lessons and activities allows students to become more engaged in these subject materials. Teachers who used a STEAM curriculum were able to utilize virtual reality and infusion of technology to teach their students, and it was found that students were more likely to meet lesson outcomes and standards due to this integration of multi-sensory engagement (Taljaard, 2016).

Technology

Being able to use technology in the classroom allows for the enhancement of the learning experience through a multi-sensory approach and allows for pieces of technology to promote relaxation, communication, and relationships among students and teachers in the classroom. Upon comparing the learning of blending and segmenting words on iPads or physical cards, it was found that both modalities provide adequate comprehension of the material and are both sufficient outlets for multi-sensory learning for second-grade students (Lee, 2016). Touch technology and haptic-based software allowed students to learn about the characteristics of different planets using visuals and auditory feedback from the devices to enhance their comprehension of the characteristics (Darrah, 2012). Especially during the pandemic, virtual learning has become increasingly prominent for students of all ages. Pacheco-Guffrey (2020) found that the use of apps such as Google Tour, Google Maps, and Google Art and Culture: Hidden World can be beneficial to providing virtual field trips for students that give them experiences of the world around them, as well as engage them in a fun and exciting platform that captivates them and encourages their desire to learn.

Science

When teaching concepts in science, it can be beneficial to utilize a hands-on approach for elementary students. When students were engaged in teaching concepts about earth and space in a multi-sensory approach, it was found that students scored significantly better on a posttest, their understanding of these concepts increased, and the rate of misconceptions about earth and space decreased (Bulunuz & Jarrett,

2009). The science curriculum often relies on the use of experiments based on hypotheses and theories that allow elementary students to learn more about the scientific world that surrounds them. Kok Siang and colleagues (2013) found that science experiments in the classroom allow students to work with the curriculum hands-on, as well as practice skills centered around discussion, responding, and reflecting on the coursework. Bevans and colleagues (2012) found that fifth-grade students who took a field trip to a farm to learn about scientific concepts such as compost, plant parts, and produce were able to touch and harvest their vegetables, allowing them to learn about the food around them, which enhanced their understanding of these scientific concepts. Hettwer (2011) found that by tasting vegetables, students were able to draw connections to scientific concepts such as the water cycle and the movement of water through different soil and rock layers.

Learning Disabilities

Multi-sensory learning has been a standard component in classrooms that contain children with learning disabilities (Ho, 2001). By stimulating senses and reinforcing memory through scaffolding and interactive media devices, students with a language or processing disorder could enhance their speaking, reading, and writing capacities and their ability to express and emote (Gkeka et al., 2020). For students with profound intellectual and multiple disabilities (PIMD), it was found that they were able to enhance their sensory processing and contextual understanding following the intervention of the multi-sensory teaching approach (van der Putten et al., 2011). Fine (2016) discovered that students who were on a 504 or IEP benefited from using occupational therapy

equipment such as a trampoline, squeeze machine, swings, or tactile boxes, as it promoted fewer behavior outbreaks, and enhanced their focus and engagement.

Educators

Education coursework is a prerequisite to getting a teaching license in the United States (US). Throughout this coursework, engaging in lessons that promote awareness and understanding of multi-sensory learning within a classroom allows them to see the significance firsthand and promote the use of this teaching strategy, while also working to eliminate false beliefs and knowledge and provide a strong foundation that these educators can then apply to their classroom. Stephenson and Carter (2011) found through teacher interviews that a multi-sensory intervention allows educators to monitor and evaluate the progress of their students effectively and efficiently. Teachers who implement a multi-sensory teaching style were able to find the preferred method and modality of their classes, and this allowed teachers to plan and prepare lessons and classroom activities based on the information they gathered (van der Putten et al., 2011). When the staff at elementary schools were trained in multi-sensory teaching and storytelling, they found that they felt prepared and well-equipped to work with students, both with and without learning disabilities (Penne et al., 2012). Preece and Zhao (2015), discovered that the use of multi-sensory storytelling and teaching allowed teachers to have a better grasp on curriculum standards and goals, as well as enhance the design and delivery of their lessons for their classes.

Methods

Introduction

This section delineates the process by which the research was conducted. Throughout this methods section, the subsections provide information on a) the participants, b) the data collection procedures and timelines, and c) the analysis procedure of the data.

Participants

To gather participants, emails were sent to every elementary educator in four school districts in Southeastern Massachusetts- over 300 teachers in total. These emails were gathered through the staff directories located on the school district's website. Of these four districts, three districts responded, which will be referred to as districts A, B, or C to keep the anonymity of the participants. All the demographics of these districts were found on Massachusetts School and District Profiles.

District A

Massachusetts School and District Profiles (n.d.) describe district A as a public school district with 2,376 students, serving preschool through 12th grade. There are 5 schools in this district, 3 of which are elementary schools. The school in which I did my research district A has 275 students, with 86.5% of the students being white. This schoolhouses students from kindergarten through third grade. Within this population, 51.6% are high-needs students, 37.5% of students come from low-income families, and 24.4% of students have some sort of disability. In this school, 2.5% of students have English not be their first language, and 2.5% of students are English language learners.

District B

Massachusetts School and District Profiles (n.d.) describe district B as a public school district with 2,459 students, serving students ranging from preschool through 12th grade. There are 5 schools in this district, 3 of which are elementary schools. The school in which I did my research in District B has 345 students, and 71.3% of these students are white. In this school, 40.6% of the students are high-needs students, 27.8% come from low-income families, and 17.7% of students have some sort of disability. 11.6% of the students in this school have a first language that is not English, and 5.2% of the students are English language learners.

District C

Massachusetts School and District Profiles (n.d.) describe district C as a public school district with 3,437 students, serving preschool through 12th grade. There are 5 school districts in this district, of which 2 are elementary schools. The school in District C where I did my research has 718 students, with 76.5% of the students being white. This school hosts students who are in preschool through second grade. In this school, 13.6% of the students have some sort of disability, 23.4% of students come from low-income families, and 33.6% of students have high needs. In this population, 7.2% of the students have a first language that is not English, and 4.7% of the students are English language learners.

Data Collection Procedures

Following the initial review of previous literature regarding development and multi-sensory learning, emails to educators were sent inviting them to take part in the study. Ten teachers responded, however, five were

selected for the study. These five educators were chosen to ensure five different grade levels and classroom types were observed, as well as drawn across the three different school districts. Once consent from the educator was received, a parental consent letter for the students was sent to the educator so the students could bring it home for their parents or guardian. Once consent was received, interviews and observations with the educator and their classroom were scheduled. Both the interview and observation protocol were crafted by me to cater to the significance of multi-sensory learning in the classroom and the role this plays in students' development in different domains. The interview and observation protocol content is discussed in the results section. Following the data collection, the data that were gathered from these classrooms were compiled and analyzed. Information on this analysis of the protocols is discussed in a subsequent section.

Data Analysis Procedure

To begin the analysis process, all the interview response questions were compiled into a single document, having each teacher being a designated color. After transferring and color-coding this data, themes, and similarities within each of the questions were extracted, picking out commonalities, as well as ideas that may overlap with one another. Also, responses that may stray from the patterns extracted were noted, as well as questions with minimal or no similarity across the respondents to identify factors that led to outliers or inconsistent data.

After working through the interview questions, a similar procedure to the observation protocol was done. The observations were color-coded and compiled onto a

single document, just as was done with the interviews. Then, themes and similarities among the observations were picked out. Along with the similarities, information that strayed from the patterns was taken note of to identify outliers within the data set.

Results

Introduction

In this section, the a) interview protocol and b) observation protocol was examined and analyzed. Each protocol analysis had the collected data set synthesized, and commonalities and themes were extracted among the answers or observations. This allowed for insight into the role of multi-sensory learning within the classroom and the role it plays in the domains of development for elementary-age students.

Observation Data Analysis

Within the five classrooms, I observed that $\frac{3}{5}$ of the classrooms had 4 instances of multi-sensory learning. One of the other classrooms had 5 cases, which was very close to the typical number of instances I observed; however, the final classroom had 7 cases, which was far different from the other classrooms. The information for the observation compiled data can be seen in Table 1, which provides a breakdown of the frequencies of academic subjects and developmental domains.

As seen in Table 1, the activation of the visual sense was the most common of the four senses being observed (visual, haptic, kinesthetic, and auditory). Despite this similarity, the quantity in which this sense was activated varied. None of the classrooms had the same number of activations, as they ranged from being activated between three to nine times. Two of

| | Class 1 | Class 2 | Class 3 | Class 4 | Class 5 |
|--|--|---|---|--|---|
| Number of times multi-sensory learning was recognized | 4 | 7 | 4 | 5 | 4 |
| Sense(s) that were most frequently activated | Visual (8) Haptic (8) Auditory (8) | Visual (6) | Visual (3) Kinesthetic (3) | Visual (9) | Visual (5) |
| Sense(s) that were activated least frequently | Kinesthetic (0) | Kinesthetic (3) | Auditory (2) Haptic (2) | Kinesthetic (1) | Kinesthetic (1) |
| Academic subject(s) that used multi-sensory learning most frequently | Math (4) | ELA (3) | ELA (2) | ELA (3) | ELA (2) |
| Academic subject(s) that used multi-sensory learning least frequently | All other subjects; only saw the math specialist | Math (1) | Math (1) | Math (2) | Math (1) History (1) |
| The domain(s) of development that were activated | Cognitive (4) Sensory (4) | Cognitive (6) Sensory (4) Physical (4) Communication (6) Social-emotional (2) | Cognitive (3) Sensory (2) Physical (4) Communication (2) Social-emotional (1) | Cognitive (10) Sensory (3) Physical (3) Communication (1) Social-emotional (3) | Cognitive (5) Sensory (3) Physical (3) Communication (1) Social-emotional (2) |

Table 1: Compiled Observation Data.

these classrooms had more than one sense being most frequently activated. Classroom 1 had visual, auditory, and haptic all activated 8 times, and classroom 3 had visual and kinesthetic activated 3 times each.

The sense that was activated the least frequently

of the four was kinesthetic. Of the five classrooms, 4 of them activated the kinesthetic sense the least. Classroom 3 had kinesthetic be one of the most activated senses, as this and visual were each activated three times. This classroom had auditory and tactile be the least active,

being observed two times.

In $\frac{4}{5}$ of the classrooms, ELA was the most frequent academic subject in which multi-sensory learning was used. Of these four classrooms, two of them had two ELA activities, and the other two had three ELA activities. Classroom 1 was the math specialist, so this classroom was an outlier in this piece of the observation, as this teacher only had math activities.

Besides classroom 1, all the other classrooms had math as the least frequent academic subject used in the classroom. Of the four classrooms that had math seen the least, three of them had one math activity, and the last had two math activities. Classroom 5 had one history activity, and this was the only classroom in which history was observed.

Table 2 describes the frequency of the different developmental domains within the classroom. This provided an insight into the domains that were most prominent, as well as least prominent within the five classrooms.

activated 14 times. The communication domain was the fourth most prominent domain, being activated 10 times. The domain that was activated the least was the social-emotional developmental domain, being activated eight times.

Interview Data Analysis

For the five sections of the interview, there were patterns visible in each section across the five educators. This first section of the interview gave insight into classroom demographics and the typical structure of the classroom.

Through this series of questions, it was found that 3 of the 5 classrooms had 21 students in their classroom. In all five classrooms, the students receive speech therapy, and in most of the classrooms, the students receive occupational therapy. Many classrooms have students on educational plans, and a few of the classrooms have students who go to counseling services. All the teachers said that they use a variety of different

| Cognitive | Sensory | Physical | Communication | Social-Emotional |
|-----------|---------|----------|---------------|------------------|
| 28 | 16 | 14 | 10 | 8 |

Table 2: Frequency of Each Developmental Domain

As can be seen in Table 2, of the developmental domains (cognitive, social-emotional, sensory, physical, and communication), the cognitive domain had the highest frequency, being observed 28 times across the five classrooms. The second most prominent domain was the sensory domain, being observed 16 times. The third most prominent domain was the physical domain, being

methods for their students, and some of the most common strategies that were mentioned were using hands-on manipulatives, whiteboards, or working in small groups. 4 of the 5 teachers agreed that having whole group lectures and simply having students listen to them talk has been the least effective strategy for their students. The teacher from classroom 2 stated that in whole group

lectures, “[the student’s] attention does not last long enough, especially because they are all at different paces and levels”.

The second section of the interview was centered around personal teaching strategies and philosophies. It was found that 4 of the 5 teachers agreed that the most effective method varies depending on the lesson they are teaching or the student they are working with, and the one teacher who specified that they believe using manipulatives was the best approach was the math specialist. This teacher stated that “using the CRA (Concrete Representational Abstract) approach ensures that students can understand difficult concepts”. All the teachers believe that encouraging students to feel and work through their emotions, as well as allowing them to share stories about their lives and their families has been an effective tool in fostering relationships. 3 of these 5 teachers work to integrate students who are in special education programs with their general education counterparts, whether that be during a lesson or when working with other students. The other two classes had different methods of integration such as small group work and remembering the students' given accommodations. Across the five classrooms, the most common pieces of technology that were in classrooms were Chromebooks or laptops ($\frac{4}{5}$), smart boards or Promethean boards ($\frac{4}{5}$), or iPads ($\frac{2}{5}$). The only classroom teacher that did not use technology was the math specialist, as they focused more on concrete manipulatives due to the short nature of their time with students. Three of these teachers believe that having high expectations for their students, as well as encouraging and promoting positive behavior is effective in managing class behavior. Two of the educators specified that their behavior management strategy varies

depending on the students they are working with. In class 5, the teacher stated that they “implement various behavior management strategies that specifically relate to the needs of their students”.

Next, educators were asked about the developmental patterns and strategies that they see and implement in their classrooms. The educators each explained that they use a different method to plan, therefore showcasing no commonality within this question. Two of these teachers believe that all the domains are important in childhood development. Still, all the educators touched upon the cognitive and social-emotional domains in their responses. Two of these teachers believe that all the domains can be achieved, and two of them emphasized that the physical domain can be difficult to address due to the time and space constraints of a classroom. The fifth teacher expressed the sensory domain as being the hardest to work towards due to the different sensory needs of children in the classroom. 4 of these 5 teachers found that their time in college focused more on historical theories and practices of educational beliefs rather than practical teaching strategies, and therefore their experiences are somewhat different than what they have experienced in the field.

The educators were then interviewed on the teaching and learning strategy of multi-sensory learning and the role in which this style plays in their classroom. All five of these teachers explained that they knew that multi-sensory learning relates to engaging senses using hands-on approaches, as well as using visuals and sensory input to assist in learning. Similarly, all these teachers found that during their time in school, if this method was talked about at all, it was during their time getting their master’s degrees. Three of the educators discussed that they used

tactile pieces for sensory learning within their classrooms. The other two educators expressed that they worked to target more than one sense in their classroom, as every student has different needs. $\frac{4}{5}$ of the teachers believe that this method of teaching could be used as a behavior management strategy because it keeps the students engaged and interested in their learning, and the fifth educator explained that they feel this method supports students in their learning and prevents them from getting overwhelmed or angry at the work they are completing. As mentioned in the behavior management question, $\frac{4}{5}$ of the teachers feel as though this method keeps students engaged, as well as enhances their cognition and review of elements of their learning. In class 4, the teacher stated that “since students are more engaged with the material, they are less likely to misbehave”. For the downsides of this method, each teacher had a different answer, however, all the educators only came up with one reason after reflecting on the method.

Finally, the educators were asked about their thoughts regarding the use of multi-sensory learning as a developmental tool within the classroom. Through these questions, it was found that $\frac{4}{5}$ of the educators believed that most, if not all, of the domains of development, can be targeted using multi-sensory learning. The fifth educator centered their response around the social-emotional, cognitive, and sensory domains due to their classroom dynamic and structure. All the teachers believe that this method keeps their students engaged and allows for the presentation of the curriculum in a variety of different ways that help students remember and understand the material. $\frac{2}{5}$ of the teachers believe that no domain cannot be addressed in the classroom. Two other educators expressed different ways this method could

hinder development, such as this method not being as applicable as students get older, and one said that it could hinder learning if the student is not receptive to change or different presentation of course material. $\frac{3}{5}$ of the educators explained that they use this method in math and ELA lessons, and the other two highlighted that they use it to teach strategies and skills to their students that they can use outside of the classroom. All five of these teachers expressed that they are in favor and support of this type of teaching and learning.

The findings and implications of the study's results are discussed in the following section.

Discussion

Introduction

This section highlights the a) implications of the research, b) diminishing biases, limitations, and future research, and c) main recommendations for educators. These implications were drawn from the data that was collected and analyzed throughout the study. The patterns and information allow for analysis of the role of multi-sensory learning on the developmental domains of elementary-age students and allow for future research and recommendations to be addressed.

Findings and Implications

Through the observation and interview protocols of this study, the role of multi-sensory learning within student development was examined. The observations and interviews that were conducted allowed for the different domains of development to be measured and analyzed and gave insight into the prominence and significance of these domains during a crucial period of development.

The interview protocol allowed insight into the demographics, teaching styles, and developmental milestones which elementary educators work to enhance in their classrooms. The findings through these interviews showed patterns and similarities among teachers. These findings supported the research question because teachers across the board supported the use of multi-sensory learning and advocated for this teaching method to enhance the domains of development in their students. These teachers struggled to find many issues or hindrances that can be caused by using multi-sensory learning and provided strong evidence for the importance of engaging the senses in the learning process.

The observation protocol showcased patterns and data that demonstrated the variety of approaches in which this teaching style could be implemented, as well as provided information related to the frequency of different developmental domains and academic subjects that were activated and stimulated.

Despite every educator activating domains and using this teaching style, from the data that was collected, the math specialist was the outlier in the data set due to the nature of their role in the classroom. Regardless of being an outlier in their data, this educator still provided valuable insight into how an elementary specialist can utilize multi-sensory learning and foster the growth of different developmental and academic domains.

These findings provide beneficial information and resources that can apply to parents, educators, administrators, or any person working with elementary-age students. The research allows educators to see the benefit of using this multi-sensory learning in their classroom, as well as understand different approaches and platforms in which they can utilize this teaching and

learning method. From an administrative standpoint, understanding the significance and benefits of this teaching style can encourage the administration to choose a curriculum that infuses multi-sensory practices as a part of the typical classroom routine and provides their teachers with proper training and resources to execute this teaching method. Anyone working with elementary students can benefit from understanding and learning about this teaching model because they can get a deeper understanding of the content which the child is learning throughout the school day, as well as how they are learning it, and could also allow for infusion of practice activities at home that will engage multiple senses to enrich the learning outside of the classroom.

Diminishing Bias, Limitations, and Future Research

Within this study, there were limitations in terms of the sample that was gathered, as well as biases that were diminished due to not letting them impact the research.

For this study, there was a small sample size due to the time constraint of completing this research study in one semester. Having only 5 educators due to this constraint, grades 4, 5, and 6 were not able to be interviewed and observed, as well as any other type of specialist besides math. The small sample size and limited demographics could encourage future research to branch out to larger sample sizes or a more diverse population. Future research with more diverse populations in different regions could provide valuable information regarding the role multi-sensory learning plays in the role of elementary students' development. Future research could work to be geared towards these upper elementary grades as well as different specialists such as a reading specialist or a speech-language pathologist.

A potential bias that was eliminated within this study was my familiarity with District A. I am an alumnus of this school district and have a parent who works in the district as well. With that, I live and have grown up surrounding the other districts, as these districts are all neighboring one another. Although this could have served as a bias, I did not allow my previous knowledge of this school district to interfere with the protocol which I followed.

Main Recommendations for Educators

The main takeaways and recommendations from this study are related to the implications and practice of this teaching method. Below is a brief bulleted list of recommendations for educators from the takeaways of this study.

- Do not be afraid to experiment to find out what works for your class and what does not, as not every method of learning is the same for every child.
- Allow students to reuse manipulatives or tactile pieces that they use for learning, as when students were already familiar with the materials, they understood how to use them and could apply these pieces to this new lesson.
- Communicate with fellow teachers or staff regarding implementation, as this ensures teachers can collaborate on a lesson and combine their ideas to make it more diverse and engage more senses than if they had planned the lesson on their own.
- Evaluate your classroom to see what your students need, because each classroom and each student has their own needs and are at different

places and levels for their academic needs, as well as their different developmental stages.

These recommendations and strategies can allow educators to practice multi-sensory teaching effectively and confidently within their classroom to enhance the developmental and academic domains of their students to foster a rich environment for learning and growing.

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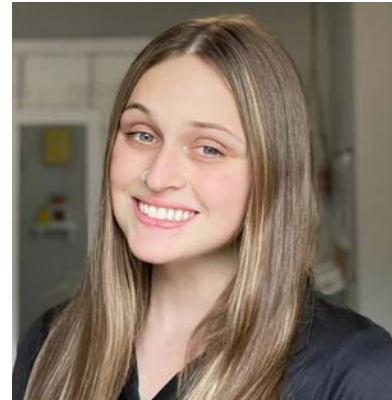
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Amanda Romaine is entering her senior year at Bridgewater State University. She is a double major in elementary education and psychology and a double minor in communication sciences and disorders and childhood studies. She is also enrolled in the Teaching English to speakers of other languages certificate program (TESOL), as well as the Commonwealth honors program. Her thesis project was completed during the spring 2022 semester under the mentorship of Dr. Jacquelynne Boivin (elementary and early childhood education). Amanda is planning to continue to get her master's degree through the dual-licensure program at Bridgewater State University, allowing her to get her master's degree in special education. She hopes after getting her master's to pursue a career as an elementary school teacher.

