Spring 2022

Effects of Using Hands-On Materials During Narrative Literacy Activities in the Preschool Classroom

Brittany White

Effects of Using Hands-On Materials During Narrative Literacy Activities in the Preschool Classroom

Brittany White

Northwestern College

An Action Research Project Presented

in Partial Fulfillment of the Requirements

For the Degree of Master of Education

Abstract

Hands-on learning has been long studied for its effectiveness in accelerating student outcomes and increasing student engagement. The present study focuses on the use of hands-on, interactive materials during narrative literacy activities for seventeen preschool students in an urban, Midwest city. Through implementation of an intervention involving students manipulating hands-on materials during a large group read aloud, findings indicate 94% of students made growth in the area of story comprehension between pre and post assessment and 64% of students reached proficiency after intervention. Overall, this study improves our awareness of the benefits of using hands-on, interactive activities with preschool students during narrative literacy activities.

Keywords: hands-on, interactive learning, engagement strategies, literacy, preschool

Table of Contents

Effects of Using Hands-On Materials During Narrative Literacy Activities in the Preschool Classroom

Each day, in schools around the world, teachers strive to determine which educational practices are most likely to support young students in the subject of narrative literacy. Though it is known students who are proficient in narrative literacy skills at a young age are directly linked to having higher rates of success in the areas of decoding, comprehension, and writing (Spencer et al, 2015), not much is known about how to best support young children in the areas of narrative literacy and comprehension. A wide breadth of research has been completed on engaging young children in the areas of mathematics and science. Young students who are taught math and science concepts in an environment abundant in hands-on opportunities and manipulatives learn more than students who simply listen to the content (Jung, Brown, & Karp, 2014). However, there is a lack of research around engaging young students in the area of narrative literacy and comprehension. This leads to teachers grasping at straws to find the best instructional strategies to keep young children engaged in the work of narrative literacy. The impact is two-fold. Students are not actively engaged in learning during narrative literacy activities, and students are not exhibiting learning outcomes equivalent of grade level standards.

The purpose of this action research project is to determine if the use of hands-on, interactive materials with preschool students during narrative literacy activities increases both student engagement and comprehension. The hypothesized outcomes include students who use hands-on, interactive materials during narrative literacy activities will be more engaged while learning and will have increased learning outcomes in the area of story comprehension. The hope is knowledge gained through reading this action research project will improve student engagement and outcomes in the area of active student engagement during narrative literacy

activities in early childhood classrooms. The impact of students using hands-on, interactive materials during narrative literacy instruction is students becoming more engaged and are able to recall more information about story events and characters (Marley & Szabo, 2010).

Research studies for this action research project were found in the databases in the DeWitt Library of Northwestern College. Studies published in the last ten years in a peer-reviewed journal were considered. Studies covering the areas of early childhood education, use of hands-on learning materials, STEM education in early childhood, narrative literacy, methods of increasing student engagement, and engaging students with special needs were studied. Twenty studies were selected that best supported the current action research and provided a working base of knowledge around using hands-on materials to increase engagement and outcomes during learning activities with young students.

Principal findings of the action research study are use of hands on, interactive materials with preschool students during narrative literacy activities increases student outcomes in the area of comprehension and use of such materials improves student engagement. There have been many research studies done on the effects of engaging students in hands-on learning during math and science instruction, but there is a gap in the research as it applies to use of the strategy during narrative literacy with preschool aged children. Though this gap still exists, this action research study will be an informative first step for teachers in the early childhood field who are searching for ways to best serve their students in the area of narrative literacy. This action research supports evidence of students learning best, and being more deeply engaged, when they are more actively engaged in learning. When students are engaged through hands-on, interactive materials during narrative literacy activities, they comprehend and retain more than students who are not.

Many studies will be reviewed which support the hypothesis of students showing higher levels of engagement and achieving higher academic outcomes through use of hands-on activities and purposeful engagement strategies. To begin, studies focusing on effective classroom management strategies will be discussed. Increased student engagement is often a purposeful teaching practice deeply intertwined with effective classroom management practices. One highly recommended engagement strategy is to incorporate movement of the body, eyes, and hands into academic learning leading to studies addressing this coming next. Studies addressing the outcomes of student engagement in math and science will follow. Lastly, studies regarding narrative literacy best practices will round out the literature review. The literature review will include the following sections:

Effective Classroom Management Leads to Student Engagement

Hands-On Approaches and Student Engagement

Hands-On Approaches in Math and Science

Hands-On Approaches in Narrative Literacy

Review of the Literature

Effective Classroom Management Leads to Student Engagement

Students enrolled in a preschool classroom are emersed in their first traditional schooling experience. Therefore, teachers of these young students must ensure the environment is rich with effective classroom management strategies that will provide students a clear understanding of their expectations during social and academic learning. In a study by Ritz, et al. (2013), teachers in classrooms across the Midwest were interviewed about their classroom management practices and systematically observed in an attempt to determine the best and most frequently used strategies for shaping the behavior of young children. The researchers found the majority of preschool teachers who participated in the study used reactive strategies such as time outs, verbal reprimands, and giving choices after a student had refused to comply more often than preventative strategies such as providing positive reinforcement, regularly reviewing expectations, and use of strategic planning of classroom materials and activities. Reactive strategies were significantly less effective in shaping student behavior. This is important because findings show "academic engagement increases as student rates of compliance increase" (Ritz, et al., 2013).

Similarly, a study by Chow et al. of 27 teachers and 70 Kindergarten students "revealed teacher classroom management predicted students' letter sound fluency at the end of the school year" (2020). Students with teachers who had poor classroom management skills had lower letter sound fluency at the end of their Kindergarten school year than students who had teachers who used effective classroom management styles. Researchers cited the importance of teachers' ability to monitor and prevent as well as redirect undesirable student behavior.

In order to find effective ways to support students with unexpected behaviors, Harvey, Dunlap, & McKay (2021) studied the effects of using structured support for young children with behavior concerns through preventing the behaviors from occurring in the first place and teaching effective replacement behaviors. Findings supported the work of Ritz et al., 2013, further cementing the importance of using preventative strategies as part of effective classroom management. When teachers used systematic methods of preventing behaviors such as visuals, pre-teaching, engaging materials, and positive praise, all students participating in the study saw a decrease in undesirable behaviors and "an increase in pro-social behaviors" (Harvey, Dunlap, & McKay, 2021).

Information from the recent study by Infurna (2020), in which researchers interviewed preschool teachers to determine the most important qualities to a successful preschool classroom, also highlights the importance of building strong relationships with children and tailoring instruction to meet students' individual needs when building a classroom management plan. Another study by Cabell et al. (2022) interviewed 314 preschool teachers and concluded teachers are most effective during large group times. Effective classroom management at the preschool level can be complex; however, the work of Chow et al., Infurna, Harvey, Dunlap, & McKay, and Ritz et al. point to the overwhelming benefits of classroom management strategies emphasizing high student engagement and proactive approaches to meet students' needs.

Hands-On Approaches and Student Engagement

Effective classroom management, however, is just the first step in ensuring students are actively engaged in learning. One way to involve students more actively in their own learning process is by use of a hands-on approach. Researchers Kosmas, Ioannou, and Retalis (2018) studied thirty-five students across five elementary classrooms as they engaged in physical

movement as part of a game-based literacy learning opportunity. According to the findings, all students' time on task increased. In addition to this, students self-reported measures of motivation, self-confidence, and joy were also reported to drastically increase. Students also improved in their total word recall. According to Kosmas, Ioannou, and Retalis, "embodied learning via the use of motion-based educational games can help improve children's short-term memory" (2018). The findings seem to suggest students who engage in physical movement while learning are more highly motivated to stay on task and also have better academic outcomes.

In contrast, a study by Korbach, et al (2020) found students can be highly engaged and reap the academic benefits even when a hands-on approach is limited to tracing and hand-eye tracking strategies. The study followed sixty students as they studied for exams. Half of the participants traced and tracked information with their fingers while the other half of students were not able to use their hands while studying. Students who traced or tracked information scored higher in comprehension, identification, and terminology on the post assessment exam. Korbach, et al. explained the findings stating, "The focus of visual attention is increased for the processing of information near the hand or the fingers" (2020). In addition to simple hand-eye tracking and tracing, engagement can be taken to the next level by providing students with a graphic organizer. In a study by Colliot & Jamet (2019), students were split into group. One group made their own graphic organizer, one group was given a teacher-made graphic organizer, and one group did not use a graphic organizer. Students using graphic organizers did better than students who did not use one. In addition, students who were given a teacher-made organizer outperformed students who made their own. This student-directed approach gives students the ability to stay focused on important materials and focus on the most important content. In other

words, students who use their hands and fingers during learning activities outperform students who do not.

Researchers Steinbrenner and Watson (2015) also state that for students with autism spectrum disorder, student engagement depends not only on student-directed practices, but on teacher's ability to coordinate joint engagement between the student and the teacher. In their study focused on eight teachers and twenty-five students, Steinbrenner and Watson found activities such as people play and teacher-facilitated hands-on learning were correlated with higher scores on expressive communication assessments. There are many ways to engage students in learning, though the idea that hands-on methods are beneficial for all students, both typically developing and those with special needs, is well researched.

Hands-On Approaches in Math and Science

For many people, math and science immediately come to mind when they think of hands-on approaches in teaching and learning. Many times materials are referred to as manipulatives and hands-on science and math activities are referred to as STEM (Science, technology, engineering, and math). A recent study by researchers Simoncini and Lasen (2018) asked the question "How important is STEM in Early Childhood?". Researchers interviewed 117 preschool teachers to gain an understanding of how valuable STEM experiences were for their students. Findings included 76% of educators reporting they view STEM education as being important for preschool aged students due to STEM typically focusing on activities "where children were engaged in hands-on learning are exciting and motivating" (Simoncini & Lasen, 2018).

This finding is echoed by researchers Dejonchkheere et al. (2016) who studied fifty-seven children between ages four and six as they engaged in scientific learning activities.

Researchers found when given both hands-on exploration activities and teacher intervention, children in the intervention group nearly doubled their mean number of informative explorations. This study led the researchers to declare, "Action plays a fundamental role in learning concepts" (Dejonchkheere, et al., 2016). Not only do teachers of young children value hands-on experiences, but these experiences are also proven to be effective.

It is not enough, however, to simply present these activities to children. In a study by Jung, Brown, & Karp (2014), researchers found children learned more when their classroom was rich in manipulatives and when they had a highly effective teacher. When both of these factors were at play, children who participated in the study using math manipulatives increased their scores by 0.355 standard deviations from preassessment to post assessment (Jung, Brown, and Karp, 2014). In addition to this, the study brought to light an opposing finding young students were more likely to benefit from use of manipulatives than older students. A study of 6,900 students found young children are much more likely to achieve high markings in the areas of literacy and math if they are highly engaged and remain curious, according to a study by Shah, et al. (2018). One way to increase engagement, and therefore scores, is to embed use of hands-on materials.

Hands-On Approaches in Narrative Literacy

Use of a hands-on approach is not reserved for science and math and can be used for narrative literacy as well. In the study by Marley & Szabo (2010), seventy-six kindergarten and first graders were read various twenty sentence stories. Students used the same manipulatives for each story and placed them in certain spots to represent characters, events, and problems. Students were given a pretest and a posttest which was scored. Students' scores were

significantly enhanced after using the manipulatives during the story. Researchers reported "physical manipulation…can enhance young children's listening comprehension", Marley & Szabo, 2010). Similarly to the research of Jung, Brown, and Karp (2014), younger children benefited more than older children from use of pictures and manipulatives.

Though similar in topic, a study focused on the benefits of using manipulatives during narrative literacy learning with older students resulted in a different conclusion. Researchers Marley et al. (2014) studied thirty-five third grade students as they used manipulatives during a story and were tested to determine their level of comprehension. Students at this age who used manipulatives while listening to a story were found to do only marginally better on the comprehension-based posttest than students who did not use manipulatives. Researchers' plans for future study included a scope and sequence of fading out manipulative supports as children grow older given their effectiveness for younger students and their lessened effectiveness for older students (Marley et al. (2014).

Though this type of support may not greatly benefit older students, it is highly effective for young children, especially those in preschool and kindergarten. For children in these young grade levels, large group intervention is needed to ensure mastery. In a study by Spencer et al. (2015), seventy-one preschool students in a Head Start setting were observed. Large group intervention included use of pictures and actions to help students remember plot events and characters. Findings showed large group, whole class intervention in narrative literacy domain improved students' ability to complete story retell activities and improved comprehension (Spencer, et al., 2015).

Researchers Cavanaugh et al. conducted a comparable study through tracking Kindergarten students' scores, executive functioning, and motivation as they engaged in literacy learning through play. Kindergarten students were divided into a control group and a variable group and given the same pretest. The control group engaged in traditional, teacher directed instructional strategies. The variable group engaged in literacy learning through guided play. In both schools, students in the guided play groups made more progress than traditional instruction groups. Teacher observations pointed to students enjoying their work more and being more engaged in the play-based work.

Learning through this play-based work is traditional of a Montessori education. Researchers Courtier et al. (2021) tracked 196 preschoolers as they entered kindergarten. When assessment scores were tracked for each child throughout kindergarten, students who attended a Montessori preschool and engaged in play-based, hands-on learning outperformed students who attended a traditional preschool. Teachers of young students have many decisions to make as they plan for how to best engage students and provide instruction in narrative literacy. Research supports the use of hands-on instruction in this area to support both motivation and engagement and academic outcomes.

In addition to determining the benefits to general education students, researcher Charlotte Mucchetti (2013) took a different approach in order to study the effects of using shared reading and hands-on experiences with students with autism. The findings indicated providing hands-on materials was not enough for these students. In order to see increases in both comprehension and engagement, story materials needed to be adapted to meet the needs of each individual student. When this occurred, student engagement was high and between 87%-100% of students were engaged (Mucchetti, 2013). Researchers Buli-Holmberg, J., & Jeyaprathaban (2015) echoed this

with their study of eighty-three students in special education classrooms and their teachers. Results of the study revealed planning and designing curriculum which meets students' needs is imperative. Hands-on materials can work for all students, though some students with special needs may require additional thought and adaptation to reap the full benefits.

Methods

The research questions this action research will strive to answer are:

1. Will use of hands-on materials during narrative literacy activities increase student comprehension?
2. Will use of hands-on materials during narrative literacy activities increase student engagement and decrease off-task behaviors?

Children participating in this action research are part of an all-inclusive preschool classroom in an urban Midwest setting. Students attend school Monday through Thursday from 8:40-3:40. There are seventeen students, three of whom are boys and fourteen of whom are girls. Of the students in the class, five receive IEP services in the area of adaptive behavior and speech services and two of these students have an additional goal area of behavior. Two additional students have IEP services for speech and language. Students goal areas encompass skills needed to self-regulate during teacher led activities and while unregulated. Ten students qualify for free and reduced lunch.

This action research will begin with determining student levels of engagement and comprehension of story characters and elements during a traditional read aloud in which students are expected to sit and listen to the story independent of material supports and after an intervention which affords students the opportunity to use hands-on, manipulative story maps

during read aloud activities. The variable at play will be the use of the story map by all students in the class during intervention and at post assessment.

Data collected for the action research project was quantitative. Two sets of data were collected. The action research was completed over the course of four weeks with preassessment data completed during week one and post assessment data after intervention collected during week four. Intervention was delivered to students for three weeks in order to allow students time to both learn the proper use of the story maps and begin to feel comfortable using them independently prior to post assessment during week four. Data to determine student engagement during read aloud experiences as well as data to determine each student's level of comprehension of the text they had heard was collected. Data was collected by the classroom teacher and by two classroom paraprofessionals.

Two data collection forms were created to keep data collection standardized. The first is a rubric used to measure students' level of comprehension of stories read aloud. Students were scored on a scale of 1-5 with a score of 4 aligning to proficiency in both the Iowa Early Learning Standards 6.2.6 and Teaching Strategies GOLD Objectives 18a. Interacts during reading experiences, book conversations, and text reflection and 18c. Retells stories and recounts details from informational texts. Another data collection form was created consisting of a table stating each students' name as well as room to mark tallies for off task behavior.

The first data collection occurred during the read aloud experience. While the teacher read each book to the whole group, two paraprofessionals watched the students and put a tally by their name each time a student engaged in an off-task behavior. Off task behaviors were defined as: talking or making sounds, looking around the classroom, playing with clothing or found

items, or leaving the carpet space. The two paraprofessionals were trained on what to look for and how to track each off-task behavior. Prior to the first data collection session, paraprofessionals received twenty minutes of instruction and prior to the final data collection session, paraprofessionals received a ten-minute refresher on data collection methods and expectations. One para took the data on eight children and one para took data on nine children. Two paraprofessionals took the data to increase the accuracy of the data due to having to watch approximately half of the class instead of the entire class during the duration of the read aloud. Students were divided based on their assigned spot during the read aloud so each paraprofessionals' attention could be more focused to one section of the carpet.

Second data collection occurred after the reading experience. Each student sat one on one with the classroom teacher to discuss the read aloud. The classroom teacher began each interaction with "Tell me what happened in the book____". If a student did not answer, said, "I don't know", or otherwise indicated they were not able to answer the question, a further prompt was given. For the book *Trashy Town* by Andrea Zimmerman and David Clemesha the prompt was "What did Mr. Gilly do for the town?" For the book Bark George by Jules Fiffer, the prompt was "What did the dog George do?". The classroom teacher scribed the student's responses as they talked about the story. The classroom teacher gave each student a score on the rubric based on their spoken response. All students were individually assessed within one hour of listening to the story.

Data was collected in this manner first the book *Trashy Town* prior to intervention. During the read aloud experience for this book, students were not given any hands-on materials. They were expected to sit and listen to the story while the classroom teacher read. Students then received the class-wide intervention of using hands-on, manipulative activities called story maps.

During the read aloud of the book Bark George, students were given a story map in consisting of an outline of the dog, George, filled with pictures of the animals in his tummy when he went to the vet. The pictures were attached to George by Velcro. As the classroom teacher read the story, the students would follow along on their own story map by taking the animal out of the dog's tummy and placing them along the bottom of the story map. Students physically manipulated the picture of each animal according to the plot event occurring in the story read by the classroom teacher.

Student comprehension data was collected and stored electronically in on a password protected device. Student engagement data measuring off-task behaviors was collected on paper using a tally mark system. The data was then transferred to be stored electronically in on a password protected device. The paper copies of the data were shredded to project student confidentiality.

To determine answers to the research questions, a chi-square test of association will be performed. Additionally, rubric scores from pretest and posttest will be analyzed. Through comparing pretest and posttest scores, it can be determined 94% of students made growth in the area of story comprehension through the intervention of hands-on, manipulative story maps during read aloud activities. Students also had a dramatically reduced number of off-task behaviors during read alouds when given hands-on, manipulative story maps.

Data Analysis

Research was completed in an all-inclusive preschool classroom located within a Preschool through 5th grade elementary school in an urban city in the Midwest region of the United States. Seventeen preschool students were observed while listening to a story during a large group literacy lesson. Students were observed first with no hands-on materials during the story and then assessed to gain understanding of their level of comprehension of the story. During the literacy lesson, student engagement was also tracked. Prior to intervention, fourteen of the students were not proficient in the area of story comprehension. Three students were proficient in this area. In addition, prior to intervention, eight students showed equal to or less than the expected number of off task behaviors determined by age. Nine students showed more than expected numbers of off task behaviors determined by age.

Students then participated in an intervention using hands-on, interactive materials during the story. Student engagement was tracked, and assessment was given to determine levels of comprehension. A chi-squared test of association was conducted to determine if students' comprehension scores increased with the intervention of the use of hands-on, interactive materials during the literacy lesson. Results of the chi-squared test of association were X_2 (1, N=17) = 7.7714, $p \leq .005$. Students were more likely to score at proficiency or exceeding proficiency with the intervention of using hands-on, interactive materials during the literacy lesson.

A chi-squared test of association was also conducted to determine if students' number of off task behaviors significantly decreased due to intervention. Results of the chi-squared test of association were X_2 (1, N=17) = 3.113, $p \leq .077$. Use of hands-on, interactive materials did not significantly decrease students' number of off-task behaviors.

Discussion

Summary of Major Findings

Results of the action research show student use of hands-on, interactive materials during read aloud literacy activities increases student comprehension. The study shows through use of this method of intervention, 94% of students made growth from assessment prior to intervention to assessment post intervention. Additionally, prior to intervention, 17% of students were proficient on the story comprehension rubric and after intervention, 64% of students were proficient on the story comprehension rubric. The reasoning behind this finding is students are able to make more concreate connections with the story events and characters when they are able to physically manipulate pieces correlating to the story in real time, as the story is read.

Additionally, action research results also show student use of hands-on, interactive materials during read aloud literacy activities does not have a significant impact on the number of off task behaviors students engage in during the read aloud. While a vast majority of students did show a decrease in the number of off task behaviors during intervention, the results were not conclusive during a chi-squared test of association to determine a relationship between the intervention and the decrease of off task behaviors. It is, however, worth noting that prior to intervention, nine out of seventeen students engaged in a number of off task behaviors greater than expected, while only four out of seventeen students engaged in a number of off task behaviors greater than expected after intervention.

This class-wide intervention was overall successful in supporting students to meet higher outcomes in the area of story comprehension. Through consistent use of hands-on, interactive materials during read aloud literacy lessons, students are able to take charge of their learning, make connections between what they hear, see, and do, and commit more information to

memory than they can when simply listening to the story being read. Hands-on, interactive materials allow children to take an active role in what has historically been a passive activity, leading to higher levels of comprehension.

Chart 1: Number of Students Proficient in Story Comprehension

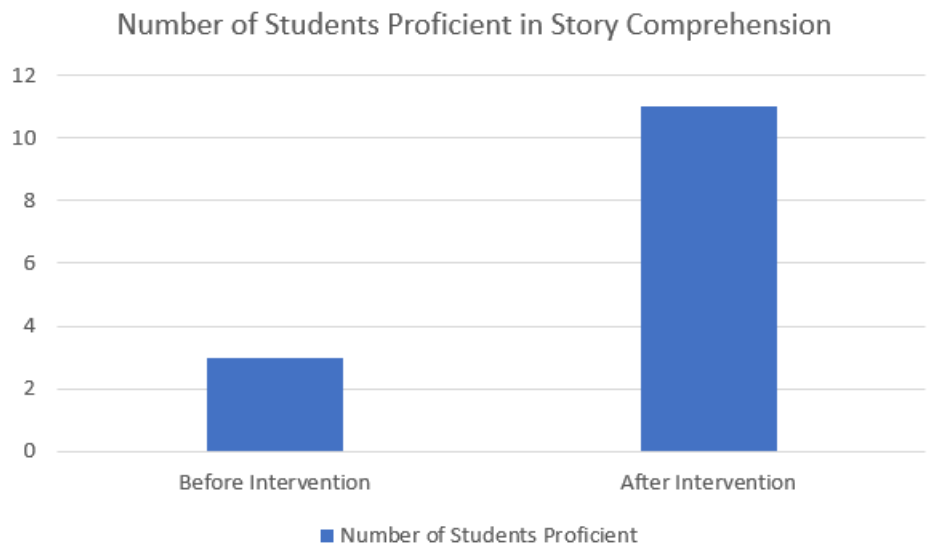


Chart 2: Number of Students Who Made Growth

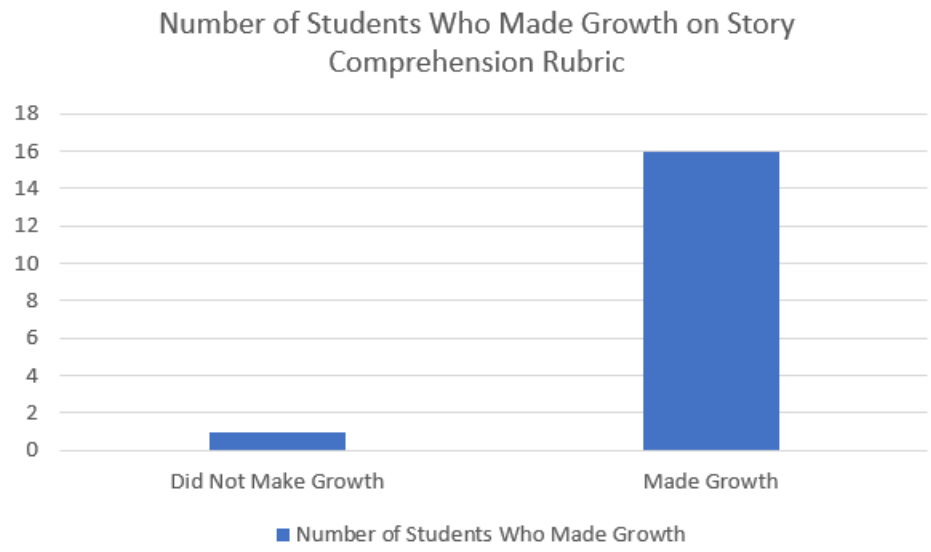
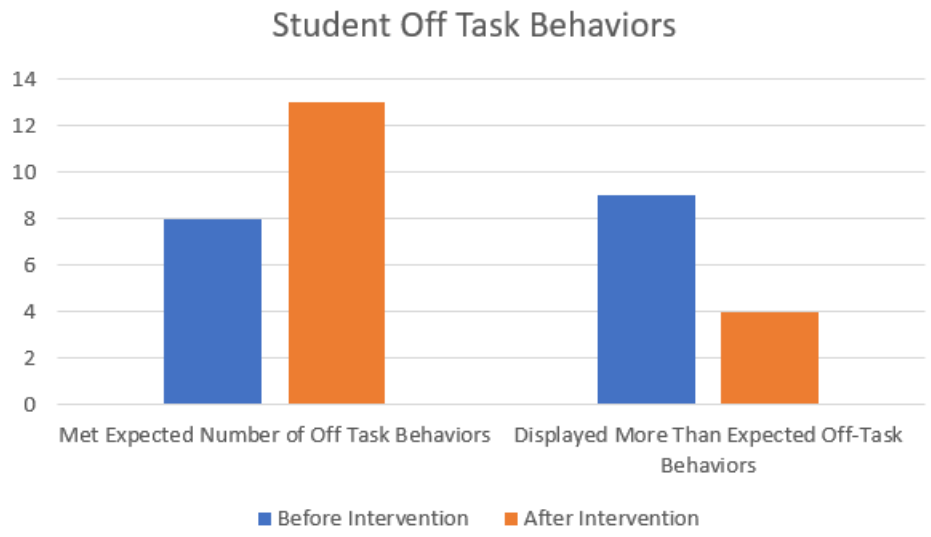


Chart 3: Student Off-Task Behavior Analysis



Limitations of the Study

Limitations of the action research include the limited number of students, teachers, and teachers' assistants participating in the study. A total of seventeen students, one teacher, and two teachers' assistants were involved. This may have led to some occurrences of off task behavior being missed by the teachers' assistants collecting data due to the high number of students they were responsible for observing at once. Additionally, the small student sample leads to the question of the data being supported should the sample size increase. One teacher was involved in the study. This does not allow different teaching styles, language usage, or personal teacher engagement styles to be considered when analyzing data.

Further Study

The next step would be to implement this study in other Preschool classrooms on a larger scale. Teachers in Preschool and Kindergarten classrooms would be shown the results of the study to increase their understanding prior to deciding if this intervention would be of interest. Teachers would participate in a professional learning opportunity to engage them in learning

around how to create their own hands-on, interactive materials and how to effectively add them to their literacy routine. Additional preparation time would be given to teachers implementing this intervention due to the time required to prepare class sets of hands-on, interactive materials.

Conclusion

Considerable research has been done to support use of hands-on learning with young students. The subject areas of mathematics and science are well researched while use of hands-on materials during literacy activities are still being studied. This study provides support to past research showing use of hands-on, interactive materials during large group narrative literacy activities works for young students. Preschoolers observed in this study made a significant amount of growth from preassessment to assessment post intervention. Students using hands-on materials during literacy activities showed greater comprehension skills and on task behaviors than they did while not using interactive materials prior to intervention. Ninety-four percent of students in this study made growth from preassessment to post assessment and sixty-four percent of students grew from not proficient to proficient through the intervention of using hands-on materials during narrative literacy activities. The results of this study indicate that, much like science and mathematics, literacy is a subject area hands-on materials should be incorporated into.

References

Buli-Holmberg, J., & Jeyaprathaban, S. (2015, November 30). *Effective practice in inclusive and special needs education.* International Journal of Special Education. Retrieved February 5, 2022, from https://eric.ed.gov/?id=EJ1099986

Cabell, S. Q., DeCoster, J., LoCasale-Crouch, J., Hamre, B. K., & Pianta, R. C. (2013). Variation in the effectiveness of instructional interactions across preschool classroom settings and learning activities. *Early Childhood Quarterly*, *28*, 820–830. Retrieved February 15, 2022.

Cavanaugh, D. M., Clemence, K. J., Teale, M. M., Rule, A. C., & Montgomery, S. E. (2017). Kindergarten scores, storytelling, executive function, and motivation improved through literacy-rich guided play. *Early Childhood Education Journal*, *45*(6), 831–843. https://doi.org/10.1007/s10643-016-0832-8

Chow, J. C., Granger, K. L., Broda, M. D., & Peterson, N. (2021). Predictive role of classroom management in literacy development in preschool children at risk of ebd. *Behavioral Disorders*, *47*(1), 53–63. https://doi.org/10.1177/0198742920972322

Colliot, T., & Jamet, É. (2019). Asking students to be active learners: the effects of totally or partially self-generating a graphic organizer on students' learning performances. *Instructional Science, 47*(4), 463-480. http://dx.doi.org/10.1007/s11251-019-09488-z

Courtier, P., Noveck, I. A., Léone, J., & Prado, J. (2021). Effects of montessori education on the academic, cognitive, and social development of disadvantaged preschoolers: a

randomized controlled study in the french public-school system. *Child Development*, *92*(5), 2069–2088. https://doi.org/10.1111/cdev.13575

Dejonckheere, P. J. N., De Wit, N., Van de Keere, K., & Vervaet, S. (2016). Exploring the classroom: Teaching science in early childhood. *International Electronic Journal of Elementary Education*, *8*(4), 537-557. http://ezproxy.nwciowa.edu/login?url=https://www.proquest.com/scholarly-journals/exploring-classroom-teaching-science-early/docview/1807740291/se-2

Dykstra Steinbrenner, J. R., & Watson, L. R. (2015). Student engagement in the classroom: the impact of classroom, teacher, and student factors. *Journal of Autism and Developmental Disorders*, *45*(8), 2392–2410. https://doi.org/10.1007/s10803-015-2406-9

Harvey, H., Dunlap, G., & McKay, K. (2021). Primary and secondary effects of prevent-teach-reinforce for young children. *Topics in Early Childhood Special Education*, *41*(2), 100–114.

Infurna, C. J. (2020). What makes a great preschool teacher? best practices and classroom quality in an urban early childhood setting. *International Electronic Journal of Elementary Education*, *13*(2), 227–239.

Jung, E., Brown, E. T., & Karp, K. S. (2014). Role of teacher characteristics and school resources in early mathematics learning. *Learning Environments Research*, *17*(2), 209-228. http://dx.doi.org/10.1007/s10984-014-9159-9

Korbach, A., Ginns, P., Brünken Roland, & Park, B. (2020). Should learners use their hands for learning? results from an eye-tracking study. *Journal of Computer Assisted Learning*, *36*(1), 102–113. https://doi.org/10.1111/jcal.12396

Kosmas, P., Ioannou, A., & Retalis, S. (2018). Moving bodies to moving minds: a study of the use of motion-based games in special education. *Techtrends*, *62*(6), 594–601. https://doi.org/10.1007/s11528-018-0294-5

Marley, S. C., Levin, J. R., & Glenberg, A. M. (2010). What cognitive benefits does an activity-based reading strategy afford young native american readers? *The Journal of Experimental Education*, *78*(3), 395–417.

Marley, S. C. & Szabo, Z. (2010). Improving children's listening comprehension with a manipulation strategy. *The Journal of Educational Research*, *103*(4), 227–238.

Mucchetti, C. A. (2013). Adapted shared reading at school for minimally verbal students with autism. *Autism : The International Journal of Research and Practice*, *17*(3), 358–72. https://doi.org/10.1177/1362361312470495

Ritz, M., Noltemeyer, A., Davis, D., & Green, J. (2014). Behavior management in preschool classrooms: insights revealed through systematic observation and interview. *Psychology in the Schools*, *51*(2), 181–197. https://doi.org/10.1002/pits.21744

Shah, P. E., Weeks, H. M., Richards, B., & Kaciroti, N. (2018). Early childhood curiosity and kindergarten reading and math academic achievement. *Pediatric Research*, *84*(3), 380–386. https://doi.org/10.1038/s41390-018-0039-3

Simoncini, K., & Lasen, M. (2018). Ideas About STEM Among Australian Early Childhood Professionals: How Important is STEM in Early Childhood Education? *International Journal of Early Childhood*, *50*(3), 353-369. http://dx.doi.org/10.1007/s13158-018-0229-5

Spencer, T. D., Petersen, D. B., Slocum, T. A., & Allen, M. M. (2015). Large group narrative intervention in head start preschools: implications for response to intervention. *Journal of Early Childhood Research*, *13*(2), 196–217.