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The Effect of Differentiation on Literacy Performance in Kindergarten

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The Effect of Differentiation on Literacy Performance in Kindergarten

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Abstract

This action research aimed to determine the effects of differentiation of instruction on literacy comprehension skills. Kindergarten students from a public elementary school in the Midwestern United States participated in this 6-week study. Throughout this time, many points of data were collected. Pre-and post-testing were used to measure students' comprehension skills before and after each mini-unit, teacher reflections were used to take notes of student progress, and observations of student engagement were noted throughout each lesson. An increase in students' literacy comprehension skills was observed throughout the study, therefore, inferring that differentiation can work to impact student academics. Through this research, I have found that students' engagement in learning varies considerably based on their interests and desires. In addition, students are much more successful in comprehending information after engaging with it in multiple ways. Further research should include more extensive and more diverse classrooms. This research works to inform my practice as a teacher as I continue to find ways to integrate differentiation into neurodiverse classrooms to help all students learn to their fullest potential.

Keywords: Differentiation, neurodiverse, kindergarten

Not all students engage in learning the same way. Students have innate neurological differences, and their interests and academic levels can vary drastically. This is especially true in kindergarten classrooms where students are entering the classroom with many different experiences and academic backgrounds. Because of this, kindergarten students at any academic level require various methods of learning and need to be challenged in their work in order to achieve success. This can quickly become problematic as students can continue to struggle with concepts that are too far out of reach or become bored with learning as the concepts are not challenging enough. In response to this concern, I utilized differentiation to create various learning experiences for students. I then used these experiences to assess their understanding of literacy topics.

During literacy instruction, a variety of resources can be used to ensure students are receiving adequate instruction. Many teachers form literacy centers for their students to work in small groups based on their reading levels, while others teach lessons to the group as a whole. Both of these strategies can be effective for learners. Using literacy centers in the classroom allows students to work independently from the teacher and with a small group of peers at their same reading level. Students can work through different stations or relevant activities and participate in various learning activities that are tailored to their specific learning needs and may be different from the other groups. However, not all students are learning during literacy centers. Working independently from the teacher means students are relying heavily on their own body regulation and self-control skills, which is not always successful. In this setting, students are required to be responsible for their own learning. Keeping increased focus at these centers can be a difficult task. Students rely on one another for problem-solving skills and the teacher is not always readily available to help with tasks, small or large. In a large group setting, although a

teacher may be able to guide all students throughout their learning, it is not leveled or targeted to the specific needs of small groups of students. However, a teacher may be able to more effectively manage a large group of students who are all participating in the same lesson and activity. Both of these strategies can be proven effective for different groups of students but relies heavily on the teacher to create various learning opportunities. Teachers need to constantly be discovering new ways to engage all students so they are actively participating in their learning experiences.

Throughout this research, the goal for kindergarten students was to increase their ability to comprehend key literacy concepts such as retelling key details and identifying characters and settings. Students worked towards these goals by engaging in literacy “mini-units” and completing pre- and post-tests regarding literacy comprehension skills. Students were then tested before the use of the differentiated materials and after. I, the teacher, then observed student engagement as well as reflected on my practices and strategies through the use of a teacher journal. The study occurred three days a week for six consecutive weeks.

The goal of this research was to find effective differentiation strategies for educators to implement in the neurodiverse kindergarten classroom in regard to literacy comprehension skills. Students enter kindergarten with varying social and academic abilities (Dijkstra, E. et al., 2016). These differences can be more commonly identified as neurodiversity. Simply put, neurodiversity is the difference in the thinking and neurological makeup of individuals (Retenbacn, Prislovsky, & Gabriel, 2021). Neurodiversity creates a problematic predicament where standard teaching practices are not sufficient in allowing adequate progress in literacy abilities for each student at the kindergarten level. Because of this, it is important for teachers to find ways to differentiate materials to aid students in achieving academic goals. Although

differentiation is proven effective, teachers often lack practicing it effectively within their classrooms. Teachers can ensure that all students are receiving a proper and adequate education that challenges them in unique ways and fosters their unique abilities through the use of differentiation in a neurodiverse classroom.

The research setting was a kindergarten classroom of students ranging in age from 5 to 6 years old. The number of students in the class was 17 and all students participated in the study. However, one student's data was not collected as part of the research because their parent/guardian did not provide consent. The elementary school where the research took place was in a rural community in the Midwestern United States. The population of the elementary school was 780 students from preschool to 12th grade. The population consisted of 97.1% white students, 1.3% Hispanic/Latino students, 1.3% students of two or more races, and 0.3% Black or African American students. 19.5% of the students receive free or reduced lunch (NCES, 2022).

Naturally, students differ in their interests and learning experiences. Through differentiation, teachers work towards bridging the gap between student differences and work to ensure each is achieving academic success. Differentiating materials for neurodiverse students is a crucial aspect of ensuring their engagement in their learning.

Theoretical Framework

Self-efficacy theory states that a student's ability to control their motivation, behavior and social environment will determine their performance (Bandura, 1977). Self-efficacy theory relates to how likely students are to exert effort into their learning based on their confidence in that particular skill. Self-efficacy is said to be “developed by four main sources of influence including, mastery experiences, vicarious experiences, social persuasion, and emotional states” (Lopez-Garrido, 2020). Students who are more motivated and confident in their skillset are more

likely to find success. Self-efficacy also influences a student's ability to persevere through difficult and daunting tasks. Students who have self-efficacy are more motivated and dedicated to their learning, and are more likely to find success in their academic performance.

In literacy, self-efficacy can prove important as students motivate themselves to be engaged with the content, remain on task, work independently, and comprehend big ideas. Comprehending literacy concepts relies on the effort students are willing to put forth and the positive thinking skills they are able to utilize throughout their learning. Self-efficacy encompasses both of these ideas and urges individuals to remain motivated. Because students have varying levels of interests and ideas, it is important that teachers provide insight into self-efficacy and its importance in the classroom. Fostering an environment that promotes self-efficacy can influence how a student comprehends, makes meaning of, and understands the different concepts of literacy. As teachers work to find ways to differentiate learning experiences in the classroom, they must also consider students' self-efficacy and willingness to learn.

Because differentiated instruction often requires students to work independently, it is crucial that students acquire self-efficacy skills as suggested by Bandura in order to succeed in various settings. Students differ from one another in many ways including the way they are engaged in the classroom. Because of these differences, many different approaches to learning are utilized. Students must have the determination to achieve their academic goals and perseverance to try new things. It is a teacher's responsibility to provide various learning opportunities for students, but it is the student's responsibility to overcome obstacles that work to interrupt their learning experiences. Self-efficacy works to encourage a neurodiverse student body to rely on individual abilities to achieve academic success.

Introduction to Review of Literature

Every student is capable and deserving of adequate education and school experience. It is a teacher's distinct responsibility to offer students various opportunities to learn and grow in the classroom. Students will build and maintain trustworthy relationships with teachers and students alike through these learning opportunities. A neurodiverse student body promotes diversity, inclusivity, and connectedness among students and teachers and should be valued for its prominence. Valuing students and celebrating their diverse abilities is essential to a successful classroom in terms of community and effective classroom management. For students to be successful, teachers should utilize differentiation within classrooms. However, using such strategies that allow for adequate learning for all students can be overwhelming for educators. Teachers are not overly effective at differentiation materials because they have not been adequately trained (Dixon, F. et al., 2014). Kindergarten students enter the classroom with varying social and academic abilities. This neurodiversity creates a gap in student understanding when a generic curriculum is utilized in the school. As teachers become more familiar with their students, personalizing and implementing quality lessons will inspire students to explore their strengths and pursue their talents as they feel valued and welcomed in the classroom. This paper will investigate effective strategies for teachers to utilize in a neurodiverse classroom to provide a positive learning environment for all learners through differentiation. Finding this success relies heavily on the definition of neurodiversity, teacher training, student-teacher relationships, and differentiation in the classroom.

Define Neurodiversity

Students enter the classroom with varying social and academic abilities (Dijkstra, E. et al., 2016). Specifically, within early education such as kindergarten, students' abilities differ significantly in terms of “cognitive and socioemotional development, socio-economic and

cultural background, and so forth, all of which can be highly relevant for their future learning” (Dijkstra, E. et al., 2016, p. 359). These differences can be more commonly identified as neurodiversity. Neurodiversity is simply the difference in the thinking and neurological makeup of individuals (Retenbacn, Prislowsky, & Gabriel, 2021). The literature seems to divide individuals into two categories: neurotypical and neurodivergent (Retenbacn, Prislowsky, & Gabriel, 2021). Neurotypical individuals are considered archetypal in their thoughts and behaviors whereas neurodivergent individuals are commonly identified with disorders or disabilities and therefore have atypical ways of thinking and processing information (Hughes, 2020). Students who are frequently recognized with neurological differences and are considered neurodivergent are also commonly identified with Autism Spectrum Disorder (Hughes, 2020). Hughes (2020) explains that neurological differences also include individuals with ADHD, bipolar, dyslexia, schizophrenia, and several other emotional, behavioral disorders (Hughes, 2020). Hughes (2020) also notes that the ever-changing definition of neurodiversity may be beginning to represent the familiar political categories of gender, class, and race as well. This definition aligns with Retenbacn et al. (2021), who also defines neurodiversity as differences in individual neurological makeup. These definitions of neurodiversity work to highlight the variations and distinctness of individuals. Defining neurodiversity leads to the understanding of unique perspectives that will enhance comprehension of concepts and ideas. It is essential to consider neurodiversity while working to differentiate materials for students.

Teacher Training

Because neurodiversity is prominent in kindergarten classrooms, teachers must be able to provide differentiation to students. Although differentiation has proven its significance in the school, research shows that teachers are not effectively implementing this practice regularly

(Latz, A. et al., 2008). It is suggested that a possible solution to this problem may be to increase the amount of mentoring and peer coaching teachers receive throughout their careers. Teachers need to be adequately educated and knowledgeable about different aspects of neurodiversity to encourage and inspire their individuality. Walters (2015) urges teachers to focus on the students to not interfere with student disclosure, self-identification, or progress in the classroom. Through each strategy, teachers are expected "to the best of their abilities...purposefully ensure that every child in their classroom knows that their teacher cares about them as an individual, likes them, and is available to them as a dependable source of support" (Rucinski, Brown, & Downer, 2017, p. 1002).

Aside from being adequately trained to implement differentiation strategies, teachers must also develop their emotional intelligence and reflect on their classroom management strategies. Classroom management strategies play a significant role in the construction of a positive and welcoming learning environment. Within a neurodiverse classroom, "effective management means to: minimize tension inside the classroom, moderate students' behavior, listen to students' ideas, encourage students to do better, and pay attention to their requirements" (Valente, Monteiro, & Lourenco, 2018, p. 743). By minimizing tension and stress within the classroom, teachers are working to counteract the uncertainties students may have that could hinder their abilities in the school. Moderating students' behavior and listening to their ideas effectively keep students involved in classroom activities. Encouraging students to do better teaches accountability and guides them in paying attention to their expectations. Sutherland, Alder, & Gunter (2003) support this claim. They describe how students with emotional behavior disorders require opportunities to be active members of the classroom through participation in instruction beyond simple methods of teaching.

Student-Teacher Relationships

Educators who strive to support a classroom with neurodiverse students realize that one successful way to promote a positive learning environment is to embrace neurodiversity. A neurodiverse classroom celebrates the different strengths of each student, values their talents and gifts, and motivates them to pursue their interests. Rucinski (2017) demonstrates that students who are taught by teachers that foster a positive learning environment through finding the value in every student strongly correlate with children's future experiences and outcomes, not only in the classroom but throughout their lifetime (p. 994). Through this study, Rucinski and Downer (2017) examined how student-teacher relationships affect student outcomes. The study included 526 students in third through fifth grade and 35 teachers from six different elementary schools. Throughout the study, students reported their feelings towards teacher relationships and classroom climates. Students who reported quality relationships with teachers and comfort with the classroom climate were more likely to be high achieving and have fewer depressive symptoms than those who did not (Rucinski & Downer, 2017). This study also showed that students with poor teacher relationships might also offer more aggression in highly emotional classrooms. These findings demonstrate the importance of teacher-student relationships and suggest that teachers be properly trained in how to develop and foster relationships with students positively.

Additionally, students who feel welcomed and safe in a positive learning environment can gain the confidence and necessary skills required to succeed. Students who feel like they have a voice in the classroom are more likely to feel accepted by their teachers and peers (Walters, 2015). Because of this, it is a teacher's ethical duty to "listen to students and value their insights" (Walters, 2015, p. 357). It is essential that students feel empowered to speak out when

they are unsure of their expectations or require clarity on a topic. Retenbach et al. (2021) also express the importance of inviting each child to be true to who they are. Teachers must provide opportunities for students to communicate, collaborate, and learn in ways that incorporate their strengths (Retenbach, Prislowsky, & Gabriel, 2021, p. 61). Tough (2016) explains how students feel competent when teachers give them challenging yet achievable tasks.

Neurodiversity & Differentiation

Because students desire appropriate challenges that allow them to be successful, teachers must better their understanding and practice of differentiated instruction. One way to achieve this goal is to embrace diversity and work to address multiple modalities as well as the abilities of students within the classroom (Gumpert, M., & McConnell, W., 2019). Children need to be addressed on an academic level that meets their cognitive needs in order to develop their talents to their highest potential. When students are not met at their level, they are often not challenged in a way that leads them to academic growth (Dijkstra, E. et al., 2016). Differentiation should be focused on all children rather than limited to those who are at a lower academic level. Dijkstra et al. (2016) suggest that the most effective practices when working towards differentiation include working with whole groups, small groups, and individual students. Because students are challenged in different ways, these various learning modules find ways to reach each student. Another important aspect of differentiation is monitoring student growth. Researchers suggest that students' academic abilities should be monitored and recorded frequently to show student growth (Dijkstra, E. et al., 2016).

Conclusion to Review of Literature

A neurodiverse student body creates the difficult task of differentiating materials for students. By embracing these differences and effectively utilizing differentiation, students will

find ways to become more engaged with the material and ultimately find success. Through teacher training and student-teacher relationships, educators are more likely to practice differentiation within their classrooms effectively. Educators who embrace neurodiversity, provide differentiated materials to their students and work to foster a positive learning environment in their classroom

Methodology

The purpose of this research was to find effective differentiation strategies for educators to implement in a neurodiverse kindergarten classroom in regard to literacy comprehension skills. Throughout this study, both qualitative and quantitative data were collected. Participants participated in pre and post-testing that examined their knowledge of literacy comprehension questions. The teacher observed student participation, reflected on the differentiated practice, and considered student growth throughout the duration of the study. Students were assessed and observed before the use of the differentiated materials and after. The teacher observed student engagement as well as reflected on teacher practices and strategies.

The study occurred and data was collected three days a week for six consecutive weeks. Each week a “mini-unit” was used as the instruction for students. Each “mini-unit” lasted for one week and consisted of three literary lessons each. During the six weeks of the study, observations were made of students’ engagement, pre/post-tests were given to students through individual interviews, a worksheet was utilized to assess comprehension, and finally, a journal was completed by the teacher after each lesson to record effective strategies, reflective thoughts, and work to eliminate biases.

This 6-week study took place in a kindergarten classroom located at an elementary school in the Midwestern United States. The study focused on 16 children, 8 males and 8 females who

participated in all of the activities. All students had the opportunity to complete the activities in the study during our usual time for literacy instruction. All strategies implemented and assessments given were part of normal educational practice and provided students with many opportunities to comprehend the materials and expectations required by the state standards. As the standards state, Kindergarten students should be able to “identify characters and setting, in a literary text, with prompting and support” and “correctly order beginning, middle, and end of a story, with support and guidance” (Department of Education, 2020).

Among the different methods to collect data, pre-and post-assessments were used throughout the study to assess students’ growth (see Appendix A). This assessment was given before and after each “mini-unit” after the first and third lessons. The teacher conferenced with three individual students at random before the first lesson and the same three students after the last literacy lesson of that unit. The students were selected at random and differed for each unit. The assessment included questions regarding the characters, setting, and retelling of key details of the story. In addition to pre and post-testing, observations of students were assessed and recorded during each lesson throughout the unit. Students were observed based on a rubric that assessed their engagement, and participation, and focus on a scale from one to three (See Appendix B). Students who were engaged, participating, and focused throughout the entirety of a lesson received a score of one. Students who were engaged, participated, and focused for some of the lessons were given a score of two. Students who were not engaged, participating, and focused on the lesson were given a score of three. This tool was used during and after each lesson to assess students throughout the unit. Additionally, students were given a short assessment at the end of each mini-unit. In this assessment, students were to answer the comprehension questions individually through writing and drawing on a worksheet that asked

students to draw/write the setting, the characters, and a “beginning, middle, and end” retelling of the story from the corresponding unit (see Appendix C). Finally, the teacher reflection journal was used after each lesson to reflect on the differentiation strategies used and their effectiveness in the classroom (see Appendix D). The answers to three questions were recorded in the journal: what differentiation strategy was used? Was it (the strategy) effective or not? What are the next steps for this lesson and future lessons? The teacher used this collected data to analyze students' progress through each unit and the action research as a whole.

Each “mini-unit” was structured the same way. Each unit was one week long and consisted of three lessons. Typically the lessons took place on Mondays, Wednesdays, and Fridays, but may have differed slightly due to holidays and/or events. During the first lessons, a story of focus was introduced to students as a whole group through a cold read. A cold read is a reading of a text without any context, pre-definitions, or introduction given. It is the most “accurate, efficient, and conservative way to assess a student’s reading ability” (Fountas & Pinnell, 2022). After a cold read of the story, 3 students were selected at random for the pre-test and teacher discussion. These same 3 students would be questioned as part of the post-test on the third day of the unit. Students were questioned about the character, setting, and retell (beginning, middle, end) of the story. Also during the first lesson, observations of students' engagement, participation, and focus were recorded. On day 2 of the unit, a different strategy was used. On this day, students were organized into small groups based on their reading levels (level A in one group, B in a second, etc.) and rotated through stations and activities related to the story. Stations included but were not limited to puzzles that when put together revealed characters from the story, sorting and organizing the timeline of the story, re-reading/watching the story on iPads through a Youtube video by scanning a QR code, identifying sight words in the story, and many

other hands-on activities that connected relevant literacy skills to the corresponding story. During the stations, students rotated through various activities. One of the stations included small group instruction with the teacher. During this time, the same book was again reintroduced to small groups of students. Big ideas, concepts, characters, settings, and retelling strategies were taught during this time to students in small groups. During and after this lesson, observations of student engagement, participation, and focus were recorded. On the final day of the unit, the last lesson focused on the same story once more, and a new strategy was used. After the story was once again read aloud to a large group of students, they were asked to complete a worksheet that assessed their understanding of the characters, setting, and retelling. This type of summative assessment was used to gauge students' understanding of the standards that were being assessed. The 3 students who were given the pre-test were given the post-test at this time. Finally, student observations were recorded for the final day and the teacher journal was completed by the teacher. This same process continued three days a week for six consecutive weeks, using a new focus story each week, and data was recorded.

After the data was collected it was analyzed. I assessed student interviews, teacher journals, assessments, and classroom observations to determine the effectiveness of different strategies used. I sorted the data that I collected by unit and looked for trends among them to determine which strategies were most effective. I averaged the scores from the observations and looked for trends among them. I used the teacher journal to reflect on the different strategies and looked for correlations between how I perceived the effectiveness of the strategy and how successful students were in completing the different activities or worksheets. I used the summative assessment to acknowledge which students met the standard and used these assessments to compare student growth throughout each week.

Analysis of Data

The raw data was collected and analyzed by the teacher. The observations from students were collected three days a week using a rubric to analyze students' participation, focus, and engagement in each lesson and strategy. The data collected was compared to the data from every other day of the lesson to show which strategies students were most engaged with. The data from students' assessments were collected from students through drawings and simple words and phrases. The worksheets were interpreted and assessed based on students' understanding of the concepts. The responses from the pre and post-assessments were compared to one another and evaluated based on their responses. All data was collected and organized based on the topic, it was then analyzed to determine any patterns and trends in students' literacy comprehension skills. The data was used to determine which strategies were most effective for student learning.

Findings

Classroom action research took place in a kindergarten classroom to better one's practice and understanding of differentiation in a neurodiverse classroom. Participants partook in pre and post-testing that examined their knowledge of literacy comprehension questions. The teacher observed student participation, reflected on the differentiated practice, and considered student growth. Participants included fifteen kindergarten-aged children, 8 males, and 7 females. 4 of these children were identified and enrolled in the Special Education program and on Individualized Education Plans (IEP). 6 of the fifteen children were enrolled in speech services at the school, 3 of the fifteen children received intervention for reading skills, and 3 of the fifteen children were reading at a second-grade level. This classroom in particular was very neurodiverse as skill sets varied drastically. The research was based on the question, *What effects*

will differentiation in a neurodiverse kindergarten classroom have on literacy comprehension skills?

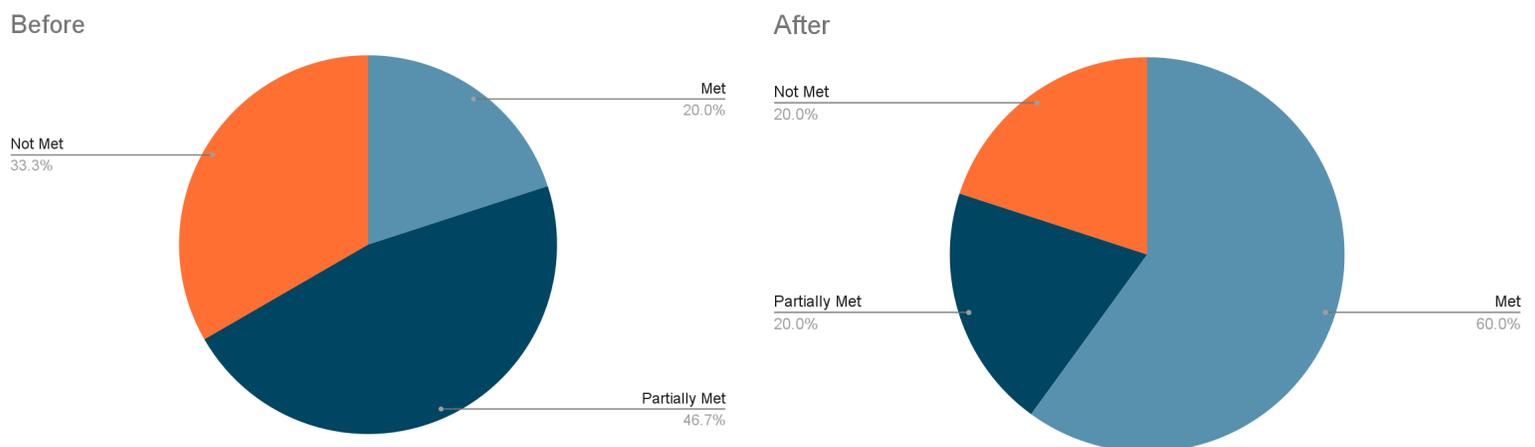
Differentiation and Comprehension

Differentiated instruction was implemented in the classroom throughout the action research. Differentiation looked like small group learning, whole group learning, iPad time, independent worksheets, cold reads, student surveys, and interviews. Students were divided into small groups based on academic abilities and lessons were accommodated based on the circumstances. For example, small group activities varied from group to group based on reading level and higher-achieving students were prompted to write responses whereas others would be asked to orally retell or draw responses. The action research suggested that students who were higher-achieving prior to the action research continued to be highly successful in the various types of instruction and differentiated learning presented throughout the action research. Some students who were lower achieving academically before the research took place began to increase in their learning, while others continued to be low achieving both before and after the differentiated strategies were used. The pie chart below shows the differences in student performance before and after the action research. It shows a slight increase in students who met the literacy comprehension goal that measured how accurately students could identify the characters and the settings of stories, as well as retell the story in a beginning, middle, and end sequence. The results were collected from the ESGI assessment students partake in every 3 months. The “before” data was collected in December of 2021, prior to the action research taking place. The “after” results were collected in March of 2022, directly after the action research took place. The results of the data were organized into three categories, met, partially met, and not met, and displayed on two pie charts below (see Figure 1). Students who achieved the goals with

100% accuracy are documented in the “met” category. Students who achieved the goals within 75% to 99% percent accuracy were reflected in the “partially met” category. Students who were not able to achieve 75% or more of the goal were recorded in the “not met” category and were referred to both the summer academy program and reading intervention specialist for the next school year. Of the approximately 3 students in the “not met” category, 2 of these kindergarteners are in the Special Education program, receiving additional instruction in literacy.

Figure 1

Student progress towards goal



Note. Students’ assessment scores of the literacy topics before and after the action research took place.

Engagement

Student engagement was measured during and after each lesson. Student engagement was assessed each day using a rubric and scale from 1 to 3. After student engagement was recorded, the average was taken of their score was taken and compared to the lessons where differentiation strategies were used. Student averages were sorted into three categories, engagement,

participation, and focus. Students each received three scores. These three scores were averaged to represent their activeness in their learning. The averages of these three scores were taken and compared to the other students. Because there were many scores were collected from each lesson, the averages for each student were too difficult to compare. Because of this, an average of all student scores were taken for each lesson and the lesson averages for overall engagement were compared to one another to determine in which lessons students were more engaged. The charts below show the findings of student engagement throughout the action research. The chart shows that before strategies were used, the majority of students were engaged most of the time or not at all, with only a small percentage of students being fully engaged all of the time. After differentiation strategies were used, student engagement averages shifted to the majority being engaged most of the time if not all of the time. The averages of the scores reflect that students were likely more engaged with the materials when differentiated strategies were used as compared to when they were not.

Table 1

Student Engagement Averages Before Differentiation

Engagement	None of time	Most of time	All of time
% of students	33%	53%	14%

*percentages rounded

Table 2

Student Engagement Averages After Differentiation

Engagement	None of time	Most of time	All of time
% of students	26%	33%	41%

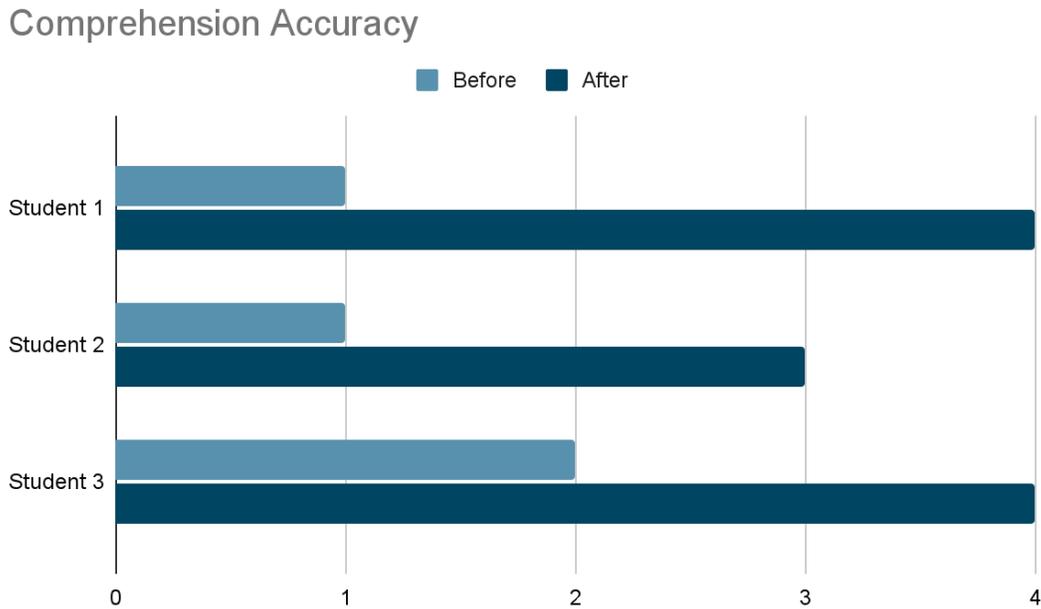
*percentages rounded

Pre and Post Testing

Pre and post-tests were given to three students, chosen at random, before and after each unit. Pre-tests were given on the first day, day 1, of the unit, and post-tests were given on day 3, the final day of the unit. Students were asked to retell key details of a story including the characters, setting, beginning/middle/end retell, and finally, students were asked to give their opinion on the story. Of the students assessed, few were able to correctly answer the questions adequately after day 1 of the unit. On day 1, the story was simply introduced using a cold read and differentiated instruction was not utilized. On days 2 and 3, differentiation strategies to evaluate the stories throughout the week were used and students were reevaluated with the post-test. The majority of students began to complete the post-tests with great accuracy. The bar graph below compares the results of students tested before the differentiation strategies and after (Figure 2). The four questions asked to students during the pre and post-test were: who were the characters in the story?, what happens in the story? (beginning, middle, end), where did the story take place?, and finally did you like the story? Because the final question was opinion based, that question could not be counted as incorrect, and students were automatically given a score of 1 for their response. Students were required to answer the questions in their entirety in order to receive the point for that question. Partially correct answers were considered as incorrect for this particular graph.

Figure 2

Comprehension Accuracy Before & After Differentiation Strategies



Note. The graph reflects the averages taken from each pre and post-evaluation done with students.

Teacher Evaluation and Reflection

A teacher journal was kept used to reflect on student progress, teacher biases that may be present, and the next steps that needed to be taken to ensure students were progressing towards the goal. The teacher's journal was used to find correlations between the teacher's interpretation of the lesson's success and the student's performance. The results reflected that the majority of the time that the teacher observed and recorded success, students' work, and engagement also reflected that outcome.

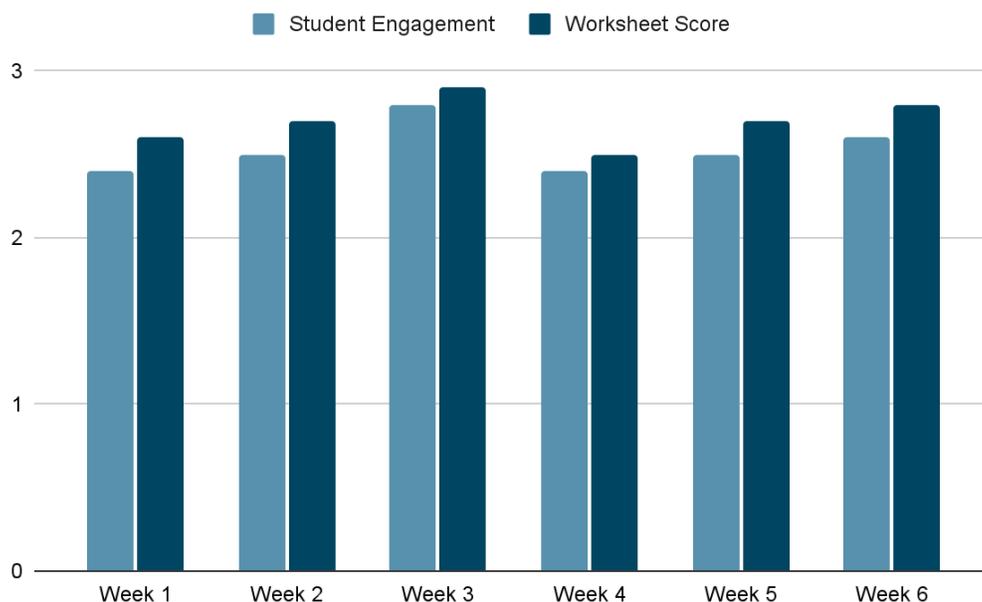
Summative Assessment

At the end of each unit, students were asked to complete a worksheet that assessed their literacy comprehension of the topics discussed through the focus story for that week.. Using

differentiation, students were given the option to write, draw, or orally retell to complete the worksheet. The worksheet revealed that only some of the students could comprehend and recall the characters, setting, and timeline of the majority of the stories and use that information to depict their understanding through words or illustrations. Some of the students who were not able to complete the worksheet with great accuracy struggled with illustration and word-formation but were able to orally retell the events of the story, while others simply could not complete the task no matter the approach. Because of these findings, the averages of student engagement were compared to the student assessments and the findings revealed that students who were given a higher overall rating in engagement, were more likely to complete the worksheet accurately. Figure 3 displays these findings. The results suggest that the relationship between student engagement and performance on the worksheet have a strong correlation and some trends emerged.

Figure 3

Comparison of averages of student engagement to averages of student worksheet performance



Conclusion

Most of the trends found in this data reflected my observations in the classroom. The different data points represent the relationship between the students and their understandings gained throughout the research. Additionally, the research has helped me to see the effect of student engagement on their learning and the result of using differentiation strategies to reach a neurodiverse student body. Additionally, most of the students questioned in the pre and post-testing suggested that they enjoyed the stories we read, discussed, and evaluated during the action research. The research also informed me of the importance of self-reflection and encouraged me to continue to reflect on my student's behaviors and understandings and use that to further inform the planning of future lessons. As shown in figure 1, our class as a whole did increase their understanding of the literacy goals, but some students are still in the “not met” category and did not improve their understanding no matter the strategies used. The observation of student engagement did show a slight increase as shown in Tables 1 and 2, but the majority of students seemed to be engaged in the learning based on the topic of the book and the activities presented. Trends revealed that students were likely less engaged in the worksheets when compared to small group activities, in which they were more likely to be engaged. Overall, this research acts as a reminder that students’ learning experiences and skills differ drastically no matter the strategies used in the classroom, but that teachers should continuously look for ways to reach all students in order to challenge their academic abilities.

Discussion

Neurodiversity among students creates a predicament in many classrooms that cannot go unaddressed. Because of this, standard teaching practices are not sufficient and need to be evaluated to fit the needs of a diverse student body. Students have diverse learning needs based

on their unique abilities, including their interests, preferred learning styles, backgrounds, and much more. The research and data show that it can be difficult to measure students' academic abilities in regard to the different teaching strategies used in order to find what is most effective for all students. Furthermore, what proves effective for one student may be inefficient for the next. Because students' academic abilities are inconsistent, it is difficult to know what and how to teach in the classroom to be the most beneficial for your students. Because of this, differentiated instruction strategies must be considered in the classroom. The goal of this research was to find effective strategies that can work to bridge the gap between students' academic differences.

After six weeks of collecting data and analyzing the results, I conclude that differentiating the materials does prove to be effective for many students. As observed throughout the research, students were typically more engaged when small group activities took place as opposed to whole group instruction and individual worksheets. Overall, students' literacy comprehension skills improved and students typically enjoyed the activities presented during this time. The study showed that we need to incorporate differentiation strategies into the classroom as frequently as possible to reach more students. The data found in this research suggests that differentiated instruction does improve students' academic performance.

There were many different methods of collecting data that proved these results. The most prominent was collecting data on student engagement. Through this assessment, students were rated on their engagement, participation, and focus throughout the lesson. When students worked in small groups with hands-on activities their overall score increased as compared to when a lesson was taught to the whole group and students' scores were typically lower during large group instruction. The averages from these scores show a drastic increase as the research

progressed and students became more familiarized with their groups and comfortable with the various activities. Another crucial aspect of collecting this data included making observations of students and using formative assessments to gauge their understanding. All in all, The data was useful to my teaching practice as it continues to guide future instruction.

Change in Practice

The results of this study encourage me as a teacher to incorporate intentional differentiated strategies into my teaching practices. By doing so, not only are students more engaged with their learning, but they also have a variety of opportunities to engage with materials and rely on their self-efficacy skills to persevere in situations. Students began to think critically about topics and problem solve situations without guidance from the teacher. With this, the study has revealed the importance of monitoring students' behaviors and interactions as well as reflecting on my teaching practices. Both of these strategies informed my future practices and helped me to make accommodations where I saw fit to encourage further learning.

However, the research has also revealed that there are students who remain low achieving academically and did not benefit from these strategies. With this, the increase in student engagement and progress towards the goals were not overly drastic. Because of this, I would encourage future research to take place that would further explore these ideas.

It is also important to note that although small group learning proved beneficial, whole group learning was also valuable to students. There are many benefits to whole group instruction when it is properly practiced. Teachers should include various opportunities for students to engage in whole group instruction through asking questions, informal check-ins, and individual discussions with students. During whole group lessons, many students were engaged in their learning and many benefited from working in a large group setting, discussions, and activities.

For these reasons, in my future practice I will not eliminate whole group learning, but rather use small group learning to reinforce the more difficult concepts for lower achieving students and find unique ways to challenge higher achieving students. By doing so, I strive to keep a balance of both whole and small group learning to differentiate lessons for my students and provide various opportunities for them to learn.

Variables

There are many variables that could have affected the results of this research. The first and most prominent factor is patterns in the lessons and mini units. Because each unit consisted of three lessons that followed relatively the same outline with different texts, some students may have become more comfortable with assignments as they progressed through the research. For example, the first time we completed an activity or worksheet, students may have been more reluctant due to their lack of experience with the specific activity. However, after a few weeks of completing the activity, students were more comfortable and familiar with the assignment and knew what was expected of them. Thus allowing them to be more vulnerable with their learning, rely more heavily on self-efficacy, and overall interact more deeply with the materials.

Other variables that could have affected the results include students' interests. Measuring engagement can be difficult because students are naturally more engaged with topics they are interested in, yet it is difficult to choose a story that encapsulates every student's interests. For instance, a student may have achieved a higher engagement score simply because they were more intrigued by the topic, rather than comprehending the main ideas. Because of this, a student may have had a higher average engagement score but lacked the ability to complete the summative assessment with accuracy.

In addition, it is important to remember that goals and routines are also large factors when implementing different strategies in the classroom. Building stamina among students, especially at the kindergarten level, is crucial to small group learning. Once stamina is built, students are able to sustain their focus for larger amounts of time. Building stamina is a crucial aspect of effectively integrating differentiated practices in the classroom and may have impacted the results of the data. Using the strategies and information learned from previous lessons to guide future instruction is also important. Taking note of how successful students were with a particular activity was also beneficial to see what was more effective for their learning. Finally, the teacher's subconscious bias in recording and analyzing data has the potential to impact the results of the study.

Future Research

Although using a variety of teaching strategies improved students' engagement and understanding, it is important to remember that there were still many students who did not benefit or improve from these practices. Future research should work to focus on these specific groups of students and attempt to understand what aspects of differentiation strategies do not benefit. Finding ways to differentiate learning to target more specific learning needs will work to benefit these students. Furthermore, providing research on how to group students into small groups would also be beneficial to differentiating learning for students with diverse needs. Discovering if groups should be homogeneous or heterogeneous will help to further understand how students are engaged in their learning and how well they work with others who are like-minded or different from themselves. Another aspect of grouping students to be considered is how large or small the groups should be in order to best reach all students. Overall, future research could be used to find the most effective ways to utilize differentiation in a neurodiverse

classroom. Because this is a prominent and relevant issue, targeting these practices would prove most effective to benefit students and motivate them to not only be participants in their learning experiences but actively engage and make meaning of their time in the classroom.

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Appendix A
Pre and Post-Test Questions

Pretest	Response	Correct	Partially Correct	Incorrect
Who were the characters in the story?				
What happened in the story? (beginning, middle, end)				
Where did the story take place?				
Did you like the story?				

Posttest	Response	Correct	Partially Correct	Incorrect
Who were the characters in the story?				
What happened in the story? (beginning, middle, end)				
Where did the story take place?				
Did you like the story?				

Appendix B
Observation Tracker and Rubric

Student Engagement Tracker Sheet

Date: _____

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Engaged																
Participating																
Focused																

Rubric:

	1	2	3
Engaged	The student is interacting with materials and other students all of the time	The student is interacting with materials and other students some of the time	The student is not interacting with materials and other students
Participating	The student is asking and answering questions and completing worksheets and activities all of the time	The student is asking and answering questions and completing worksheets and activities some of the time	The student is not asking and answering questions and completing worksheets and activities
Focused	The student is having relevant conversations and completing activities in a timely manner	The student is having relevant conversations and completing activities in a timely manner some of the time	The student is not having relevant conversations and completing activities in a timely manner

Appendix C
Summative Worksheet

Draw/Write the **CHARACTER...**

Draw/Write the **SETTING...**

BEGINNING	MIDDLE	END

Appendix D
Teacher Journal

Utilizing Differentiation in a Neurodiverse Classroom

Date: _____

Journal Entry # _____

1. Differentiation Strategy Used:

2. Was it effective? Why or why not?

3. Next Steps:

Notes: