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Impact of Chronological Age Differences on the Academic Performance of Students in a First-Grade Classroom

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Abstract

In this study, the researchers investigated whether chronological age differences had an impact on the academic performance of students in first grade. Twenty-nine (29) first-grade students were assessed and observed. Their teachers also provided data on their performance through interviews and grade reports. Participating students ranged in age from seventy-three (73) to ninety-two (92) months. Performance data was collected for the core subjects of mathematics and reading in both numerical and narrative forms. Data was then analyzed for relevant patterns. Participants were classified as either younger (≤85 months) or older (≥86 months). The younger group showed difficulties in mathematics, while the older group showed some difficulties in reading. The younger group also needed more teacher guidance. Teachers could use this information to offer specific support to students of varied ages. Further research could be done on the causes of the particular differences observed between age groups as well as on ways to reduce age-related performance gaps.

Impact of Chronological Age Differences on the Academic Performance of Students in a First-Grade Classroom

Introduction

The importance of adapting instruction to meet the needs of different age groups has long been recognized in education. In the twentieth century, age-graded schools became the norm (Miller, 1991). The curriculum of early grades differed from that of upper grades, and the teaching methods used at each level varied according to age. These ideas persist today, with most teachers planning their instruction to fit the grade level they teach. This approach often assumes that students in each grade have the same needs because they are in the same age bracket. First graders are usually six years of age (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2015), but this only measures age in years. Children are always developing, and they could undergo big changes in a month or two. In any given class then, students actually represent a range of ages. This is true even of single-grade classrooms. Children must be at least five to start Kindergarten (Yesil Dagli & Jones, 2012), but some of those five-year-olds may be sixty months while others may already be seventy months. Since these chronological age differences follow the class into successive grades, an understanding of their impact, if any, on student learning would be valuable for all teachers.

The purpose of this study was to see whether age differences within classrooms have an impact on performance. The researchers posed the following research question:

Does chronological age impact the academic performance of students in a first grade classroom?

By first grade, students have been learning with their class for at least a year, and they are immersed in the core subjects of language arts and mathematics. The researchers chose this

grade for the above reasons and also because first grade is early enough in the students' education to make changes to their instruction impactful in the long run.

Review of Related Literature

Previous research on the subject of age and academics has yielded somewhat mixed results (Mendez, Kim, Ferron, & Woods, 2015). This could be due to the fact that so many factors besides age are involved in academic performance. Also, most studies done on this topic focused on a specific area such as mathematics, literacy, or attention rather than the overall impact. When taken together, however, the body of literature points to better academic performance for the older students in classrooms (Sakic, Burusic, & Babarovic, 2013; Horstschräer, & Muehler, 2014). Some found advantages in long term outcomes (Hurwitz, Smith, & Howell, 2015) while others documented the advantages in the lower grades (Bernardi, 2014).

Chronological age differences are established early on. When students are first enrolled in Kindergarten, cut-off dates for birthdays are used to determine eligibility. This is common practice in the United States and in many other countries (Horstschräer, & Muehler, 2014; Yesil Dagli & Jones, 2012) and results in a spectrum of ages and maturity levels within each class (Bedard & Dhuey, 2006). These differences often show in the academic performance of students, especially in core subjects such as reading and mathematics. Huang and Invernizzi (2012) found that younger students had lower literacy measures scores than the older students in the same class, and, even though they were not as marked, these differences still existed in second grade. In their article on the effects of early and delayed enrolment in school, meaning some children were younger and others older than average, Yesil Dagli and Jones (2012) reported that "Delayed enrolled children had stronger mathematics skills than did on-time enrolled children,

who had stronger skills than did the early enrolled children" (p. 3071). This suggests that students who are younger than average for their grade are more likely to perform poorly in mathematics. It also points to an advantage in this area for the older students. This study did find some exceptions related to demographics, but the above conclusion held for most students.

One study gave the same assessment to children in a grade only once they reached a certain age in months. The results showed that the performance differences among students in that grade were based on when in the year they were born. In other words, when students of varied ages in months but in the same grade were tested all at once, the younger students performed worse than the others, but when the test was administered to all students at the same age in months, the differences were negligible (Crawford, Dearden, & Greaves, 2014). These findings are significant because they reveal the potential impact of even small age differences on academics.

Possible explanations for this impact have been suggested, and they point to maturity and developmental differences among children in the same classroom. Bedard and Dhuey (2006) asserted that the wide range of ages in classrooms means older students will be far more mature. After analyzing data from nineteen countries, they concluded that younger students do not perform as well. Likewise, Sakic, Burusic, and Babarovic (2013) confirm that students who are older when they start school do slightly better, at least in early elementary, and add that "Differences in brain maturation can be related to differences in functions important for successful performance in school" (p. 658). Thus, they attribute the impact of age differences to maturity.

There is also a less conclusive side to this topic. One report indicated that students who enter school later perform similarly to those in the average age range for the grade and that some

older students actually underperform their younger classmates (Mendez, Kim, Ferron, & Woods, 2015). Another study put forth that only students from higher socioeconomic backgrounds benefit from being older in their grade (Suziedelyte & Zhu, 2015). Overall, however, there is sufficient discussion on the impact of age on academics to warrant further research.

Methodology

This study was conducted at a private elementary school in the state of Tennessee. The participants were twenty-nine (29) students from two first-grade classrooms (16 from one and 13 from the other). The two teachers also participated in an interview. Prior to data collection, the researchers obtained permission from the school principal and from the teachers. Then, parents of the first-grade students received an information sheet and a parental consent form to read and sign, indicating if their child was allowed to participate. Finally, the researchers sought the assent of the students through an assent form. All information collected was kept confidential. Student names were used during data collection to ensure accuracy, but they were replaced by random numbers during analysis.

Data Collection

In order to search for the impact of chronological age on academics, the researchers first recorded the date of birth for all participants; this was provided by the classroom teachers. The researchers opted to only collect data on the student's performance in the core subjects of reading and mathematics, which receive the most attention in first grade. Academic performance data was collected in several forms. The teachers provided a record of each student's current performance in the form of average, above average, or below average for the selected subject areas. Through an interview, they also described the level of learning support needed by each child. Teachers also shared their observations on the impact of age on the academics of their

first-grade classes. Participating students were then individually interviewed and assessed by the researchers. The students answered two main questions about their perception of schooling: (1) Do you like school? (2) Do you think school is hard or easy? If hard, what is the hard part? To reduce the chances of getting the answers students thought were wanted, the children were assured that there was no right answer and that their honest opinions were welcomed. Answers were written down by the researchers.

After the interview, each student was given two pages from a grade-level book to read aloud. The chosen book was *Bengal Tiger* by Edana Eckart, a nonfiction level E book according to the Reading A-Z leveled book system, which classifies books by complexity suited to readers of different abilities. Level E is one of the more average levels for first grade. To prevent frustration to readers below the book's level, all children were given, upon request, the words they could not read on their own. The researchers completed a running record for each child. This assessment tool documents each word as read correctly by using a check mark or incorrectly by noting how the child read it or if it was given to them. For mathematics, each child completed four sums of varied difficulty. The researchers observed the children as they added and collected the worksheet for grading.

Analysis

Data analysis began by assigning a number to be used instead of each name. All processed data for each number were entered into a spreadsheet. The students' ages were calculated by using their date of birth; October 27th, the first day of data collection, was used as the point up to which all ages were calculated. The researchers converted all ages to months using an online age calculator. This step was key because it allowed them to see slight age differences more clearly. Teacher reported performance in mathematics and reading was converted to a number system of

one to three (1-3), with one (1) being below average, two (2) being average, and three (3) being above average. Researcher reported performance in mathematics was taken from the four sums given to students. These were graded in two sections out of two (2) possible points each: the first two as basic math and the last two as math. Researcher reported reading performance involved working out the percentage of words read correctly from the running records (see Figure 1). This percentage determines whether students were reading at their instructional/independent or frustration level. Any percentage below 90% is considered frustration level and implies that the student is below the text's reading level.

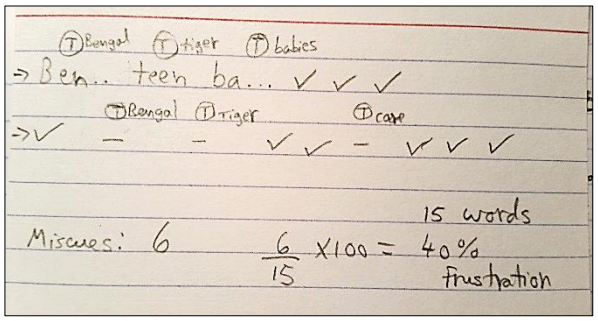

Figure 1 - Sample running record and analysis

Narrative data from the student interviews was coded as L (like school), E (school is easy), D (dislike school), H (school is hard), and S (sometimes). These letters were combined to represent the full response. For example, LE would mean that the child likes school and finds it easy; DSH would mean the child dislikes school and sometimes finds it hard. Narrative data from the teacher interviews was color coded into three categories: Younger, younger and needing extra support, older and needing extra support. For the purposes of this study the researchers defined younger as a student who was six years of age at the beginning of first grade or eighty-five months and below (≤ 85 months) at the point of data collection. Older students were those who started first grade at seven years or eighty-six moths and above (≥86 months) at the point of data collection.

The numerical and narrative data were analyzed together and separately for any patterns according to age, particularly within the age groups defined above (younger and older).

Results

The twenty-nine students who participated ranged in age from seventy-three (73) to ninety-two (92) months of age, which is a nineteen (19) month range. The average age was eighty-four (84) months. Seventeen (17) students fit into the *younger* category while twelve (12) fit into the *older* category.

An analysis of the numerical performance data revealed that, overall, more students in the younger group (10 out of 17; 59%) were below average in reading, mathematics, or both when compared to the older group (4 out of 12; 33%). Seven younger students (41%) struggled with math compared to three of the older ones (25%); however, the performance differences between the two groups were less marked in reading, and according to the running records, the older group struggled more with reading accuracy (75%) than the younger group (64%).

Student Group	Below Average Math	Above Average Math	Below Average Reading	Above Average Reading
Older (≥86 months) 12 total	3	4	9	2
Younger (≤85 months) 17 total	7	1	11	1

Table 1- Older and younger students with performance above or below average

Of the students who performed above average in mathematics, four were older and one was younger; in reading, two older students were above average, and one younger student was above average. Other details also emerged from the numerical data. Older students who struggled with math only struggled with the more advanced sums; only younger students struggled with the basic math sums, and two of the younger students got none of the advanced sums right. Younger students who performed below average in reading had generally higher scores than the older students who performed below average. Older students who were poor readers tended to score drastically lower than average. The lowest reading score (27%) was that of an older student. The

lowest mathematics score (0) was that of a younger student. The lowest performing student overall was also the youngest (73 months).

The analysis of the narrative data along with the numerical showed that more of the younger students need extra support from the teacher. Teachers talked about eleven of the younger students as needing more help and being less independent learners. A teacher said of one of the youngest children (below 80 months) that "She needs much support and is frequently off-task." Another of the youngest "is unmotivated… she cries and doesn't want to [complete writing assignments]." One of the students in the younger category (83 months), according to his teacher, "is very independent, excited, and loves learning." Five of the older students were said to need extra support, one in mathematics, and the others with either reading or behavior. The majority of older students were described as independent.

When teachers were asked about their observations regarding age differences in the classroom, the responses were different. One teacher emphatically stated that "Older makes a difference. Very young, they struggle with keeping up and doing as much." She also mentioned the importance of reading skills and confidence to academic success. The other teacher said that the relationship between academics and age is a varied one. "Maturity gets better with age," she asserted, but she also gave the example of her oldest student (90 months) who is the lowest in reading out of the whole class. This same student performs above average in math. She explained, "Sometimes, they are older for a reason, and the reason doesn't go away, especially if they are held back." The oldest student in this class struggles only with reading.

Student interviews indicated that the majority (23) of these students like school and find it easy (17). Nine of the seventeen younger students reported that school is hard. Most cited math as the hardest part. Six of the twelve older students reported that school is hard. Some cited math,

others reading, and one writing as the reason it is hard. The oldest student (92 months) said he did not like school because it is boring; he found it easy. The youngest of all students needs the most teacher support. Her teacher described her as "Not as independent, slow and unmotivated" and explained that this student sits right by the teacher to ensure that her assignments get done. She struggles with both reading and math, and she reported school as hard.

Discussion

The results of this study were mixed, which matches much of the previous research on the topic of age and academics (Mendez, Kim, Ferron, & Woods, 2015). The researchers set out to see if chronological age impacts the academic performance of students in a first grade classroom. The results suggest a possible academic impact in that a higher percentage of younger students are performing below average in reading and mathematics overall and a higher number of younger students require extra teacher support.

It appears that being younger in first grade could create difficulties for children, especially in mathematics. Younger students seem prone to struggle with math if they struggle with anything, while older students seem to struggle more with reading if they struggle with anything. It is possible that younger students have difficulty with mathematics because they are at a different stage in their development; this is supported by research which found that working memory is a strong predictor of mathematics achievement and that the working memory of children of first-grade age is different from that of children in second grade. Younger students rely more on a visual than verbal component (De Smedt et al., 2009). As mathematics becomes more abstract, these students may fall behind. Other possible causes for the differences between age groups could be interesting research topics for the future. The reading difficulties among older students were somewhat unexpected. Older students who are poor readers may be bringing

difficulties already from the previous school year into first grade. One of the teachers alluded to this when she talked about children being older but struggling, explaining that they often have difficulties that go beyond their age when they come in, especially those who were held back. Research backs this teacher's observation; students who were retained have lower performance and tend to not catch up to their class (Mendez, Kim, Ferron, & Woods, 2015).

Not all of the students in the younger category of this study showed difficulties with academics, but it is important to note that the cut-off age for the categories was somewhat arbitrary. When considering a subgroup of the younger students who were below eighty (80) months of age, all these younger students struggled in at least one area, some in all. The youngest student showed poor performance in both reading and math, and the teacher reported this student as needing a large amount of support. The student reported that school was hard. This pattern was similarly found in most other students in the youngest subgroup, which suggests that very young students in first grade may be the ones struggling to keep up academically. One of the teachers expressed her wish that children this young should not be placed in school until later because they struggle to keep up and to "do as much."

Limitations

This study was quite limited by time and location. Data collection was done over a period of only two weeks and in just one school with two first-grade classes. A longer study with a broader sample of students might yield more conclusive results. Following the students in first grade throughout the school year, for example, would paint a clearer picture of their academic performance. The tools used by the researches also had limitations. While representative of certain levels of mathematics, the mathematics assessment only covered addition and only had four problems. This was due to the short time available to work with each student. A more varied

assessment on math would be ideal. The running record was done on a short text; longer texts would likely yield more accurate overall results for each student. Also, reading performance data that includes comprehension assessments would be more informative; these assessment limitations were somewhat offset by the data supplied by the teachers, who are constantly assessing a variety of math and reading performance tasks. The researchers checked their own assessment results with those of the teachers and found a high level of consistency, especially in math. Another limitation was the student interviews. Young children tend to want to please, and it is possible that some gave inaccurate responses because they thought they were the right answers the researchers wanted. Children were assured that honesty was welcome before answering the questions, but the possibility still exists.

The research question driving this study, does chronological age impact the academic performance of students in a first grade class, found some answers in the results. The younger students appeared to struggle more academically, with a few exceptions. This performance difference was more evident in mathematics. Older students were more likely to struggle with reading if they had difficulties. The very youngest students (under 80 months) were consistently reported to need more teacher support and to struggle academically. Due to the small scale of the study, these conclusions cannot be generalized to all first graders. They can, however, be useful in their implications for teacher practice at a local level. They show a need for better understanding the impact of slight age differences, which are present in all classrooms. Knowing about how students in different age groups differ will help teachers to be more responsive to their varied needs and, perhaps, guide parents as they consider the best age for their children to start school.

Conclusion

This study suggests that chronological age differences can impact the academic performance of first-grade students, although other factors are also involved. If younger students are struggling with mathematics and older students somewhat with reading, teachers can be more alert to the need for extra scaffolding in these areas for these students. It is also important to recognize that single-grade classrooms do not necessarily have students at a single level because those slight age differences of even a few months could make a difference in how the students learn. With this in mind, educators can plan for lessons and activities that fit more than one age group. Academic differences may be a given in every classroom, but meeting students where they are and teaching to their level are important steps towards promoting academic success for all children.

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APPENDIX

Appendix A

Teacher Interview

(For question one, the teacher went down a list of participants and answered for each one)

1. How much support does his student need? How independent is the student?

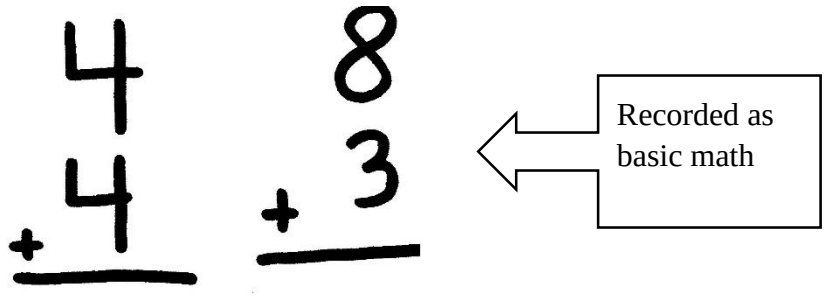
2. Have you noticed any academic difference between younger and older students this year? In general?

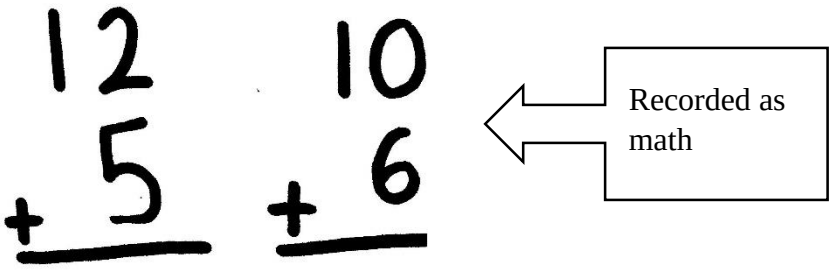
Student Interview

1. Do you like school or not so much?

2. Do you think school is hard or easy? If hard, what is hard about it?

Mathematics Assessment



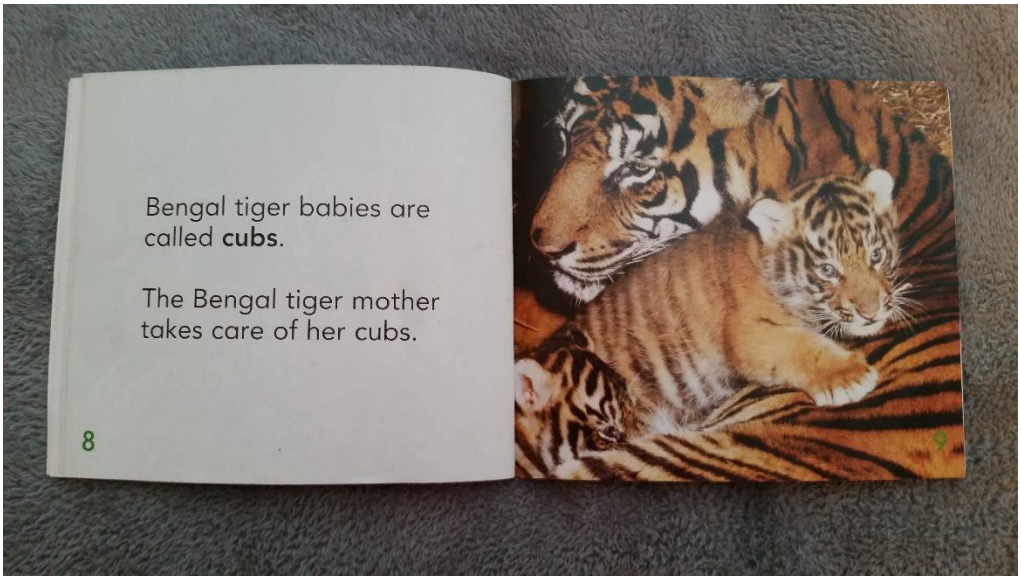


Reading Assessment

Bengal Tigers by Edana Eckart

Nonfiction, Level E

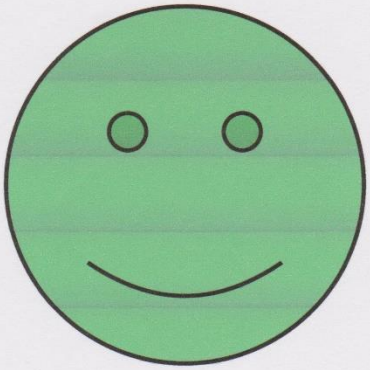
Pages 8 and 9, 15 words, 2 sentences



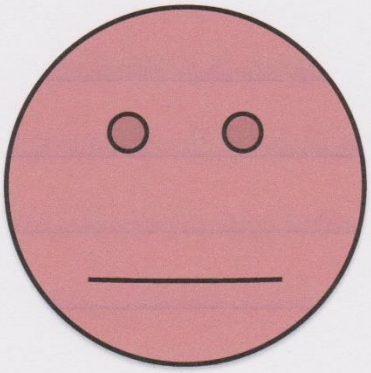
Appendix B

Write your name and circle your answer. Thank you!

I _____ say



Yes



No

to helping my buddies Astrid and Sandra on their project.

Parental Permission for Child Participation in Research Study

Title of Research Study: "Impact of Chronological Age Differences on Academic Performance of Students in a First Grade Classroom"

Introduction

We are senior elementary education students at Southern Adventist University, and we are conducting a short-term research study on the potential impact of age on the academic performance of students in the first grade. Through this letter, we are seeking your permission for your child's participation in this study. Please read the information provided about the study and the researchers. Your permission also allows your child's homeroom teacher and educational staff to discuss and report the academic growth and maturity level of your child. Your child's participation and information pertaining to this study will be kept completely confidential.

The Purpose of the study

The current study aims to explore the potential impact of age on the academic performance of students in the first grade. This information will be helpful for teachers as they seek to better meet the needs of individual students in the classroom.

Procedure

Your child will be observed during different sessions by the two researchers to collect information on how they perform in the academic environment. We will also be interviewing your child's homeroom teacher regarding the academic and maturity level of your child. Finally, your child may be given a grade-level academic task to be graded by the researchers and used to assess how the child relates to the content.

Right to Ask Questions

You have the right to ask any questions during and after your child participates in this study. If you have any questions you may contact the researchers, Sandra Candelario and Astrid Rodriguez, at secandelario@southern.edu or arodriguez@southern.edu.

Thank you for your time!

Signature Page

I _____ **give /do not give** ***(Please circle one)*** permission for

Parent/Guardian Name

my child_____ to participate in this research study.

Name of Child

I understand that any information collected on my child will be kept confidential and that participation is optional.

_____

Parent/Guardian Signature

Please Sign and Return