

Introduction:

Starting at the preschool level, students are introduced to the communicative, reciprocative process that happens between a student and a teacher. While technology, state standards and classroom advancements have changed the classroom in many ways, teacher questioning has maintained solid roots. Teacher questioning is used among all grade levels preschool all the way up to college level education. It provides the student with critical thinking and may probe any further information or discussion. There are many different types of questions that students may answer throughout the school day. However, teachers of all school levels ask questions for a variety of reasons; to ensure children are engaged in the learning process, checking for understanding throughout the lesson and may share feedback about a particular subject area. The study below looks to explore the wait time in between a teacher question and a student response over multiple primary grade levels.

Literature Review:

In addition to stimulating creative processes, question asking can fulfill many important components in the learning process. Indeed, studies suggest that stronger training in question-asking may be needed of teacher candidates even at younger levels. An international study conducted by Bay (2016) set out to determine the preparedness of kindergarten teacher candidates in regards to their question-asking skills. Although it has an admittedly small participant pool of teacher candidates from both Michigan State and Gazi University, the qualitative study has a strong, well-justified methodology that analyses question-asking forms intended to be used with students. Results show that pre-service kindergarten teachers in both

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the U.S. and in Turkey mostly ask questions of the first three levels from the taxonomy referenced (comprehension, knowledge, and synthesis questions).

The taxonomy presented is Bloom's cognitive taxonomy, which categorizes questions by the type of thinking it inspires. Wh- and closed-ended questions fall in the Knowledge category; explanation questions are in the Comprehension category; and if... then questions fall in the Application category. Other categories of the taxonomy include Analysis, Synthesis, and Evaluation, and are higher-level thinking questions (Bay, 2016). If we can assume that higher-level questions will have a longer wait time, the findings in this study might suggest a shorter wait time for younger students, to whom we can expect predominantly lower level questions be asked.

Because of the level of thinking it initiates, the type of question asked is an important consideration for any study addressing wait time and age. Although perhaps under-researched, a question type that often initiates higher-level thinking is the follow-up question (Gilson, et. al., 2014). In a qualitative inductive analysis measuring recorded teacher conference, Gilson, et. al. sought to determine what types of follow-up questions elementary teachers asked reading students of varying reading levels. Analysis coded follow-up questions into two categories: those that inspire lower-level thinking, and those that inspire higher-level thinking. Despite a small participating group, results show that teachers ask different types of questions of students at different levels. Given the variety of student skill levels in a classroom (Gilson, et. al., 2014), it may be difficult to predict the wait time. If, however, we expect higher-level thinking questions to be asked around students with a higher level of skill, we might expect to see more questions of these types in older grade levels compared to younger grades.

Educational expectations of teachers and students has changed dramatically since the turn of the century. Teacher questioning includes a variety of expectations from the students as well from the teacher. Secondary teachers must think of critical, higher level thinking questions with students whereas preschool and elementary school teachers may think of questions that are effective and applicable; providing something a child can touch or see. For others, direct questioning and instruction is important for their academic success. A previous study that involves secondary students with Autism Spectrum Disorder and teacher questioning. In this study, the authors examined how Direction Instruction or DI, affects the student's ability to answer three "wh-" questions (Cadette, et al., 2016). Variety in this teacher questioning including, small group work, and the direct instruction which includes scripted lessons, grouping students, repeated content, wait time, signals, group responding, a fast pace and understanding the material at a mastery level before moving on to further content (Cadette, et. al., 2016).

With the focus on "WH-" questions, studies continued with children with specific language impairments. According to Deevy and Leonard (2004), students that were typically developing and students with language impairments, there was only a slight difference in the comprehension of "WH-" questions. Using cartoon visuals, the authors set out to examine the length of the "WH-" question and the correct answer from each student. For the questions that were shorter in length, even the ones that include a subject, the scores did not differ between the SPI group and the TD group. The authors did find that the SPI group and the TD group did not differ much in the ability to comprehend the questions, but when presented with the questions that included the subject or object, the results seemed to change and the SPI group performed low. (Deevy, et. al., 2004).

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There are many different factors that can affect the amount of time a teacher waits after asking a question, before allowing a student to answer. Researchers from the Appalachia Educational Laboratory (1995) developed a study in which they recorded observed wait-times as they related to multiple variables. These variables included: the cognitive level of teacher question, whether the student to answer is designated before or after the question is asked, who actually answers the question, number of students responding, cognitive level of student response, the teacher repeating or rephrasing the question, teacher probing, and teacher redirection of the question to other students. For this study teachers were observed in their classrooms teaching, as well as participated in pre and post lesson meetings with the observer.

All of the data taken regarding these variables was quantified and scaled between -1 and 1; for each variable in the study a percent was calculated in order to find its relevance to wait-time. The research found that there is a longer wait-time observed when a teacher asks a student to answer after posing the question rather than before. They also found that when wait-time is less than three seconds, there are more responses than when wait-time is extended past three seconds. It was also revealed that questions with less than three seconds of wait-time received lower cognitive responses, while increasing the wait-time led to answers of a higher cognitive level. The data showed a minuscule increase in the chance that a teacher will rephrase a question whether or not there was more or less than three seconds of wait-time given. There was also a small increase in the likelihood that a teacher would probe for answers after posing question if there were more than three seconds of wait-time.

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Research Question:

Considering the above research, which indicates different types of questions and different levels of thinking are used with different grade levels of students, we expect to find a correlation between between grade level and wait time for teacher questions. By recording the time span between when a teacher asks a question and when a student answers at a variety of grade levels, we hope to determine if there is a connection and what that may mean about the questions we pose as teachers. Do higher grade age level questions require more critical thinking, and therefore more wait-time? Perhaps younger students need more time to build their thoughts, and require more wait-time.

Hypothesis: Teacher question wait time correlates to student age levels.

Methodology:

The quantitative methodology will track teacher wait time in a variety of grade levels across different school districts in Central New York. Graduate student researchers will record the wait time of all teacher questions posed to students during a 40-minute time period.

Tracking wait-time associated with questions at the pre-k level, 1st, 3rd, and 5th grade levels; thus providing a wide range to test our hypothesis. Using a stopwatch, we will record the time span between when a teacher asks a question, and when a student answers it. Upon retrieving our data, we will calculate the average wait-times that we found at each age level. This will hopefully help us to determine which age level students require the most wait-time to formulate their responses.

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Operational Definitions:

Teacher wait time is operationally defined as the time between the teacher posing a question, and the time when a student responds. Wait time may include the time it takes a teacher to call on a student. Researchers will start their stopwatch as soon as the teacher's question is posed, and stop the clock as soon as a student either responds or the teacher rephrases the question. While the question may have failed to get a desired reaction/response, it is still a representation of the teachers' expected wait time for the students to formulate a response.

Instrument:

A smartphone stopwatch will be utilized to record teacher wait time in seconds, to the hundredth place. Cell phone stopwatches are being used over traditional stopwatches for reasons of convenience, and to avoid disruptive beeps. For a 40 minute observational period, all teacher question wait times will be recorded in the researcher's notes, which will subsequently be added to the data grid and averaged for analysis.

Findings:

Four researchers observed a total of four classes, with student ages ranging from 3 to 11 years. During a 40 minute observational period, researchers recorded the wait time for a total of 40 teacher questions (see Table 1). 22.5% of all wait times were over 10 seconds. Of the wait times over 10 seconds, 50% of those came from the 10-11 year age range. Out of 40 teacher questions, 52.5% of all wait times were under 5 seconds. Of the wait times under 5 seconds, 23.8% came from the 3-5 age range, 33.3% came from the 6-7 age range, 28.6% came from the 8-9 age range, and 9.5% came from the 10-11 age range. The empirical data collected shows support for the hypothesis, that teacher question wait time correlates with the age level of the

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students. Further, the findings show a directional correlation, indicating longer wait times on average for older students.

Table 1: *Wait time is by the second. Classes were observed for 40 minute intervals.

Question Number	Ettie (Age 3-5)	Patrick (Age 6-7)	Patrick (Age 8-9)	Steven (Age 10-11)
1	10.50	1.55	11.4	27.60
2	6.36	2.45	2.12	18.06
3	5.18	9.67	4.5	11.23
4	4.22	2.05	1.45	15.74
5	2.66	3.00	2.71	3.12
6	1.72	13.13	2.44	7.23
7	9.41	1.78	15.59	6.79
8	4.25	2.58	5.45	2.10
9	4.63	3.55	3.20	7.70
10	7.51		11.48	
11			8.91	
12			3.88	
Average	5.64	4.41	6.09	11.06

Discussion:

As we gathered our data we began to observe some patterns. We have found that aside from preschool age students, who need a little more time to develop their responses, that as age level increases so does the average amount of wait-time. This answered our hypothesis as we set out to discover if there is a correlation between age level and the amount of wait-time given following a teacher question.

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Preschool age students had a higher wait-time than students in the age range of six to seven, and was fairly close to the amount of wait-time presented to students aged eight to nine. Perhaps this is because of the age of the students and their lack of formal knowledge regarding conversation. Perhaps this is because this is their first time in a school setting and simply need more time to understand what is being asked of them. After the preschool age, wait-time drop down to roughly four and a half seconds. As age level increases there is a steady increase in the amount of wait-time given to students. The longer wait-time in between teacher question and student response may be in direct relationship with the length of the teacher question. As the age groups in this study get older, the questions become more complex and require critical thinking where preschool teacher questions may be answered with a yes or no followed by a question that might pertain to that individual student.

Another pattern that was noticed pertains to the question number or the order in which certain questions are asked. For all age groups, with the exception of 6-7 year olds, the response time was over 10 seconds for the very first question. We see that time drops dramatically for the four other age groups but stays about the same for the 6-7 year old students during the second question.

Limitations and Implications:

A limitation of our study was our inability to cover every school age level. Students that are between the ages of eight and nine, those that are thirteen and over. We did our best to cover as many age levels as we could, however there were a few that were out of our control. Future

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studies should apply examine the wait time of junior high and senior high school students to see if the directionality of the correlation continues.

Another limitation in our study is the inconsistency of subject area and time within the study. As the literature indicates, different subject areas may be more conducive to different types of teacher questions. Further, the type of thinking related to different subjects may also impact wait time. For instance, a geography question might yield a quicker response compared to a mathematics question which involves some figuring. Many of the 40 minute time periods when data is collected, is not the same time of the day and the subject area is different. Our sample includes teacher questioning in varying content areas from preschool level to high school biology.

A concern for validity is the lack of any metric to indicate or explain external circumstance which impact teacher question wait time outside of the cognitive functions inspired in the students by the questions. For example, if a teacher has asked a question, then turns to the board to write something before calling on a student, this might impact wait time in a way that has nothing to do with the variables being tested in the present study. Classroom management issues were also observed as having impacted wait time. Thus, the data collected in the present study represent a myriad of variables impacting wait time aside from age, which the researchers had hoped to isolate.

Many students in the preschool setting where data was collected were students that are *still learning to be a 'student.'* This included things like raising their hand, sitting quietly, and *listening when someone else is speaking* (i.e., when a teacher asks them a question, it should

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follow with a response). These are all major factors when we think about how they would respond.

Finally, an addition to observing older students, a larger sample of questions should be taken, both over a variety of subjects, and over a larger span of time. The final sum total of 40 teacher question wait times was a limitation of our methodology, which called for one 40-minute observational period for each class. Naturally, a much larger sample would be more desirable, such that statistical significance can be obtained with a high level of confidence.

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