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STEAM Interventions with Non-Identified Gifted and Talented Students

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Abstract

Some elementary school classrooms are divided by students who are identified as gifted and talented (GT) and students who are not identified as GT, leading to lower self-perceptions of those who are not GT students. The purpose of this study was to implement engaging STEAM (science, technology, engineering, art, and math) activities with the non-GT students to see what would happen, specifically looking for changes in self-perceptions and attitudes about school. This study took place in a fourth-grade GT clustered classroom. The researcher administered pre- and post-attitude surveys, interviewed students, and observed the students during the STEAM intervention. The collected data was analyzed using the constant comparative method, and the researcher looked for major themes that emerged from the data. Four major themes emerged from the data: the influence of the GT clustered classroom on non-identified GT students, student perceptions, STEAM and positive learning experiences, and STEAM and student growth.

STEAM Interventions with Non-Identified Gifted and Talented Students

It is Wednesday afternoon in the fourth grade gifted and talented (GT) clustered classroom. Thirteen students are getting picked up by the GT teacher, accompanied by subtle cheers and exclamations from the students getting to leave. Underneath the shuffling of feet and chatter, I can hear remarks from the students who are not leaving for GT: “Oh, I wish we could go”, and “Why don’t we get to go with them?” Alongside these comments, a student begins to explain how she tested for GT and is sure that she is supposed to be joining them. Later in the afternoon, I overheard a student say, in an insincere tone, “I am glad we don’t have to go to GT anyway.” As the students trickled in from GT, you could sense the weight on the non-identified GT students as they listened to their peers talk about what they got to do and how much fun they had. The heaviest weight of all, the weight that any adult with insight could see, was the weight the students felt because they fully understood what separated them from their GT peers.

In the following weeks, the students continued to make remarks when their friends were pulled out of class and attempted to mask their feelings when their friends returned with exciting experiences to share. I could clearly see how this GT cluster classroom model met the needs of the GT students, but I could also see how this model was affecting their peers. For 45 minutes every Wednesday, eight students were left out of the fun and left behind.

Purpose

Students’ self-perceptions can be highly influenced by their school setting (Litster & Roberts, 2011). In some elementary schools with inclusion model classrooms, students who are identified as GT are clustered into a single classroom. When there are not enough GT students to fill the class, the class is then filled with general education students (students who are on-grade level). In this very specific classroom model, it is likely that the students who are not identified

as GT may struggle with lower self-perceptions (Litster & Roberts, 2011). GT students are often pulled out for further enrichment while their peers stay in the general education classroom. One way to provide enrichment for students is through STEAM (science, technology, engineering, art, and math) activities. STEAM activities can be used as a tool for high engagement for all types of learners (Bush et al., 2020).

The purpose of this study was to examine what happens when STEAM activities are implemented with students who are not identified as GT in a fourth-grade classroom. Through this study, I hoped to learn more about how teachers could use STEAM activities with all learners. I also wanted to see how we could support the non-identified GT students in the GT clustered classroom. Because of the research that surrounds the effectiveness and benefits of STEAM (Bush et al., 2020; Dejarnette, 2018; Jia et al., 2021; Wilson, 2018), I chose to use STEAM activities as an intervention. My study addressed the following research question:

Research Question: What happens when STEAM activities are implemented with students who are not identified as GT in a fourth-grade classroom?

This action research study was conducted during my year-long clinical teaching placement at place at Country Place Elementary (all names are pseudonyms) in a fourth-grade GT clustered classroom. The school was in a Texas town with a population of about 125,000 people. Country Place Elementary had a little over 700 students and served grades K-5th. At Country Place Elementary, 31.0% of the students were Hispanic/Latino, 57.8% White, 6.8% African American, 0.2% American Indian, 0.3% Asian or Asian Pacific Islander, 0.2% Pacific Islander, and 3.7% Biracial. About 2.9% of the students were English Language Learners (ELLs), and 46.8% of students were economically disadvantaged.

Literature Review

The STEAM field and STEAM education are continually picking up traction and becoming more prevalent in schools (Bush et al., 2020). In the following sections, I will explain what STEAM is, why it should be implemented in schools, why STEAM is beneficial for *all* learners, and the importance of promoting positive self-perceptions in school. I will then explain the need to further study the effects of STEAM integration with students who are not identified as GT.

What is STEAM?

The integration of STEAM has become more popular in education in the past decade (Bush et al., 2020). STEAM education focuses on "cultivating students' ability to solve complex and realistic problems" through interdisciplinary thinking (Jia et al., 2021). STEAM education is an inquiry-based learning approach that helps students learn about the different subjects involved, teaches problem-solving skills, and can motivate students to explore possible interests in future careers (Tomar & Garg, 2020). Originally known as STEM (science, technology, engineering, and mathematics), this educational framework pursued educating students in these four disciplines to prepare them for higher education and career fields in STEM (Daugherty, 2013; Dejarnette, 2018). There are many ways that schools integrate STEAM into their curriculum and classroom practices, but the focus of this article is on STEAM in the elementary school setting. The depth and complexity of STEAM activities vary widely and depend on the time allotted for the activities and the purpose of the activities (Gross & Gross, 2016). For example, a STEAM activity that could be conducted in an elementary classroom would be building a bridge out of toothpicks and marshmallows and challenging students with certain weight requirements (Gross & Gross, 2016).

Why Should STEAM be Implemented in Schools?

STEAM integration in the elementary classroom has a wide range of benefits. Research has shown that engaging in STEAM activities strengthens children's learning and motivation (Jia et al., 2021), and strengthens their communication and collaboration skills (Dejarnette, 2018).

Grounded in the constructivist learning theory, STEAM activities allow students to build knowledge off their own prior knowledge and experiences and the knowledge and experiences of others and apply that to problem-solving scenarios in the various STEAM disciplines (Gross & Gross, 2016). Essentially, STEAM education intertwines the knowledge of the discipline and the knowledge of the individual student. In this model of learning, all children bring value and important perspective to the table. STEAM lessons and activities are highly engaging for students through hands-on learning experiences to test their ideas and work through trial and error (Bush et al., 2020). When students are curious about the world around them, are able to take ownership of their learning, and can feel empowered by the learning process, they are on track to being lifelong learners and world-changers (Tomar & Garg, 2020). By implementing learning practices such as STEAM in the elementary classroom, we are setting up children for success as they continue to move forward in school (Dejarnette, 2018; Tomar & Garg, 2020).

STEAM for *All* Learners

Over the years, schools have developed programs to support a special population of students with unique educational needs, students who are identified as GT (Wilson, 2018). Students identified as being GT are classified as performing higher in academic areas, having a higher level of intelligence, and having higher leadership capacity (Altun & Yazici, 2014). Strides have been made to better support and enrich students who are identified as GT, and these students are increasingly getting the advanced and enriched academic support that they need

(Gur Erdogan & Yurtkulu, 2017). GT students should continue to be provided support and enrichment opportunities in schools in ways that optimize their capabilities and foster further growth. Because of the underlying framework of STEAM education, all types of learners can benefit from these types of experiences (Tomar & Garg, 2020). Inclusive classrooms that represent a variety of learners can use STEAM activities to bring out the potential and strengths of all students (Clements et al., 2021; Dejarnette, 2018; Tomar & Garg, 2020).

Promoting Positive Self-Perceptions

Students, especially adolescents, are constantly internalizing what is going on around them and that has a direct impact on their social-emotional well-being (Turan, 2021). Furthermore, "cognitive processes, emotional processes, and interpersonal skills are skill sets categorized under social-emotional learning competencies," and these may all be affected when students are separated from their peers to participate in engaging STEAM activities while the others are left behind (Turan, 2021, p.1127). When students are put in a scenario where they see that a group is labeled as being "better" or "smarter" and thus they receive more enrichment, this may directly harm students' perceived competencies, and this information is used to "form beliefs about their abilities" (Litster & Roberts, 2011, p.131). Providing experiences and scenarios for students to feel successful in the classroom is an important way to support and encourage positive self-perceptions in students (Litster & Roberts, 2011; Turan, 2021).

The Need for This Study

While there are many studies about how STEAM integration is beneficial for GT students and some studies supporting the integration of STEAM in early childhood classrooms and low-income schools, there are not a lot of studies supporting the need for STEAM integration in the inclusive general education classroom. More specifically, in my review of the literature, there are

no studies that specifically look at STEAM integration with general education students who are not included in the GT pull-out program: the students who are "left behind." Additionally, many studies showed STEAM education on a much larger scale with full STEAM/STEM programs and curriculum, but fewer studies showed the impact that small levels of STEAM integration can make. While this particular study looks at a very specific classroom setting, a GT cluster classroom with over 50% of students identified as GT, this study could be impactful for other classrooms with a similar context.

Methods

In the following sections, I have described the participants of this study, the data that was collected, and how the data was analyzed. As the year-long clinical teacher and researcher, the participants were accustomed to following my instructions and engaging in conversation with me as I had an established relationship with all the participants.

Participant Selection

Participants were selected from a fourth-grade GT clustered class. Participation was solicited from every student who was not identified as GT. Participation in this study only took place on Wednesday afternoons when the GT students were pulled out of class for enrichment. The students were informed of the study and received an informational letter and consent form for their parents to read and sign. The sample for this study (the students who are not pulled-out for GT enrichment) were all non-GT students. All eligible students consented to participating in this study. Six students were males, and two students were females. Six students were White, and two students were Biracial, Hispanic and White. All of the fourth-grade students were in the nine to ten years age group. All of the participants in this study have been assigned pseudonyms.

Data Collection

For the study, four forms of data were collected: an attitudes pre- and post-survey, field notes during the intervention, artifacts, and student interviews. Before implementing the intervention, participants took a pre-assessment survey (see Appendix A). The survey was a Likert-scale attitudes survey concerning the participants' attitudes in their specific classroom setting, their self-efficacy in the classroom, and their perception of STEAM activities. After reading the questions about how they felt about something, students could respond with 1) very bad, 2) not good, 3) I don't know, 4) I feel okay, or 5) great. Each choice had a corresponding Emoji that represented the phrase. The survey did not include open-ended questions.

Next, the students engaged in STEAM activities in the classroom. Once a week for four weeks, the students who were not removed for GT participated in STEAM activities in the classroom. The students worked in smaller groups to respond to a challenge under one or more of the STEAM disciplines. Students worked to find solutions to the challenges and complete it within the forty-five-minute block. As the researcher and clinical teacher, I selected STEAM activities that I knew the students would enjoy and engage in. Throughout the intervention, I collected the completed STEAM activities and other materials as artifacts. Alongside the intervention, the next form of data I collected was observational data. I took headnotes during the intervention by jotting down phrases and interactions I observed and fleshed out these notes during my planning period following the intervention in order to find themes more clearly (Hendricks, 2017).

After the four-week intervention, the participants completed the post-assessment survey. Following the survey, I individually interviewed each of the participants for 10-15 minutes following a semi-structured interview protocol. Students were asked to expand on their post-

assessment responses and to describe their experience during the STEAM intervention. The interviews were recorded and transcribed.

Data Analysis

After collecting the necessary data and transcribing the interviews, I began to analyze my data. Graphs were generated using the pre and post-surveys to compare the descriptive statistics (Mertler, 2009). I looked for significant changes in responses and noticeable pattern in the graphs. I used the constant comparative method for analysis of the transcribed interviews and field notes (Hubbard & Power, 2003). I coded the first 20% of my data, generating 17 level 1 codes. Level 1 codes are pieces of recurring data such as words or phrases that are used (Tracy, 2013). I later used these level 1 codes to code the remaining 80% of my data. I kept a running index of level 1 codes and added addition level 1 codes as needed. After the initial coding of the data, I created 4 level 2 codes using phrases that accurately represented a group of level 1 or primary codes (Tracy, 2013). I also created memos for each of the level 2 codes that went into more depth about the codes and gave a better description of what the code represented. After coding all the data, I created a codebook (see Appendix B) to represent the generated codes by grouping level 1 codes under their corresponding level 2 code.

Findings

The following portion of my research describes the findings from the intervention and the collected data. The quantitative data collected from the pre and post-surveys revealed a slight change in perceptions after the STEAM intervention. The qualitative data revealed four major themes after implementing STEAM activities with non-identified GT students in a GT clustered class. The four major themes include the influence of the GT clustered class on non-identified GT students, perceptions, STEAM and positive learning experiences, and STEAM and student

growth. In the following sections, I will describe each major level 2 code and the level 1 supporting codes.

Influence of the GT Clustered Class on Non-Identified GT Students

Primarily through my interviews, I was able to gain insight into the experiences of the non-identified GT students in a fourth-grade GT clustered classroom. Within my data, I found that the students who are not identified as GT and are separated from their peers once a week have strong feelings towards the separation. While students are not told that their peers are being pulled out for GT enrichment, they are fully aware that over half of the class is leaving for GT. The students had both positive and negative feelings towards this pull-out time. When asked about their experience in third-grade in a GT clustered class, Beth explained, “We did work because I had never been in an all-GT class and so a few kids would leave, and they get to do fun activities, and we had to do more work and when they would come back they didn’t have to do that work.” This student, along with three others (Tom, Winston, and Jane) noticed that their peers were doing fun activities while she and her peers stayed in the classroom and worked on classwork.

Another significant code that emerged was the reversed roles that the participants experienced through this intervention. Before the intervention, the students occasionally did fun and engaging activities during GT pull-out, but not every week. During the intervention, the GT students expressed jealousy and frustration that we were doing STEAM activities while they were gone. Multiple participants shared that their GT peers would “show off” and “brag” about what they got to do when they were pulled out. When I interviewed Winston and asked how he thought his peers in Mrs. Moore’s class felt when they returned to class after the first STEAM intervention, he told me, “Probably a little sad and mad that they didn't get to do what we were

doing.” I then asked how it made him feel, and he responded “...if they did something fun they wouldn't be as sad.” Winston and multiple other participants expressed how the roles were reversed once they started doing STEAM activities without them. The participants took the opportunity to tell their friends in GT about how much fun they had while they were gone and seemingly tried to make them feel as if they were missing out on the fun. This was unexpected but very significant. Before the intervention, when the students in GT did something exciting or special, they would return to the room and share it with their friends in a way that made them appear down or jealous. This code appeared in my observation field notes occasionally, but primarily through discussion in the student interviews. Multiple students were very aware of this role reversal and how it seemed “unfair” for their peers to be upset. A couple of participants expressed empathy for their peers and wished they could join in on the STEAM activities as well.

Within my data analysis, I found themes of competition and comparison among students in the participant group and apparent feelings of competition and comparison with students outside of the participant group. Beth expressed in her interview that comparison makes her feel discouraged in school and feel down about herself. Additionally, students were constantly looking at other students and groups during the intervention and comparing their work, saying the other group’s product was “better” or “cooler.” I found that the students have a natural leaning to compare themselves to others, and I could see how this innate comparison played out when their peers were pulled out of class weekly for being labeled “gifted and talented.” This led me to wonder about the deeper implications of this categorizing of students.

The competitive nature of students also emerged during my data collection and raised some additional questions. Although, I never indicated to students that the STEAM activities

were competitions, and I consistently reiterated this throughout the interventions, the participants continued to use the word "win" if they finished first, their structure was stronger, or if their product looked "cooler." When students used this competitive language the other students either tried to argue that they "won" or would drawback and get quiet. Other language that I identified as competitive was the idea of "copying" others' ideas. In general, throughout the interventions, students created a competitive atmosphere. These themes of how students felt when their GT peers were pulled out, the role reversal, and competition and comparison gave me a look inside the classroom culture and environment for non-identified GT students in a GT clustered class. The findings above also lay a strong foundation for the rest of my findings.

Perceptions

Another major theme I found pertained to students' perceptions, more specifically, the participants' self-perceptions, perceptions of success, the influence that grades have on their self-perceptions, and the effects of positive affirmation. A majority of the data that supports this code comes from student interviews where students could express how they felt about themselves as students and describe the reason they felt that way.

One of the most consistent themes across all participants was the influence that grades have on students and their self-perceptions. Seven out of the eight participants mentioned in their interviews, and multiple times within those interviews, their grades in direct relation to their perception of themselves as students (both positively and negatively). When I asked Winston about how he felt about himself as a student, his first reaction was "Like how many good grades I get?" In my interview with Tom, he expressed "...when I do something I don't really believe in myself to do it" and when I asked, "why?" he said, "my grades." This displays the value that students find in grades and how prominent they are in their lives. Likewise, in five other student

interviews, students expressed feeling discouraged by their grades. The topic of grades was never mentioned in the surveys, interview questions, or during the intervention. Although I never once provoked a conversation about grades, almost all of the students brought them up as a primary topic of discussion.

In an extension to my findings on the influence of grades, I found that student perceptions of themselves and their perceptions of success varied. The influence of grades was consistent among all students: good grades make them feel good about themselves, and bad grades make them feel bad about themselves. Other than grades, what makes students feel successful? In five of my student interviews, I found that students felt good about themselves and felt successful when doing non-academic things such as sports and art. When comparing these two ideas, perceptions of success and influence of grades, I saw that students felt poorly about themselves when they got bad grades, and good about themselves when they are doing something they are good at such as sports and art. An additional finding that pertains to student perceptions is the effect that positive affirmation has on students and their self-perceptions. When interviewing Daniel, I asked him what made him feel good about himself, and he explained that when teachers call him out and say “Daniel is being a leader,” and “Daniel is ready to go” it makes him feel good. Winston and Beth expressed similar feelings in their interviews. This smaller theme is significant when juxtaposed with the negative influence that grades have on students and their self-perceptions.

STEAM and Positive Learning Experiences

The previous two findings lay some groundwork for more significant findings in relation to the STEAM intervention. Within my data, I clearly saw the influence that the STEAM interventions had on students’ learning experiences by creating a positive experience for almost

all students. Students were excited to do the STEAM activities, they experienced success, encouraged others, and engaged in collaborative groups.

On the Wednesday afternoons of the second, third, and fourth STEAM intervention, as we prepared students to grab their supplies to leave with Mrs. Moore, you could hear the excitement in the participants' voices as they exclaimed "Yes!" and talked about how excited they were for this part of the day. I noted a conversation I overheard following the third intervention where some students were discussing how excited they were for the following week and how they loved this time we got to spend together doing the STEAM activities. When one of the STEAM interventions was postponed, the students were noticeably upset, saying things such as "aww," and quickly asked when it would be rescheduled for.

A contributing factor to the students' excitement was the new and authentic successes that the students were experiencing. Due to the structure of STEAM activities, "success" can be a wide range of processes and outcomes and trial and error. Tom, a student who had a low self-perception as a student shown both in the survey and interviews, cheered "Yes! We created a good idea!" when his group built a structure that held additional weight. Similar sentiments were shared when other participants were successful in the STEAM activities. In this atmosphere, where students were experiencing success, they were also encouraging their peers. I previously stated the presence of competitiveness, but there was also a clear presence of being a cohesive team and cheering one another on. One example of this occurred during the first intervention when Daniel repeated "Oh my gosh, Jane, smartest person ever," when Jane added a scaffold to their structure. Throughout the different interventions, students would encourage others by saying, "Wow, that looks so good!" and "That was a good idea!" Students encouraged each other in their own groups and across groups. Alongside supporting others verbally, students practiced

good collaborative skills when working with their groups to achieve a common goal and to help others achieve their goals. In the final STEAM intervention, each student had their own product, but they were able to talk and share ideas while they worked. During this intervention, many students offered to help their peers complete their shadow artwork, even if it took away from their own products. Students also used interpersonal skills by sharing ideas and problem-solving when they had disagreements.

STEAM and Student Growth

Throughout the intervention and after interviewing the participants, it was clear that students experienced growth in multiple ways. By engaging in STEAM activities, students were highly engaged and displayed their creativity, their perceptions changed, they displayed critical thinking and problem-solving skills, showed leadership, and tried new things. I also saw the need for scaffolding in STEAM activities and how that would further student growth.

Within my research, I found a large amount of proof of high student engagement and creativity among the participants. In the interviews, students consistently used the words “fun” and “creative” to describe the interventions. Daniel explained in his interview, “When we got to do what we wanted differently it felt good not just copying the screen ‘cause we got to design and that was sort of different.” Six out of the eight participants used the term “creative” to describe what they enjoyed about the STEAM activities. They enjoyed the flexibility within the challenges. Not only did students talk about being creative in their interviews, but I observed this creativity through my observations. Tom, a student with low-self perceptions of himself as a student, displayed creativity during the STEAM interventions by using his resources to make his products better. When he was praised for this, he was evidently proud of himself and the work he had done.

Four participants showed a change in their perceptions through the STEAM interventions, specifically in the content areas of science and math. When asked about why she gave math and science a higher rating on the Likert scale survey, Beth explained “Because I realized it [science] is not just learning about erosion and rocks, but it can we activities and it's not just out of a book.” Beth shared here the specific importance of doing activities that are hands-on rather than activities from a book. Pertaining to math, Beth shared “I have a lot more grace for math because of the stuff that we did.” During the third intervention, Beth also explained how math was more fun when doing it for “something like this,” meaning for solving a hands-on problem. Jane, Tom, and Winston all shared similar sentiments when they were asked about how they felt about the science and math activities.

When doing the STEAM interventions, I found that six out of the eight participants displayed critical thinking skill and problem-solving skills. During the first STEAM intervention when Jane asked if she was allowed to use her water bottle as a temporary support wall while her team built her structure and reinforced it. I also saw critical thinking skills as students make connections between the STEAM activities and other content they had learned throughout the year. When building an animal habitat during the second intervention, Daniel connected the shelter to a social studies lesson from the beginning of the school year when he said, “The Karankawa built homes like this” referring to the wigwams that the Karankawa tribe built.

Students displayed emerging leadership skills when working with their groups. These emerging leadership skills looked like the students joining their groups and leading their group discussion about what they wanted to do and where to start. During one intervention, the students had to create a paper airplane that would fly far and straight in order to measure it. George knew how to make a paper airplane that flew far, so he spent time showing other students one-by-one

how to do the folds and assumed the role of "teacher" in this situation. A contributing factor to this emerging leadership was the safe environment that students were in to try new things. This "safe environment" is a culmination of being in a small group, not being graded, and telling the students that they can try new things and that when they do something wrong, it will help them make their product better. Jane, who is normally a more reserved student, showed newfound confidence during the interventions. Jane would add materials to her team's structure without asking and did so confidently. Jane also shared ideas with her group without being asked. Within this safe environment, students knew they could make mistakes. I observed this behavior in all four of the interventions where students would test their ideas, and if they did not work, modify their ideas over and over again. The participants showed resilience when their ideas failed and continued to try hard.

A smaller but important finding from my research was the importance of strong scaffolding in STEAM, especially when done with a wide variety of learners. Throughout the four interventions, I saw places where students needed additional support in order to be successful. An example of this need for scaffolding was with Tom during the very first intervention. For Tom, the activity was challenging and the group work added an additional hurdle. He had reached his frustration level and became disengaged and off task. When I asked why he was not working with his group, he shared that he was confused and did not know what was going on. After discussing possible ideas for their structure and making the activity more relevant to him personally, he re-entered the group and shared ideas. I found through this study that STEAM interventions, especially if they are being done with a large range of abilities, need to be scaffolded for students who need more support and students who need to understand important skills in working with a group.

Quantitative Findings

The quantitative findings of my research did not lead to many significant findings. Due to the nature of the survey being Likert scale, not having any free-response questions, and the surrounding distractions, students seemed to rush through the survey and submitted them very quickly.

When asked how they felt about their classmates leaving on Wednesday afternoons, four students' attitudes changed to "Great." When asked how they felt about coming to school, four students' attitudes increased from "I don't know" to "I feel okay" and from "I feel okay" to "Great". Two post-survey responses raised some questions that I addressed with the participants in their interviews. Garrett's response to the question asking how he felt when his classmates left on Wednesday afternoons during the pre-survey was "I don't know." On the post-survey, Garrett's response dropped down to "Very bad." When I asked him why it changed, he shared that he felt bad for the students in GT because they did not get to do the fun activities that we were doing. His response clarified that he did in fact enjoy doing the STEAM activities and showed empathy for his classmates. There were a few other survey questions that pertained to school and the students' feelings about their classmates that dropped. The students who dropped their answers have been experiencing other difficulties in school not related to academics. The rest of the qualitative data remained about the same with some slight fluctuation. The graphs representing the pre and post-survey data can be found in Appendix C.

Limitations

A major limitation of this study was time. Because the participants were in the non-identified GT group, they continued to be separated from their classmates on Wednesday afternoons when GT left for enrichment. While the findings of this short-term study are

significant, a longer study would possibly show a larger shift in perceptions. Time was also a limitation in the duration of the individual interventions. While forty-five minutes was a good amount of time to complete the STEAM activities, set-up and clean-up also had to be done within this window of time, and group discussions before the activities took time. When we started to run out of time, the students felt rushed and wanted to finish. The study was successful as-is, but extended time would have likely increased these findings and also benefitted the participants.

Implications for Teachers

The data collected and analyzed through this study led to the findings of the influence of the GT clustered classroom on non-identified gifted learners, perceptions held by students, STEAM and positive learning experiences, and STEAM and student growth. The implications of this study pertain to three categories: incorporating STEAM activities, grades and creating positive learning experiences, and non-identified gifted learners in GT clustered classrooms.

One significant implication of this study for teachers is the value of implementing STEAM into the general education classroom, whether it is a GT clustered classroom model or not. Through this short-term study, I was able to collect data that showed how STEAM learning can be beneficial for different learners, and for students who do not particularly love certain disciplines of STEAM, such as math and science. In just four, forty-five-minute sessions of STEAM engagement, students practiced skills that teachers work on with their students all year: critical thinking, problem-solving, creativity, taking risks, communication, and collaboration. Students practiced these skills through authentic learning experiences while having fun. The STEAM activities were time-friendly and did not require extensive planning and preparation, so they were simple to implement.

Another implication that this study has for teachers comes in the form of a question: How can we get students to experience success in the classroom in a way that is not tied to grades? This is a question I held in the back of my mind throughout the study as I witnessed students experiencing success during the activities, and also vocalizing the importance that grades have on their self-perceptions and perceptions of success. In this study, I saw students experience success through STEAM activities, but what are other ways that teachers can help students experience success that motivates and encourages them without tying it to grades? How can teachers break down the idea that a student's level of success depends on how they performed on a test? The answer to this question varies from classroom to classroom, but there are two parts to achieving this. First, we have to create a classroom culture that values that student over the work and grades. Who the student is as a person is more valuable than their academic successes. Second, we can create learning experiences for our students that allow them the freedom to apply their own meaning, knowledge, and experiences where the product or end result can look different from student to student.

The last major implication of this study would be made stronger with more time and additional research. The guiding question of this implication is, "What are the deeper implications of categorizing students by gifted and non-gifted?" More specifically, in an inclusion model clustering the gifted learners in a classroom that represents the majority, and separating them from the non-identified gifted learners on a weekly basis, what are the deeper implications? Schools should undoubtedly recognize, differentiate for, and provide enrichment for students who are gifted. *How* we do this is what we need to look into further. One of the original motivations for this study was observing students who are part of the non-identified gifted group and how they appeared to feel when their classmates left and would come back and

share the fun things they got to do. Some considerations for this implication include looking at the GT clustered model and assessing whether or not this is the best model for all students. The second consideration that is represented well within this data is how that portion of time, when the two student groups are separated, is spent and what can be done to enrich the non-identified gifted learners during this small-group-like setting.

This study has left me with a few further questions. The first question, stated above, looks into what some deeper implications may be of categorizing students by "gifted" and "non-gifted." Based on the conversation of grades and students experiencing success in the classroom, this study also led me to wonder in what other ways teachers can create a learning environment that allows all students to be successful and cut the ties that have been formed between the value of grades and how successful a student is in the classroom. Additionally, because STEAM can be an especially effective way to enhance and enrich student-learning, how can STEAM lessons be regularly implemented into all types of classrooms and integrated into other content areas?

During the initial planning of this study, I assumed the implications would apply to a very small and specific group, those that are in an inclusion GT clustered classroom model. The results of this study led to much more broad implications. This study adds to the abundant research that has been done on STEM/STEAM and its benefits. This study adds a new perspective on STEAM being done in a very specific classroom model and how it benefited general education students. Additionally, this study led to an important conversation about the impact that grades have on students and their self-perceptions. What is done with the information gathered in this study can look different depending on the reader. For myself and my own classroom, I plan to implement STEAM activities with all levels of learners with appropriate scaffolding. The benefits of STEAM on the learning environment and student growth of various

levels of learners through a small four-week intervention show me that a consistent implementation could be even stronger. All students deserve enrichment in school, and STEAM learning is a great avenue for this.

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Appendix A

Survey Protocol- Pre and Post survey

(This survey will be administered in the form of a Google Form)

☹ (1) = Very bad 😐 (2) = Not good 🤷 (3) = I don't know 🙂 (4) = I feel okay 😁 (5) = Great

1. How do you feel about yourself as a student?

2. How do you feel about yourself as a member of this classroom community?

3. How does it feel when your classmates leave on Wednesday afternoons?

4. How do you feel about coming to school?

5. How do you feel about the other students in our classroom?

6. How do you feel about science activities?

7. How do you feel about technology activities?

8. How do you feel about engineering activities?

1 2 3 4 5

9. How do you feel about art activities?

1 2 3 4 5

10. How do you feel about math activities?

1 2 3 4 5

Appendix B

Codebook

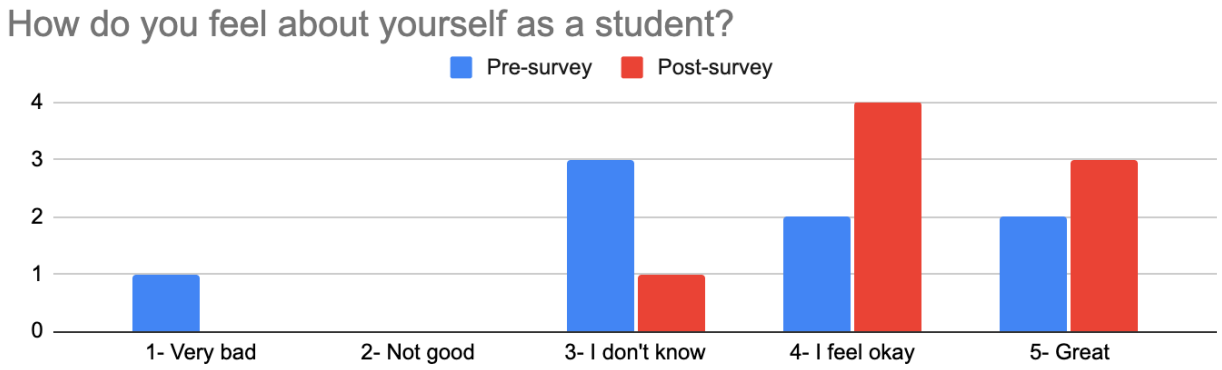
Code	Level	Definition	Example	Color
Influence of GT-Clustered Class on Non-Identified GT Students	2	The influence and impacts on students who are in a GT clustered class but are not identified as GT.	"Not really good, cause when they went we didn't really do fun stuff. We just worked on schoolwork."	
When the GT kids leave…	1	What happens when the GT students leave for enrichment and how it makes their peers feel.	"A few kids would leave and they get to do fun activities and we had to do more work and when they would come back they didn't have to do that work."	
Reversed Roles	1	How the GT students react when the non-GT pull-out students do STEAM activities without them.	"I mean I didn't feel like I wanted to brag in their face, but in my head I was like well they got to do fun stuff before I mean maybe not this time when they went to GT because they might have just done papers. So it was unfair."	
Comparison	1	Students comparing themselves and their work to that of their peers.	"Whenever someone tries to compare something... people like to compare and brag"	
Competition	1	Students turning non-competitive tasks into competition and want to "win".	"We won, we finished first"	
Perceptions	2	The way that students view themselves as students, what makes them feel good, and perceive success.	"I don't wanna say I'm *smart* smart, but like um I don't really know."	

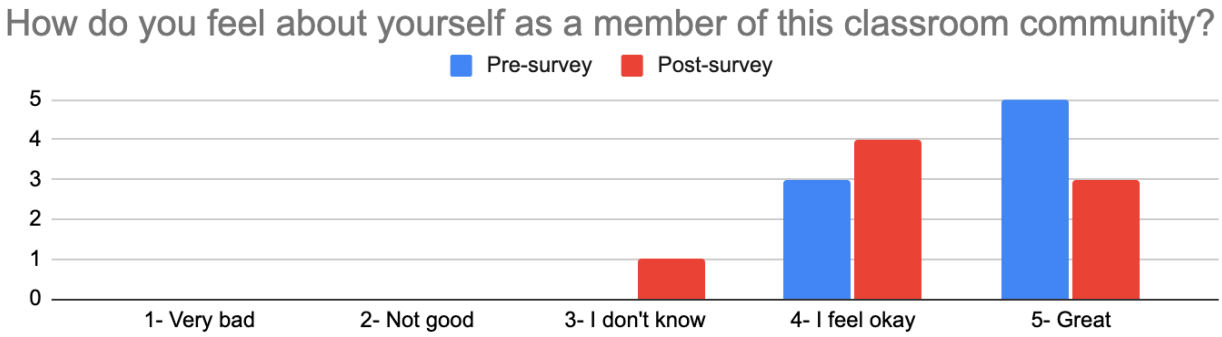
Influence of grades on self-perceptions	1	How grades influence the way that students feel about themselves and perceive success.	"I don't normally get very good grades"	
Perceptions of success	1	What students view as success and what makes them feel good about themselves.	“Maybe like if I get everything right .... or when I feel included.”	
Positive Affirmation	1	How positive affirmation influences students’ self-perceptions.	“Sometimes when I do stuff when she doesn't ask me to or you like when you say “Daniel is ready to go” or “Daniel is being a leader””	
STEAM and Positive Learning Experiences	2	The positive learning experiences that occurred during the STEAM interventions.	“I was excited because I knew we were going to do something fun.”	
Excited for STEAM	1	Students expressing excitement when they engage in (or are going to engage in) STEAM activities.	When Mrs. Moore was coming, the non-GT students said “YES!” and were very excited, which is not how they used to respond.	
Experiencing success	1	Students experiencing success in their STEAM activities and how they react to that success.	“Yes! We created a good idea! Yes!”	
Encouraging others	1	Students encouraging and supporting their peers during the STEAM interventions.	“Oh my gosh, Jane, smartest person ever!”	
Collaboration and group work	1	Students collaborating with their peers and group members to complete a challenge.	Students problem solved and started to help each other. They took turns holding the paper down and tracing the other person’s shadow and vice versa.	
STEAM and Student Growth	2	The personal growth, skill development, and ability to show off	When we got to do what we wanted differently it felt good not just copying the screen	

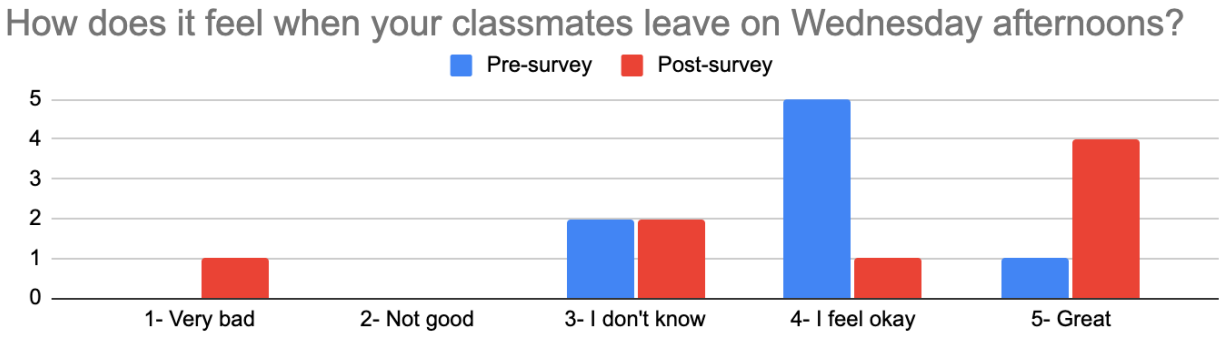
		existing skills that students put to practice during STEAM interventions.	cause we got to design and that was sort of different.	
Engagement and creativity	1	Students show high engagement in the STEAM activities and express creativity through the challenges.	“The shadows I liked how I could do this (put his arm up) and make a snake and like make cool shapes and be creative.”	
Changes in perceptions	1	Students express a change in their perceptions of content related to STEAM through the intervention.	“Because I realized it is not just learning about erosion and rocks, but it can be activities and it's not just out of a book.”	
Critical thinking and problem solving	1	Students display critical thinking skills and problem-solving skills when working on a STEAM challenge.	“Can we use a water bottle to hold the structure so it doesn’t fall? Just while we work?”	
Emerging leadership	1	Students show leadership skills when working in groups and with others on challenges.	“What are we going to do”- starting group discussion to establish a plan.	
Safe environment to try new things	1	Students try new things and step out of their comfort zone when in a safe environment.	Jane kept adding to the structure confidently and without asking group members. She is normally reserved. This was out of character had this been a whole-group.	
Need for scaffolding in STEAM	1	Students show the need for scaffolding within STEAM activities to be appropriately supported for success.	“I don’t know the plan” in a defeated voice and was uninvolved with his group.	

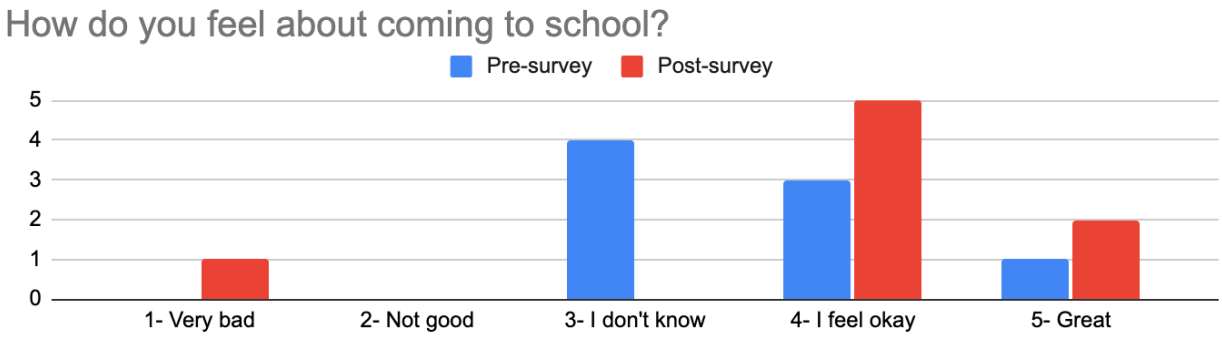
Appendix C

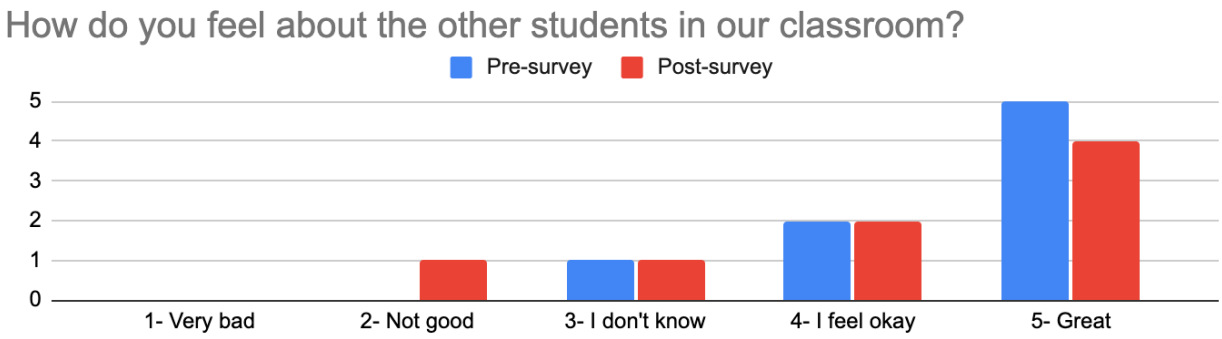
Quantitative Data

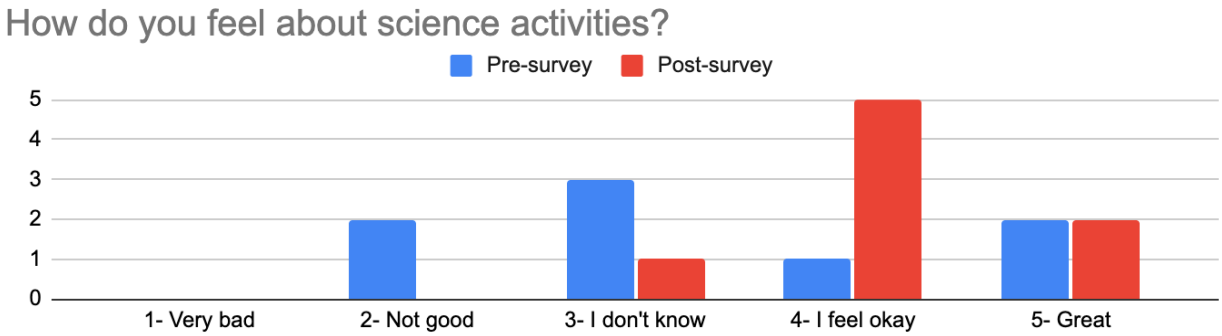


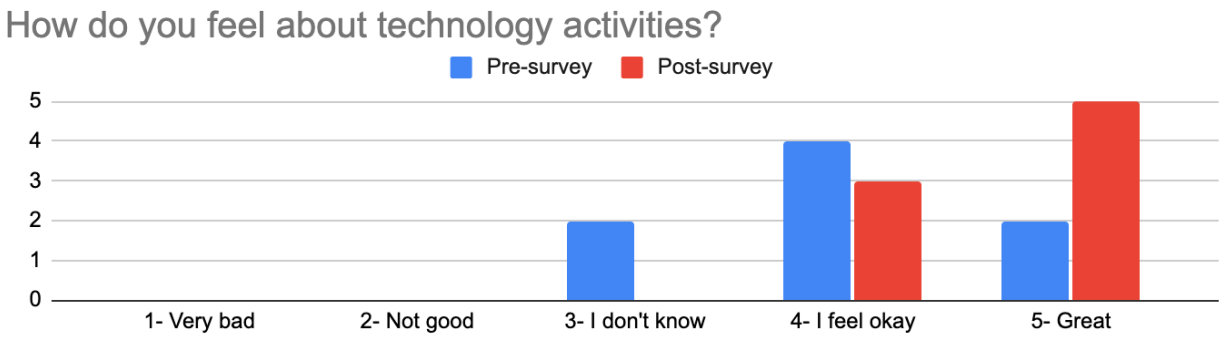


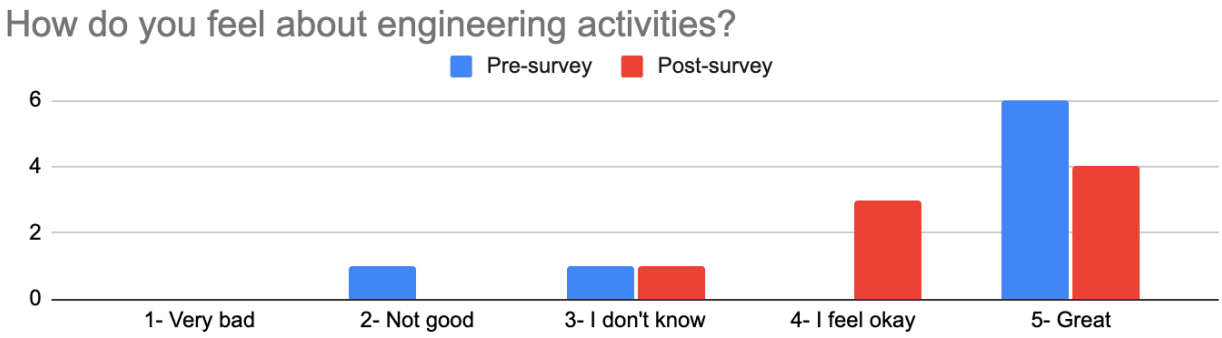


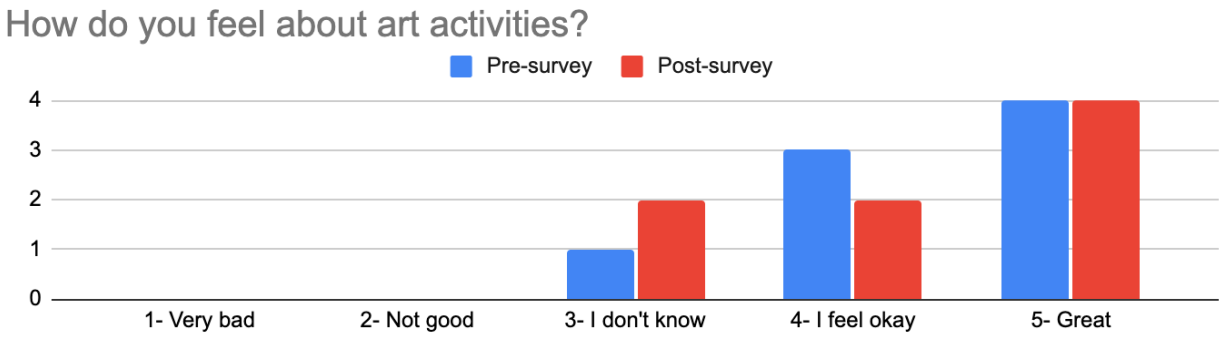


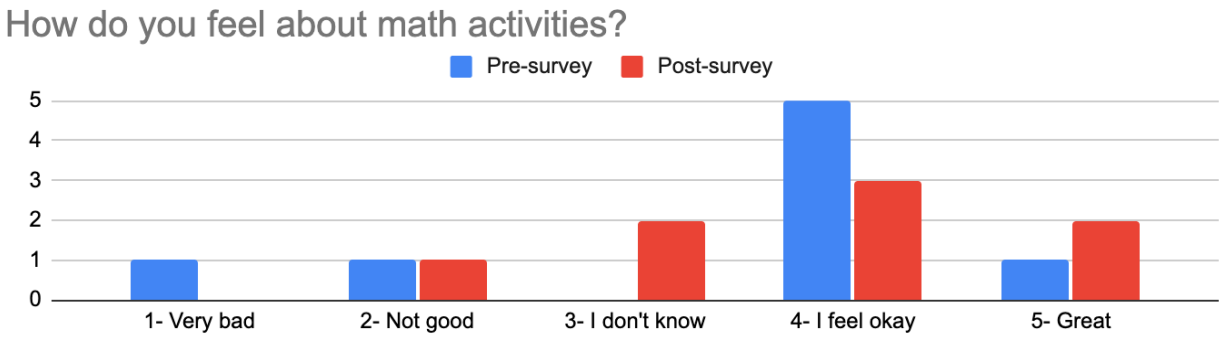

How do you feel about the other students in our classroom?
Pre-survey
Post-survey
5
4
3
2
1
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great


How do you feel about science activities?
Pre-survey
Post-survey
5
4
3
2
1
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great


How do you feel about technology activities?
Pre-survey
Post-survey
5
4
3
2
1
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great


How do you feel about engineering activities?
Pre-survey
Post-survey
6
4
2
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great


How do you feel about art activities?
Pre-survey
Post-survey
4
3
2
1
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great


How do you feel about math activities?
Pre-survey
Post-survey
5
4
3
2
1
0
1- Very bad
2- Not good
3- I don't know
4- I feel okay
5- Great