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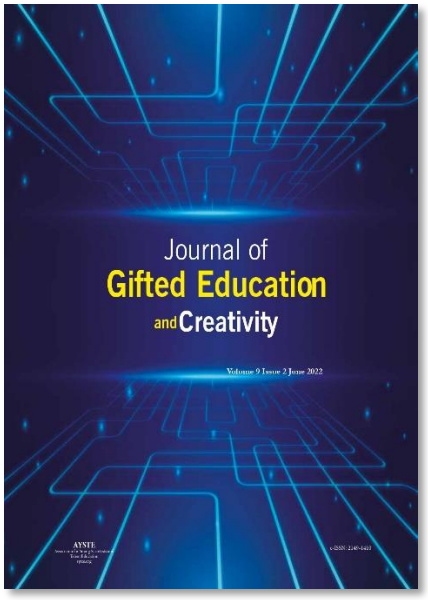

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Research Article

Creative activity as a coping mechanism for the COVID-19 Pandemic

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Abstract

This study explored the use of creative activities as a coping mechanism for the COVID-19 pandemic. Students, as well as social media participants, were asked to describe some of the activities they undertook during the months of quarantine from February to August of 2020. It was expected that individuals who actively participated in creative tasks, such as painting, yoga, or writing, would exhibit greater resilience to the negative effects of social isolation. An online survey was administered to participants both at a university and in the community. Participants assessed their emotional state two weeks prior to participating in the study, described a creative activity they did, the motivation behind choosing it, how it made them feel, as well as their attitudes toward the pandemic. Participants feeling the most adverse effects of COVID-19 turned to creative activities as an outlet for their negative emotions. This finding indicates that creativity may have therapeutic effects for individuals struggling with the COVID-19 pandemic. A positive correlation was found between a positive outlook towards the pandemic and both intrinsic and extrinsic motivations for choosing the activity, resulting in greater commitment to the activity.

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Introduction

While quarantined during the Bubonic Plague in 1606, Shakespeare wrote King Lear, Macbeth, and Antony and Cleopatra (Pringle, 2020). Around the same time, in 1665, Isaac Newton was forced to leave his studies at Cambridge due to social distancing orders and began his year of discoveries. During this time, Newton formulated his theory of gravity, discovered differential and integral calculus, and studied optics (McDonald, 2020). Although the last major pandemic was the flu pandemic of 1918, there have been other pandemics such as H1N1 as recently as 2009 (CDC, 2018). However, the COVID-19 pandemic, which has affected the lives of people all over the world in 2020, is the first pandemic in the era of social media in which lockdown was enforced. With the rapid spread of COVID-19, quarantine strategies such as lockdown, self-isolation, curfews, and limited gatherings have been imposed. This new way of life has been difficult for many people to adjust to and has even elicited feelings of anxiety and loneliness (Usher, Bhullar, & Jackson, 2020).

Isolation and Mental Health

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Isolation is defined as the experience of being separated from others. Moreover, social isolation results from the absence of social relationships. This can be due to prolonged time spent alone or the lack of meaningful social and professional relationships (GoodTherapy, 2020). According to Holt-Lunstad, loneliness and perceived social isolation are more harmful to physical and mental health than obesity (Holt-Lunstad, Smith, & Baker, 2015). Situational loneliness, caused by external or environmental factors, has been linked to depressive symptoms, lower life satisfaction, and increased pessimism (Mushtaq et al. 2014). In July of 2020, CAMH reported that since the onset of the COVID-19 pandemic, 50% of Canadians experienced a decline in mental health. Studies have linked the experience of quarantine to symptoms of anxiety, depression, and PTSD (CAMH, 2020). However, a plethora of research has shown that physical activity can have a significantly positive effect on mental health (Darongkamas, Scott, & Taylor, 2011). This evidence has led to the inclusion of physical activity in mental health treatment (Crone, 2007). In fact, out of the 19 participants involved in the Mindful Exercise Project, aimed at improving physical and mental health in adults, all the participants reported improvements in their wellbeing and 56% reported feeling less depressed overall (Darongkamas, Sott, & Taylor, 2011). Simply taking a scenic walk can provide a sense of purpose, aid with difficulties sleeping, and improve wellbeing (Crone, 2007).

Creativity and Mental Health

While prolonged periods of time spent in social isolation have led to increased levels of anxiety and depression, this has also been a time for individuals to focus on their hobbies and create new things as they spend more time at home. While some have taken the time to learn to cook through *YouTube* videos, others have learned new dance moves on *Tik Tok,* and yet others have spent hours catching up on *Netflix* series. Although there is no right or wrong way to quarantine, some activities might provide a better coping mechanism for dealing with COVID-19 isolation than others. According to Reynolds, art activities may promote psychological wellbeing (Reynolds, 2000). In a study by Schall et al., (2018), merely viewing art in a museum helped improve subjective wellbeing, mood, and quality of life in people with dementia (Schall et al., 2018). Furthermore, partaking in creative activities has the potential to reduce stress and improve mental wellbeing (Leckey, 2011).

In a study conducted by Caddy, Crawford, and Page (2012), at a hospital in Perth, Australia, it was found that art therapy provided significant improvements in mental health. Patient data were analyzed over a five-year period, between 2004 and 2009, and it was discovered that 403 psychiatric inpatients who had frequented an art therapy group during this time showed a greater reduction in their symptoms post-treatment than other patients. Patients were compared on four different psychometric measures, including the *Depression and Anxiety Stress Scale (DASS -21).*

Those that had been to art therapy showed a significantly greater degree of clinical change from admission into the hospital to discharge (Caddy, Crawford, & Page, 2012).

However, for creative activity to have therapeutic outcomes, it must actually provide value and meaning to individuals and give them a sense of purpose (Griffiths, 2009). Griffiths found that creative activity can be used as a treatment medium in therapy for various mental health problems. Most notably, activities that involved higher levels of engagement and choices resulted in participants feeling more relaxed and peaceful after the therapy (Griffiths, 2009). In a study by Reynolds (2000), the experiences of 39 women who used needlecraft to cope with depression were documented. The level of concentration involved in needlecraft work was described by most of the women as providing a distraction from their worrying and depressive thoughts (Reynolds, 2000). Corry (2013) goes so far as to suggest that creativity is the ideal coping mechanism due to its transformative properties. Through creative activity, individuals have the power to adjust their perspectives, expectations, and acceptance of negative situations. This may lead to an integration of emotional, physical, cognitive, and social functioning (Corry et al., 2013).

The Present Study

While many studies have found a link between creative activity and mental wellbeing, there is still a gap in research when it comes to coping with mental health during the COVID-19 pandemic. The present study looks at the ways that

individuals used creative activities to cope with social isolation from the beginning stages of the COVID-19 lockdown and measures levels

of engagement involved in completing the tasks. It is expected that active creative activities, such as learning a new dance routine, painting, or crochet, serve as a better coping mechanism for dealing with the pandemic than more passive activities such as watching television. Furthermore, it is expected that a higher degree of intrinsic motivation in completing the creative activity will have a better outcome on mental health. Intrinsic motivation refers to a disposition or tendency to seek a challenge, explore, and participate in engaging activities (Deci & Ryan, 2009). Being intrinsically motivated to complete a task means to do so purely for the enjoyment that it provides (Seifert & Hedderson, 2010), which in turn facilitates the creative process even further (Yuan et al., 2019).

Consciously choosing a creative activity with a goal in mind to complete the activity for mental health benefits can also be referred to as self-regulation. Self-regulation is a process that involves problem solving to set goals, achieve those goals, and reduce barriers to the goals (Leventhal, Brissette, & Leventhal, 2003). Self-regulation does not only involve physical processes, but the awareness of emotions and feelings as well. Perceived threat and the social context surrounding the threat is important when deciding on an action plan for coping with the threat (Leventhal, Brissette, & Leventhal, 2003). Leventhal (2016) uses the "Common-Sense Model" to describe how behavioral and cognitive processes come together in self-regulation and coping with health threats. The CSM model looks at the specific rules that highly self-regulated people implement when coping with health threats and the factors that prevent non-self-efficacious people from committing to a specific action plan (Leventhal, Phillips, & Burns, 2016).

Creative activity may serve as a self-regulating mechanism in coping with stress and anxiety about the pandemic. Individuals who are aware of their emotions and actively seek activities that allow them to express negative feelings about the pandemic are expected to have an overall more positive outlook towards the COVID-19 pandemic.

Method

Participants

Two hundred and nineteen participants (50 male, 167 female and 2 identifying as other) voluntarily completed a writing task followed by two questionnaires. 101 participants were from social media platforms such as *Reddit* and *Facebook,* who volunteered to participate either through a survey exchange or for personal enjoyment. 118 participants were enrolled in Introductory Psychology courses at a Canadian university and took part in the study in exchange for course credit.

Research Model and Self-Report Measures

The research model involved a combination of university students and members of the Reddit online community who completed self-report quantitative and qualitative measures. The qualitative measure described a personally meaningful creative episode completed during the pandemic. The quantitative measures related to the respondent's emotional state just prior to participating in the online study, a subjective assessment of the effects of the pandemic on health and personal life, and a reflection on the role of the described creative activity in ameliorating the effects of the pandemic.

Emotions. This 12-item self-report was used to assess prevailing emotions during two weeks prior to the study (Cupchik, 2020) including, for example *anger, fear, happiness,* and *anxiety.* Participants were asked to rate how often they experienced these emotions on a 7-point Likert Scale (1= not at all, 4= more than half the days, 7= nearly every day). Items 2, 6, 8, 11, and 12 were related to positive emotions and items 1, 3, 4, 5, 7, 9, and 10 were related to negative emotions (see Appendix A for the Emotions measure).

Creative Activity Episode Recollection. Participants were asked to recall one specific creative activity that they did alone during the months of lockdown (February 2020 to August 2020). They were then required to describe one episode in which they completed this activity using a minimum of 150 words. The episode recollection needed to include the reason for choosing the activity, the feelings involved while completing the activity, and the context surrounding the

activity. The purpose of this task was to identify different types of creative activities and how they were related to self-reported emotions and feelings about the pandemic.

Activity Reflection. After describing the activity, participants completed the 10-item *Activity Rating Scale.* Participants rated the activity on different scales related to valence, stimulation, skills required, and connectedness with others on a 7-point Likert Scale (1= disagree strongly, 7= agree strongly). An example of a question from the Activity measure is "The activity helped reduce feelings of anxiety about the pandemic." Items 1, 2, 4, 5, 7, 8, and 9 were related to intrinsic values for completing the activity while items 3 and 10 were related to community outreach and connectedness with others (see Appendix A for the Activity measure).

COVID-19 experiences. A second 10-item self-report was administered to participants to assess the effects of COVID-19 on emotional, physical, social, and economic realities. For example, participants were asked to agree or disagree using a 7-point Likert Scale with phrases such as "COVID-19 has affected my work/school routine." Items 6, 7, and 8 were related to positive effects of the pandemic, such as having more time for family, while items 1, 2, 3, 5, and

9 were related to negative effects of the pandemic, such as anxiety about contracting the illness (see Appendix A for COVID-19 measure).

Procedure

The full survey was administered using Google Forms. A link to the survey was posted on *Survey Exchange Groups* and *Art and Creativity Groups* on *Facebook*, as well as *Art* and *Survey* subreddits on *Reddit*. For University students, the survey was administered through a course platform where a link was provided to the form. Anonymity of the students was preserved and the study had received prior ethical approval from the university.

Participants were presented with an introduction to the study and a Consent before continuing with the study. The first part of the study included demographic questions such as age/year of study, gender, and profession. The next part of the study was the Emotions measure. Participants were then asked to do the Episode Recollection writing task, after which they completed the Activity Rating and the COVID-19 measure. At the end of the study a debriefing section was provided. This included the purpose of the study and the expected findings. Respondents were also provided with contact information for any questions or concerns they may have regarding the study.

Results

Overview

Responses to the Emotions, Activity, and COVID-19 measures were analyzed using principal components factor analysis (PCA). Pearson correlations were then conducted to determine correlations among the different measures. Regression scores from the PCA, also known as subject weights, were used when correlating factors across measures and to select narratives based on participant experiences.

Emotions. Principal components factor analysis with varimax rotation was performed on responses to the Emotions measure representing affective state during the two weeks prior to participating in the study (N= 219). Two factors with Eigenvalues greater than 1.00 were found that accounted for 60.10% of the total variance. The factors were labeled: (1) Negative and (2) Positive emotions (see Table 1).

Factor 1, *Negative emotions,* accounted for 35.83% of the variance. The items with loadings of .50 or greater were: feelings of sadness over the last two weeks (.84), feeling depressed (.83), feeling anxious (.80), feelings of fearfulness (.75), feeling angry (.72), feelings of guilt (.70), and feelings of loneliness (.69).

Factor 2, *Positive emotions*, accounted for 24.30% of the variance. The items with loadings valued at .50 or greater were feeling: hopeful (.84), interested (.82), happy (.77), grateful (.73), and surprised (.51).

Table 1.

Factor Analysis of the Emotions Questionnaire

Factors	Eigenvalues	Items	Loadings
Factor 1. Negative emotions	4.30	Item 4. Sad	.84
		Item 7. Depressed	.83
		Item 5. Anxious	.80
		Item 3. Fearful	.75
		Item 1. Angry	.72
		Item 10 Guilty	.70
		Item 9. Lonely	.69
Factor 2. Positive emotions	2.91	Item 6. Hopeful	.84
		Item 8. Interested	.77
		Item 2. Happy	.82
		Item 12. Grateful	.73
		Item 11. Surprised	.51

COVID-19 Measure. Principal components factor analysis with varimax rotation was also performed on the combined social media and student responses to the COVID-19 questions (*N*= 219). The first analysis produced three factors with Eigenvalues of 1.00 or greater which accounted for 56.69% of the variance. Items 4 ("I have struggled to connect with my family and friends") and 10 ("I am resilient and able to cope with changes in my life") were dropped from the analysis due to cross loading on two or more factors. In the final analysis, two factors with Eigenvalues of 1.00 or greater were derived, accounting for 48.47% of the variance. The factors were: (1) Positive features of the COVID-19 pandemic, and (2) Negative features of the COVID-19 pandemic (see Table 2).

Factor 1, *positive responses to the pandemic*, accounted for 24.25% of the total variance. This factor included all the positive aspects of social distancing and quarantine. The items with

loadings of .50 or greater were: "I have been able to slow down and spend more time with the people closest to me" (.81), "I have spent more time doing things I enjoy" (.81), and "I am optimistic that the current situation will improve" (.70).

Factor 2, *negative reactions to the pandemic*, accounted for 24.22% of the variance. Factor 2 encompassed the negative aspects of quarantine and isolation. The items with loadings of .50 or greater were: "I have struggled to adjust to societal changes from COVID-19" (.72), "my personal finances have been negatively affected" (.62), "my social life has been negatively impacted by the pandemic" (.62), "my work/school routine has been affected" (.56), and "I am anxious about my health and contracting COVID-19" (.56).

Table 2.

Factor Analysis of the COVID-19 Questionnaire

Factors	Eigenvalues	Items	Loadings
Factor 1. Positive features	1.94	Item 7. Slowed down and spent time with people close to me	.81
		Item 6. Spent more time doing enjoyable things	.80
		Item 8. Optimistic that the situation will improve	.70
Factor 2. Negative features	1.94	Item 2. Struggled to adjust to societal changes	.72
		Item 3. Personal finances were negatively affected	.62
		Item 5. Social life was negatively impacted	.62
		Item 1. Work/school routine was affected	.56
		Item 9. Anxious about health and contracting COVID-19	.56

Activity Measure. A principal components factor analysis with varimax rotation was performed on the participants' responses to the activity ratings (*N*= 219). The first analysis produced two factors with Eigenvalues of 1.00

or greater, accounting for 50.25% of the variance. Item 6 ("The activity helped me reduce feelings of isolation") was dropped from the analysis due to cross loading on both factors. After removing item 6, the analysis produced two factors with Eigenvalues of 1.00 or greater, accounting for 51.63% of the variance. The factors were labeled:

(1) Intrinsic reasons for choosing the activity, and (2) Connectivity reasons for choosing the activity (see Table 3).

Factor 1, *intrinsic motivation*, accounted for 37.10% of the variance. This factor was about internal motivators for choosing the creative activity. The items in factor 1 with loadings of .50 or greater were: "the activity was helpful in coping with the pandemic" (.80), "the activity was stimulating" (.75), "helped reduce feelings of anxiety about the pandemic" (.73), "felt a sense of accomplishment when completing the activity" (.70), "provided an escape from reality" (.61), "the extent of positive versus negative feelings involved when recollecting the episode" (.60), and "the use of personal skills" (.60).

Factor 2, *outreach motivation*, accounted for 14.54% of the variance. Items in this factor related to external motivators for choosing the activity, such as the need to connect with others. The items in factor 2 with loadings of .50 or greater were: "influenced by social media in choosing the activity" (.74) and "felt more connected with friends and family" (.72).

While some creative activities were chosen purely out of boredom, others were chosen for the value that they provided. *Intrinsic reasons* for choosing an activity included improving personal skills and providing an outlet for negative emotions. Alternatively, *connectivity motivation* for choosing an activity focused on social media and family as determining factors. High scores on both *intrinsic* and *connectivity motivations* were related to Episode Recollection paragraphs focusing on themes such as motivation, goals, and completion.

Table 3.

Factor Analysis of the Activity Questionnaire

Factors	Eigenvalues	Items	Loadings
Factor 1. Intrinsic Reasons	3.34	Item 7. Helpful in coping with the Pandemic	.80
		Item 9. Extent that the activity was Stimulating	.75
		Item 2. Helped reduce feelings of anxiety about the pandemic	.73
		Item 1. Felt a sense of accomplishment when completing the activity	.70
		Item 4 Provided an escape from reality	.61
		Item 8. Positive versus negative feelings involved when recollecting the episode	.60
		Item 5. Use of personal skills	.60
Factor 2. Connectivity Reasons	1.31	Item 10. Influenced by social media in choosing the activity	.74
		Item 3. Felt connected with friends and family	.72

Qualitative Illustrations of the Activity Factors

Subject weights from the regression scores were used to select the 10 highest scores and 10 lowest scores on Factors 1 and 2 of the Episodes Recollection measure. The following are examples from the two highest and two lowest regression scores for each factor.

Factor 1 (Top). Participants scoring the highest on Activity Factor 1, *intrinsic motivation*, showed more commitment and dedication to their creative activities which centered around personal goals. Participant 122, with one of the highest regression scores (1.44) in the Activity factor 1, displayed a very intrinsic motivation for choosing the activity. This participant was motivated by personal fitness goals. Additionally, Participant 123, with a regression score of 1.37, relied on the activity to provide a cathartic experience. Both participants showed a high incentive for choosing and completing their activity.

Participant #122, male:
During the pandemic, I started working out way more for so many reasons.... I started to work out because I was motivated by the people around me and because I already started before gyms closed. .... A milestone I hit was benching 170 pounds and I weigh 165... My bench has increased from 135 to 170 in about a month so I know Im doing something right. Overall, Im just really motivated which is why I started/continued working out during the pandemic. Also, it relieves a lot of stress and energy which is good for my mental health.

Participant # 123, female:
One creative activity that I did alone during the pandemic, which greatly helped me cope with the situation was write poetry.....I had actually stopped writing poetry for a while before the pandemic, as I got busy but what promoted me was I had a whole bunch of emotions going through me. I felt angry, sad, hurtful, lost, and especially alone even with family....I did break down while writing, but it was a more healthy option for me rather than exploding. In the poem, I said everything i had to and the words just flowed like a river. I wrote pages and pages, turned out to be a long poem but it was worth it. I gained a sense of calm and peace after that poem which I hadn't had in a long time. The calm and peace is what got me through the pandemic and kept me going....

Factor 1 (Bottom). Participants scoring low on Activity Factor 1 showed low intrinsic motivation for completing their creative activity. These participants tended to choose the activity out of boredom and not having anything else to do. For example, Participants 101 and 145 had the lowest regression score (-2.86 and -2.85 respectively) in Factor 1, and this is evident in the paragraphs written, which center around losing interest and giving up on the tasks.

Participant # 101, female:
The creative activity was making a crochet animal toy. I had been feeling very down and frustrated because of the lockdown, so I made the conscious decision to do something I usually enjoyed doing to try improve my mood. I had intended to make a wolf and started with some grey thread, for some reason it wasn't working so I switched to another color....I had not spend much time on the activity before I lost interest and gave up, I think it might have been around 15 minutes (usually crocheting small characters/animals takes me half a day to complete). I didn't feel any better, perhaps worse because I couldn't find the motivation or any enjoyment in crocheting like I usually did.

Participant # 145, female
I drew flowers and leaves on my old shoes with markers. I was really bored at home during March since that's when school switched to online....I saw this guy on YouTube who painted shoes and it looked really cool so I decided to draw on the shoes. It was fun at the time while drawing on the shoes, however I never drew on a second pair and I never wore those shoes....it made me feel less bored at the time but afterwards I again became bored since it did not take that long.

Factor 2 (Top). Factor 2 represented *connectivity motivations* for engaging in activities. The 10 highest scores and the 10 lowest scores were then compared in terms of descriptions of the chosen activities. The following are examples from the two highest and two lowest Factor 2 regression scores. High regression scores reflect a greater need for connectedness with others and an external motivation for choosing the activity. The responses focused on social media as an influencer for the activity and quality time with family being of importance when completing the task. Participant 37 had the highest score (2.37) on Activity Factor 2. Participant 144 came next, with a regression score of 2.13. Both participants wrote paragraphs about an external influence that motivated them to reach a creative goal.

Participant # 144, female
I tried to learn and improve on my drawing skills. It was the videos and posts online that prompted me to do these due to all the hacks and shortcuts that I learned. I was excited and looking forwards to what I was about to create since I haven't been able to draw much in high school. I had a full day picnic with my sister where we took

our sketch pads and drew cool things using cool techs and hacks. It made me feel happy and in control as I was in charge of something while exploring something new which isn't the case usually when I learn something new.

Participant # 37, female
I decided to keep my body healthy through doing intermittent diet....I started doing home workouts which includes body weight workout, resistance band workout, indoor cycling and lifting weights. This decision was made as I got bored of baking and overeating and felt like it was time to use this 'never ending' quarantine time to do something productive. I felt more confident and healthier after making this decision and implementing it. I also had a workout buddy, my mom, to keep me accountable. On days I feel like slacking she will motivate me.

Factor 2 (Bottom). Participants scoring the lowest on Activity Factor 2 exhibited the least extrinsic motivation for choosing their creative activities. Their accounts had a pessimistic tone and focused on a desire to escape feelings of loneliness but with little motivation to do so. Participants 91 and 176 scored very low on factor 2 (-2.67 and -1.96), suggesting that external influence was not a key component in choosing the activity. Both participants displayed incoherence in their paragraphs. Themes of alienation and being stuck in a negative situation were common in both paragraphs.

Participant # 91, female
I took time between my schoolwork to write a song. I had not written music in a while and my stress and anxiety were at a peak. I had no sense of control and it was the only thing that I could do as an outlet for all of this emotion. It was rather a cathartic experience....The tears began to stream down my face and I could not stop. The song became a prayer for revival, truth, freedom, and restoration from the alienation that we were experiencing. Being cut off from the world did something that made the strongest powerless. There was nothing that we could do. So we waited until we could once again venture out and even then it was not the same.

Participant # 176, female
I have re-sparked my interests in arts but essentially only arts.... learned how to digitally compose multiple genres of music....I began to draw on paper again, learned how to use drawing tablets, and began learning how to animate as well....When I began, and honestly still up to this point, I still felt hollow, I made what would be considered quite a tremendous amount of progress in a short period of time however it is not unnatural for me to do so.... I give up and move on as quickly as I pick these things up, as a result I have a fairly surface level knowledge about many things, yet no real passion I've held on to for longer than a period of maybe two months at a time....

Correlations

Seven significant correlations were found when analyzing the data from the Emotions, Activity, and COVID-19 measures. Factor 2 of the Activity measure, *connectivity motivation*, correlated positively with the experience of positive emotions over the two weeks prior to the study, $r = .26$, $p < .01$. Participants who had chosen an activity involving feeling connected to others reported higher levels of positive emotions such as "happiness' and "gratefulness." As expected, Factor 1 of the COVID-19 measure, *positive features of the pandemic*, correlated positively with Emotions Factor 2, *positive emotions*, $r = .34$, $p < .01$, and negatively with Emotions Factor 1, *negative emotions*, $r = -.28$, $p < .01$. Viewing the pandemic as a time for doing enjoyable things was associated with experiencing positive emotions, such as "hope," and "interest" more often and negative emotions, such as "loneliness" and "anxiety," less often.

Factor 1 of the COVID-19 measure was also positively correlated with both Factor 1, *intrinsic motivation,* $r = .23$, $p.01$, and Factor 2, *connectivity motivation*, $r = .30$, $p < .01$, of the Activity measure. Participants who viewed the pandemic as a good time for doing enjoyable things were also more motivated to complete creative tasks, either intrinsically or extrinsically. They showed more commitment to the activity and, overall, more positive descriptions of their activity in the writing tasks.

Conversely, Factor 2 of the COVID-19 measure, *negative features of the pandemic*, was positively correlated with Factor 1 of the Emotions measure, *negative emotions over the last two weeks*. Participants who experienced the most adverse effects of COVID-19 also reported more negative emotions overall, $r = .27$, $p < .01$. However, the most crucial finding was that Factor 2 of the COVID-19 measure was positively correlated with Activity Factor 1, $r = .23$, $p < .01$. Participants experiencing the most adverse effects of the pandemic reported highly intrinsic reasons for choosing their creative activities. These participants were internally motivated to turn to activities such as poetry, painting, or music as ways to cope with the negative circumstances around them. They described the activity as an outlet for their emotions, a kind of catharsis, suggesting that the activity could be a mediator between negative effects of the pandemic and negative emotions overall.

These findings are in line with the Intrinsic Motivation Hypothesis of Creativity. Intrinsic motivation fuels creativity (Minney, 2016). In turn, creative art activities can promote psychological wellbeing. Consistent with Reynolds' (2000) findings, using creative tasks to cope with adversity provides an outlet for negative emotions such as depression and anxiety. Furthermore, tasks that are intrinsically meaningful and provide a sense of purpose are central to overcoming feelings of hopelessness and despair (Spandler et al., 2007).

Discussion

The purpose of this study was to examine the power that creative activities can have in coping with the COVID-19 pandemic. The pandemic has affected the lives of almost everyone worldwide to some degree. For many, the "normal" way of life has been disrupted due to imposed quarantine, social distancing, and restrictions (Bhullar & Jackson, 2020). While the virus itself poses a physical threat, the repercussions of isolation can pose an emotional threat. We are now faced with the challenges of both danger control and emotional control as we navigate through this new way of life. We must take precautionary measures to avoid contracting the virus and passing it on to others by social distancing and maintaining personal hygiene. But we must also learn to cope with the anxiety surrounding health and isolation (Cupchik, 2020). However, as mentioned by Spandler (2007), having a sense of purpose and meaning is central to mental health recovery, and participating in art offers a range of positive therapeutic benefits. Engaging in creative activities in general can reverse feelings of hopelessness, despair, and anxiety about the future (Spandler, 2007). The present study combined beliefs about creativity and mental health and tested them against attitudes towards the pandemic.

Attitudes Toward the Pandemic

One of the most significant findings of this study was that participants reported both positive and negative features of the pandemic. Negative features involved anxiety about contracting the illness and struggling to adjust to the new way of life. This was expected, as the pandemic has caused the breakdown of both physical and mental barriers that normally separate work/school from home/private life (Cupchik, 2020). However, some positive features that were reported involved having more time to do enjoyable things and being able to spend more time with family. Participants who reported these positive features were also more optimistic that the current situation would improve. Overall, participants who thought of the pandemic as a time for doing positive things reported feeling more positive emotions, and fewer negative emotions, over the past two weeks prior to the study. Similar to the Chinese logogram for the word 'crisis,' which is composed of the signs for both danger and opportunity, these participants were able to see an opportunity amidst chaos, which helped them to better cope with the negativity around them. Alternatively, participants who were not able to think of any positive aspects of the pandemic reported feeling more negative emotions leading up to the study.

Emotion Regulation

Whether participants held positive beliefs or negative beliefs about the pandemic, both groups benefited from participating in creative activities. Choosing a creative activity to do during the pandemic was either stimulated by an intrinsic motivation or by the desire for connection with others which was strongly correlated with overall positive

emotions. Having a strong motivation for choosing the activity, whether the motivation was intrinsic or extrinsic, was correlated with overall positive attitudes toward the pandemic. However, the more negative a person's attitudes towards the pandemic, the more intrinsic the reasons were for taking up a creative activity. Participants who felt the strongest negative effects of the pandemic were also compelled to regulate their own emotions through cathartic activities such as writing poetry. Understanding their own emotions was central to coping with the negative changes in their lives. This finding is in line with a study by Leventhal, Singer, and Jones (1965), which suggests that some level of fear and arousal is necessary for producing a change in behavior. However, since the present study was mainly interested in participants who had participated in a creative activity during the pandemic, there is a lack of evidence to suggest that those experiencing the most adverse effects were turning to creativity to regulate their emotions. Nevertheless, turning to creative activity may serve as a form of emotion regulation for stressful events.

Building Resilience

Using creativity as an outlet for negative emotions may help build resilience during hardship. In the COVID-19 study by Cupchik (2020), students who measured high in resilience were also more in-touch with their feelings. When speaking about their problems, they also spoke about how they dealt with the problems. They were also more critical in their approach to coping with stressful situations and actively sought ways to regulate their emotions (Cupchik, 2020). Similarly, in the present study, participants who were aware of their negative emotions and wanted to overcome these emotions used creative activities to do so. They showed an active need to self-regulate and more commitment to the task. This could possibly be related to perceived locus of control. Participants who felt the negative effects of COVID-19 but chose to change the aspects of their lives that they were able to control, such as the types of activities they did indoors, exhibited greater emotion regulation than participants that did not actively seek to make any changes. Perceived control can have a huge impact on wellbeing, and an internal locus of control has even served as a buffer for decreased immune function in patients with major depression (Reynaert et al., 1995).

Further research should look at the extent that creative activity provides a sense of control during a stressful event. It may also be important to look for differences between individuals working/studying from home versus those that are considered "essential" as each group may have a different source of anxiety. Furthermore, it would be interesting to see the differences in coping between individuals who already had creative tendencies prior to the pandemic and those who turned to creativity because of the pandemic.

Biodata of Authors

Julinda Seydini graduated from the University of Toronto, Scarborough Campus with a BSc in Psychology in 2017. Since then, she has been working as a Financial Advisor at CIBC bank in Toronto while also volunteering in psychology labs and doing independent research. In 2020, she partnered with Professor Gerald Cupchik on a research study looking at how creative activity was used as a way to cope with the COVID-19 pandemic. She is now studying for her masters degree in counselling and psychology at Yorkville University in Toronto. She hopes to become a psychotherapist and implementing creativity to cope with anxiety and depression. Her interests include creative expression, interpersonal relationships, and mental health.

Gerald Cupchik has been a professor of psychology at the University of Toronto since 1974. He was president of three international organizations, including: IAEA, the International Association for Empirical Aesthetics (1990-94), Division 10, Psychology and the Arts, of the American Psychological Association (1996-97), and IGEL, the International Society for the Empirical Study of Literature (1998-2000). He received the Rudolf Arnheim Award in 2010 from the APA and the Gustav Fechner Award in August 2018 from the International Association for Empirical Aesthetics, both for distinguished research and service. He published *The aesthetics of emotion: Up the down staircase of the mind-body* in 2016 (Cambridge University Press).

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Appendix A

Creative Activity During COVID-19 Questionnaire

Creative Activity During COVID-19 Questionnaire

Demographics

What gender do you identify with?

1. Male
2. Female
3. Other

What age group do you pertain to?

1. 18-22
2. 23-30
3. 30-40
4. 40 and over

What is your occupation? (For social media only)

1. Student
2. Working full-time
3. Working part-time
4. Unemployed

What year of study are you currently in? (For SONA only)

1. First year
2. Second year
3. Third year
4. Fourth year
5. Fifth year +

Emotions Over the Last Two Weeks

On a scale of 1 to 7, to what extend do each of the following emotions apply to you over the last two weeks? Pick one that applies.
(1= not at all, 4= more than half the days, 7= nearly every day)

1. _____Angry
2. _____Happy
3. _____Fearful
4. _____Sad

1. _____Anxious
2. _____Hopeful
3. _____ Depressed
4. _____Interested

1. _____ Lonely
2. _____ Guilty
3. _____ Surprised
4. _____Grateful

COVID-19 Questionnaire

Think about how the COVID-19 pandemic has affected you. Answer the following questions using 1= Disagree Strongly, 2= Disagree, 3 = Somewhat Disagree, 4= Neutral, 5= Somewhat Agree, 6 = Agree 7= Agree Strongly

1. COVID-19 has affected my work/school routine.
2. I have struggled to adjust to societal changes from COVID-19.

3. My personal finances have been negatively affected.
4. I have struggled to connect with my family and friends.
5. My social life has been negatively impacted by the pandemic.
6. I have spent more time doing things I enjoy.
7. I have been able to slow down and spend more time with the people closest to me.
8. I am optimistic that the current situation will improve.
9. I am anxious about my health and contracting COVID-19.
10. I am resilient and able to cope with changes in my life.

Episode Recollection

While most of the city was in lockdown during the months of February to August of 2020 due to the COVID-19 pandemic, more time was spent at home. Think back to the last 6 months and try to recollect ONE specific creative activity that you did alone that helped you cope with the pandemic.

Think of one specific episode when you did this creative activity. What was the creative activity and what prompted you to do this? What were your thoughts and feelings leading up to the activity? Describe the context in which the activity occurred. How did this make you feel?

Provide your answer below using a minimum of 150 words

Activity Rating

Please rate your activity on the following scales
1= Disagree Strongly, 2= Disagree, 3= Somewhat Disagree, 4= Neutral, 5= Somewhat Agree, 6= Agree, 7= Strongly Agree

2. I felt a sense of accomplishment when completing the activity
3. The activity helped reduce feelings of anxiety about the pandemic
4. I took part in the activity to feel more connected with my friends/family
5. The activity provided an escape from reality
6. The activity allowed me to use my skills
7. The activity helped me reduce feelings of isolation

Please note the rating scale has changed.

8. To what extent was the activity helpful in coping with the pandemic? (1= not at all helpful, 7= extremely helpful)
9. To what extent were positive or negative feelings involved when recollecting the episode? (1= extremely negative, 7= extremely positive)
10. To what extent was the activity stimulating? (1= not at all stimulating, 7= extremely stimulating)
11. To what extent were you influenced by social media in choosing this activity? (1= not at all influenced, 7= extremely influenced)

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Research Article

Effects of STEM education on the academic success and social-emotional development of gifted students

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Abstract

STEM education, accepted as one of the most significant educational movements of recent years, is an approach that aims to educate students, including gifted students, in the disciplines of science, technology, engineering, and mathematics as a whole. This research aims to provide a general framework of the effect of STEM education on academic success and social-emotional development using the meta-synthesis method related to the work done for gifted students. The descriptive distribution of 28 studies that meet the criteria for inclusion in thematic meta-synthesis is given according to the data source of the publications. A critical examination of literature published from 2010 to 2020 identified combining and analyzing the results of research on STEM education in the field of gifted education. The view that STEM education positively affects gifted students' academic and social-emotional development has once again been proven through qualitative data. The findings of this study on STEM programs showed that attending a unique program can meet the needs of highly able students. When STEM education is viewed through the lens of the multifactor model, it can be said that it works to meet their academic, social, and emotional needs. While the literature focuses on how these needs are not met, it was refreshing to experience students with high learning potential who are mostly satisfied with their educational opportunities and social environment. Implications for STEM education on academic success and social-emotional development and suggestions for future research are discussed.

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Introduction

The systematic convergence of science, technology, engineering, and mathematics into an integrated STEM curriculum provides students a more extensive base of real-life learning skills (English & King, 2019; Fan et al., 2021). This convergence helps students learn STEM content through the application of the scientific method and the cycle of

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engineering design (MacFarlane, 2015; Margot & Kettler, 2019; Self, 2020). Being science and technology literate has become extremely important in both developed and developing countries. Work force and economic development policies encourage individuals to develop their cognitive and technical skills across multiple stages of acquiring knowledge, formal education, and applied training. These goals seek to raise new generations of children equipped with STEM concepts, open to innovations with an entrepreneurial spirit, and an ability to think creatively. To nurture and equip such a generation, requires an educational climate that gives students a sense of responsibility and encourages the development of their STEM self-efficacy. Quality STEM education allows students to explore and confronts mistakes while equipping them with technological knowledge from a young age (Ihrig et al., 2018; Gale et al., 2020).

Recently in science education, learning experiences have trended toward engineering and technology disciplines. As a result, students are gaining skills such as generating ideas and creative problem solving with depth and complexity (Johnson et al., 2020). In this way, scientific thinking and engineering practices provide students with opportunities to explore possible solutions to the environmental and social problems they face (Dailey et al., 2018; Dailey & Cotabish, 2016). Through practical activities, interactive discussions, independent work, and teamwork in the STEM process, students reach targeted learning goals, configure the newly acquired knowledge, and develop self-management and self-confidence skills. Students also gain research skills as they complete their projects, strengthen their relationships with peers and adults, and work in collaborative groups to see the positive effects of their work. In STEM education, meaningful and permanent learning occurs through integrated and applied knowledge and skills presented through a broadly structured research process, original questions, and carefully designed products and activities (Millar, 2020; Wilson, 2018).

Integrated STEM education has been widely advocated and implemented with students across all grade levels and ability ranges. While the effects of STEM education have been studied across geographic boundaries and educational systems (e.g., Aldemir & Kermani, 2017; Toran et al., 2020), less is known about the impact of STEM education on students identified and participating in gifted education. The purpose of this meta-synthesis study was to examine the impact of STEM education on gifted and talented student populations.

Conceptual Framework for Studying Gifted Education and STEM

Gifted and talented curriculum should be differentiated across four areas of learning design: course of study, curriculum standards, instructional models, and authentic engagement (Kettler, 2016). For students to achieve the domain-specific outcomes that constitute advanced performances, the curriculum needs to be intentionally altered and aligned at each of the four levels. A quality gifted education provides out-of-school services such as mentors, experts, and programs that develop the skills of students. Additionally, quality gifted education should foster academic development and provide behavioral strategies for gifted and talented students due to effective and stimulating learning experiences (NAGC, 2019). Gifted students need to have problem-solving opportunities to be able to adapt to real life (Reis & Renzulli, 2018). Gifted students must concentrate on their interests to develop research projects. The development of societies depends on the ability of gifted students to receive appropriate, timely education. To direct gifted students to real life, STEM education is one of the models applied in the education of gifted students, currently trending worldwide (Morris et al., 2019).

Recent national reports advocate preparing learners for careers in science, technology, engineering, and mathematics (President's Council of Advisors on Science and Technology, (PCAST, 2010). STEM education helps students in the United States see themselves as scientists, mathematicians, and individuals with capacity to pursue STEM careers. Moreover, students participating in rigorous educational programs have a better chance of pursuing STEM careers (Almarode et al., 2014; Yoon & Mann, 2017). Thus, STEM education has the potential to support gifted students through high-quality curriculum, career planning in STEM disciplines such as aerospace engineering, astronomy, biochemistry, statistics, psychology, and a focused pathway to prepare for increasingly rigorous educational opportunities (Bruce-Davis et al., 2014; Robinson et al., 2014; Sternberg, 2019).

Gifted students feel confined in schools with standard curriculums and teaching approaches for the typical student. Each has distinct talents, interests, obsessions, passions, and occasionally learning problems. Gifted children understand complex concepts quickly and acquire content more quickly and in detail than their classmates. They want more in-depth discussion. They understand and generalize ideas.

Educators have advocated modifying all three areas (disciplines of study are framed by emphasizing advanced content, higher-order thinking, processing, and products are developed, and learning experiences are created around significant concepts, issues, and themes that occur in real-world applications and theoretical understandings within and across disciplines) and developing an integrated curriculum model (ICM) for talented children. ICM helps gifted students develop their abilities and talents in their own manner and at their own speed (Van Tassel-Baska & Baska, 2021). ICM emphasizes big ideas, advanced material, critical thinking, real-world applications, and cross-disciplinary methods. ICM is aimed to accelerate learning quicker and deeper than standard curricula. It encourages critical thinking above repetition and memorization. It emphasizes multidisciplinary conceptual learning. Structuring, compacting, and accelerating are supported. It allows talented students to thrive in their own manner.

STEM in Gifted Education

STEM education is advocated for all learners, but STEM curriculum in gifted education should include a differentiated framework in order to contribute to the development of high ability learners (Johnson et al., 2020). The open-ended and inquiry-based approach of STEM learning tasks are ideal for creating a differentiated learning environment (Dailey et al., 2018; MacFarlane, 2015; Mun & Hertzog, 2018). Ideally, personalizing or customizing STEM education for talented students yields advanced learning trajectories that become more complex as it progresses. The theoretical model for STEM in gifted education includes both the principles of STEM integrated learning and the principles of gifted and talented curriculum. This merging of the two educational approaches yields a curriculum emphasizing the following: (a) advanced STEM content, (b) complex thinking with a STEM framework, and (c) conceptual understanding of STEM problems, theories, and ideas (Kettler, 2018).

Academic Success and Social-Emotional Development of Gifted Students

All students develop socio-emotionally from childhood to adulthood. Some disagreements remain whether identified gifted students develop similarly or dissimilarly from the non-identified peers. Fundamental to this issue is the theory of individual differences. Intelligence and academic potential are the chief traits on which gifted students differ from non-identified peers. The theory of individual differences states that there are covariate elements that will differ in individuals concurrent with the differences in intelligence and academic potential (Lubinski, 2000). Much of the research indicates that identified gifted students develop socially and emotionally quite similar to non-identified peers (Bracken & Brown, 2006; Cross et al., 2008; Wiley, 2020). However, there may be some ways that individual differences in high intelligence students corresponds with some social and emotional differences.

One potential area (domain) for differential development is self-concept. Gifted students tend to exhibit higher global self-concepts and higher perceived academic competencies than general education peers (Litster & Roberts, 2011; Sarouphim, 2011). When gifted students are accelerated academically, they demonstrate even higher levels of global self-concept (Hoogeveen et al., 2012). In other words, gifted students tend to be more self-aware than their peers and this greater awareness could benefit from differentiated STEM education.

Another area of potential differences is perfectionism. While the research suggests that gifted students are no more likely to develop maladaptive perfectionism, their experience with perfectionism may be qualitatively different (Margot & Rinn, 2016; Rice & Ray, 2018). Gifted students may more intensely concern themselves with small failures and experience academic pressures in some unique ways. Differentiated STEM education for gifted students could interact with their high cognitive ability and yield some effects related to the theory of perfectionism.

Positive and productive social, emotional, and academic development are typical goals of all types of education including STEM education and gifted education. Strength-based approaches to development define skills and

competencies in each of the three areas (Aspen Institute, 2019). Typical examples of skills and competencies include the following. In cognitive development, students acquire the abilities to create objectives, plan future, endure, concentrate, and address these issues. In social and interpersonal development, students learn how to deal with social problems, settle disagreements, show respect for others, collaborate and work as part of a group, advocate for themselves, and take ownership of their own learning. In the area of emotional development, students learn to identify and control their emotions, comprehend the feelings and perspectives of others, display empathy, and deal with stress and setbacks (Allensworth et al., 2018). Thus, as we ask the question of whether STEM gifted education impacts the cognitive, social, and emotional development of students, these skills and abilities are examples of those potential outcomes.

Lack of Empirical Evidence

Though STEM education is often recommended for gifted students, gaps exist in the literature concerning its effect on the academic success and social-emotional development of gifted learners. The current study contributes to understanding the effect of STEM education on gifted students. This study also provides a potential framework for researchers for future studies within this conceptual space.

There are limited STEM education studies in connection with bright kids and there is no consensus among STEM stakeholders about what is the ideal STEM program for gifted students in schools (Mullet et al., 2018). In this respect, systematic literature reviews are important both for following the developments of scientific studies and determining associated trends. Besides, such studies are also essential to identify the problems arising in a field. In this study, we employ a meta-synthesis approach using qualitative data analysis techniques to make valid and trustworthy conceptual analyses (Finfgeld-Connett, 2018). In the meta-synthesis approach, the research team relies on textual narratives that describe and explain the findings of each study included in the synthesis rather than statistical analysis as would be used in meta-analyses.

Aim of Study

This study examined and synthesized primary research studies related to the effects of STEM on two major areas: the academic achievement of gifted students and social-emotional development of gifted students. The following research questions were answered.

- How does STEM education affect the academic success of gifted students?
- How does STEM education affect the social-emotional development of gifted students?

Method

We used a meta-synthesis research protocol to answer these two research questions. Meta-synthesis has been noted as a valuable analytic tool in social and health science disciplines (Hanes & Macaitis, 2012), and evidence synthesis was the primary goal of the study. In meta-synthesis, the research team uses qualitative analysis techniques to systematically review primary studies and generate synthesized results (Braun & Clarke, 2021; Finfgeld-Connett, 2018). Meta-synthesis begins with a position of objective idealism acknowledging that results exist and can be rationally and systematically synthesized (Ludvigsen et al., 2016). Within this tradition, our analytic processes involved classifying findings of primary studies and meta-summarizing those findings within established theoretical frameworks (Gough et al., 2017; Harden, 2010).

Screening Model

The table presents a rubric for assessing the quality of articles (see Table 1). A 5-point scale was applied to each article, with 1 being "poor" and 5 being "excellent" out of eight criteria.

The literature identification process is long and challenging. For the literature to be discovered, each research question needs to have descriptive, clear, and understandable information about the author, year, type of publication, and attachments of the studies that meet the inclusion and exclusion criteria presented in a table. The table contains the research codes, author, publication name, publication year, and theme code of the studies.

Studies included in thematic meta-synthesis contain some descriptive features related to the inclusion and exclusion criteria. The presentation of descriptive tables by the researcher is an approach that increases the reliability of the research. The source of the synthesis confirms the suitability of the research question with the data set. (Braun & Clarke, 2021; Finfgeld-Connett, 2018). In Table 2, the descriptive distribution of 28 studies that meet the criteria for inclusion in thematic meta-synthesis is given according to the data source of the publications.

The 28 studies consisted of 18 studies performed in the United States, and eight studies were non-USA (two studies in Australia, two studies in Turkey, one study in Taiwan, one study in China, one study in Israel, and one study in Netherland. Two studies were cross-cultural. One stud was performed in USA and Norway (Lange, 2018), and the other one was conducted in Spain, Ukraine, India, Singapore, Australia, Canada, and the USA (Haggerty, 2014).

Search Criteria

The inclusion criteria in the meta-synthesis include the following: time frame, databases, keywords, findings of the studies, and publication type (Borenstein et al., 2011). In the selection of primary studies for the analysis, the studies had to be published within in 2010 or later. Studies written in English were included. Qualitative studies were included. Quantitative studies, book chapters, and non-empirical studies were excluded. Those taking part in the study must have been students in elementary, middle, and high school, as well as students attending college. Any study with participants outside the K-12 and college-age groups was excluded from the study. As an example, Tay et al. (2018) and Margot and Kettler (2017) were removed from the present meta-synthesis review since they were conducted on teachers.

Table 1.

Meta-synthesis Rubric

Criterion	5: Excellent	4: Good	3: Average	2: Fair	1: Poor
Setting	Setting includes STEM education that improves academic achievement and fosters social-emotional development	Setting includes STEM education that contributes to academic achievement and social-emotional development.	Setting includes STEM education that attempts to foster academic achievement and social-emotional development.	Setting includes STEM education, academic achievement, and social-emotional development.	Setting does not include STEM education, academic achievement, and social-emotional development.
Methodology	All assertions and support conclusions are based on sufficient observed and measured phenomena and derives knowledge from actual experience.	Most assertions and conclusions are based on sufficient observed and measured phenomena and derives knowledge from actual experience.	Some assertions and conclusions are based on observed and measured phenomena and derives knowledge from actual experience.	Assertions and conclusions are based on observed and measured phenomena and derives knowledge from actual experience.	Assertions and conclusions are based only on observed and measured phenomena.
Addressing process	Addresses four or more processes stages of the STEM education.	Addresses at least three processes stages of the STEM education.	Addresses at least two processes stages of the STEM education.	Addresses at least one processes stages of the STEM education.	Fail to address any processes stages of the STEM education.
Compatibility	Research questions require a clear purpose, focus, setting, support, and processes.	To some degree, purpose, focus, setting, support, and processes can be relevant to research questions.	Some key factors require research questions.	Not directly relevant to research questions.	Does not apply to research questions.
Reporting	Sources for further reading are provided in the citations.	Citations that are thorough and accurate.	Citations that are complete entirety.	Citations that are not complete.	There are insufficient, incorrect, and/ or missing citations.
Setting	Setting includes STEM education that improves academic achievement and fosters social-emotional development	Setting includes STEM education that contributes to academic achievement and social-emotional development.	Setting includes STEM education that attempts to foster academic achievement and social-emotional development.	Setting includes STEM education, academic achievement, and social-emotional development.	Setting does not include STEM education, academic achievement, and social-emotional development.
Methodology	All assertions and support conclusions are based on sufficient observed and measured phenomena and derives knowledge from actual experience.	Most assertions and conclusions are based on sufficient observed and measured phenomena and derives knowledge from actual experience.	Some assertions and conclusions are based on observed and measured phenomena and derives knowledge from actual experience.	Assertions and conclusions are based on observed and measured phenomena and derives knowledge from actual experience.	Assertions and conclusions are based only on observed and measured phenomena.
Addressing process	Addresses four or more processes stages of the STEM education.	Addresses at least three processes stages of the STEM education.	Addresses at least two processes stages of the STEM education.	Addresses at least one processes stages of the STEM education.	Fail to address any processes stages of the STEM education.
Compatibility	Research questions require a clear purpose, focus, setting, support, and processes.	To some degree, purpose, focus, setting, support, and processes can be relevant to research questions.	Some key factors require research questions.	Not directly relevant to research questions.	Does not apply to research questions.
Reporting	Sources for further reading are provided in the citations.	Citations that are thorough and accurate.	Citations that are complete entirety.	Citations that are not complete.	There are insufficient, incorrect, and/ or missing citations.

The studies included had to be published in sources indexed in ERIC, Google Scholar, or ProQuest databases. Keywords for the studies to be included are "gifted + STEM," "gifted + academic success," "gifted + social development."

Initially, 568 primary studies were identified using the search criteria. After eliminating duplicates and papers that met our exclusion protocols, a total of 28 primary studies were used for the analysis (see Figure 1).

Data Analysis

Meta-synthesis applies qualitative data analysis processes to systematically synthesize the results of multiple primary studies. Even when the primary studies yield quantitative results, the process of synthesis involves qualitative analysis within a post-positivist tradition. In this study, which was designed with the thematic meta-synthesis method, the data were analyzed and interpreted by following the steps suggested by Braun and Clarke (2021).

Familiarization With the Data: This includes reading the entire dataset several times to familiarize yourself with dataset. The purpose of this step is to find information relevant to the research questions. Transcribing data by hand can be beneficial for researchers as it allows them to gain a deeper understanding of the data. I first read each publication once before coding in this phase. Taking notes at this point was necessary during this first round of each study as it required 'active reading.' Rather than coding, I utilized this active reading to become familiar with the main topics addressed in each study. To recognize the data in this study, each of the documents included in the research was read one by one, and the first codes thought to be related to the research question were marked.

Table 2

Studies Included in Meta-synthesis

Author/Year	Topic	Source	Grade level	Country
Jen and Moon, 2015	Students in Taiwan who graduated from a self-contained STEM-specific program.	Gifted Child Quarterly	High School	Taiwan
Coleman,2016	Black men's real-life motivations for pursuing careers in science, technology, engineering, and math.	Illinois Mathematics Science Academy	High School	US
Tofel-Grehl and Callahan, 2014	Community characteristics of STEM high schools.	Gifted Child Quarterly	High School	US
Wu et al., 2019	STEM talent development program perspectives of students.	Journal of Advanced Academics	College	US
Rice et al., 2016	Exceptional students of color in historically black colleges and universities in STEM fields.	Journal of Research Initiatives	College	US
Morris et al., 2019	Improving the STEM education of gifted Australian children by using rural knowledge.	Research in Science Education	Middle School	Australia
Mullet et al., 2017	Gifted high school students' perceptions on their STEM education.	Journal of the Education of the Gifted	College	US
Karahan and Unal, 2019	Gifted students designing eco-friendly STEM projects.	Journal of Qualitative Research in Education	K-6	Turkey
Dai et al., 2015	Living and learning in a STEM program: the perspectives of first-year college students.	Gifted Child Quarterly	College	China
Dieker et al., 2012	Encouraging gifted students to pursue jobs in the STEM fields via the use of computer-based simulations and virtual reality.	Gifted Education International	K-6	US
Hoyle, 2018	Study of Rural African American Girls Attending a Specialized STEM High School for Gifted and Talented Students.	Dissertation	College	US
Gilson and Matthews, 2019	Advances in Education: The New Early College High School for Engineers.	Journal of Advanced Academics	High School	US
Flowers III and, Banda, 2019	Participation in advanced placement and advanced math and science courses by Black males with STEM aspirations.	Gifted Child Today	College	US
Mun and Hertzog, 2018	From performing arithmetic to thinking mathematically, teaching and learning in STEM enrichment spaces.	Roeper Review	K-6	US
Vlies, 2013	Talented Students in STEM Gifted Program: Their Future Careers	Thesis	High School	Netherland
Collins and Roberson, 2020	Gifted black males in a program share their experiences in developing their STEM identities and talents.	Gifted Child Today	K-12	US
Bruce-Davis et al., 2014	Administrators, instructors, and students at STEM high schools all have different views on how best to educate and learn.	Journal of Advanced Academics	High School	US
Alcantara, 2015	Institutional and informal communities of practice on STEM	Dissertation	High School	US
Alrajhi, 2020	Teaching STEM Students in an Honors Program Using Holistic Approaches	Dissertation	College	US
Zocher, 2020	Qualitative Perspectives on the Strange Trails of Persistence in STEM	Thesis	College	US
Islam, 2019	Perspectives on Practices and Challenges of Science Teaching	Dissertation	K-6	US
Albert, 2020	The Effect of STEM on gifted learners.	Dissertation	Middle School	US
Sahin and Yildirim, 2020	Determining how STEM education influences gifted and talented students' post-secondary opportunities	Malaysian Online Journal of Educational Sciences	Middle School	Turkey
Kohan-Mass et al, 2018	The gender gap in STEM subjects	Gifted Education International	High School	Israel

Stith, 2017	Evaluations of STEM-focused schools	Dissertation	High School	US
Lange, 2018	Educating high-potential children in Norway and the United States about STEM.	Thesis	High School	Norway, US
Burt, 2014	Self-efficacy and middle-school students' STEM course selections.	Dissertation	K-6	US
Haggerty, 2014	Qualitative research on secondary school STEM student projects	Dissertation	K-12	Spain.., US

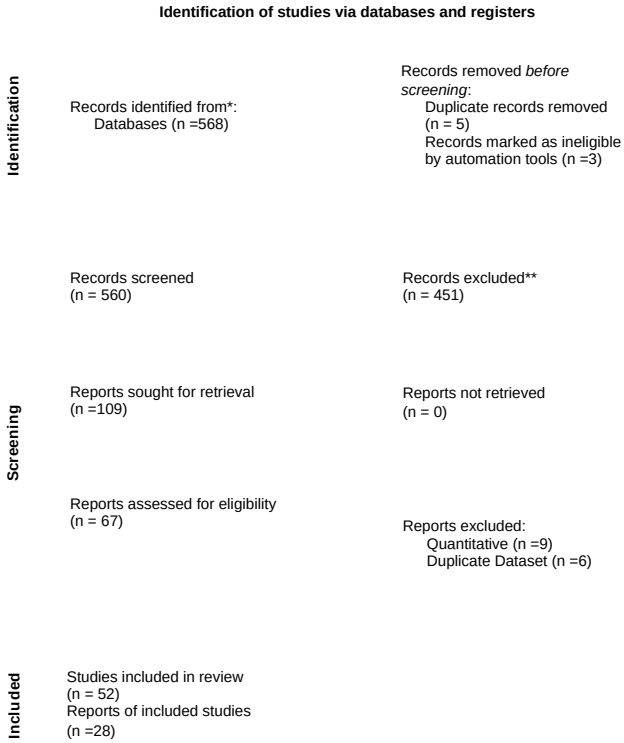

Figure 1

Flow Chart for the Inclusion and Exclusion Process of the Studies

Note. PRISMA flow diagram (McKenzie et al., 2020) of the article inclusion process

Generating Initial Codes: Themes are built from codes. Providing concise descriptive labels is used to describe or interpret data relevant to the study subjects. Researchers should spend equal time reviewing each of the data items in the dataset to establish themes. Codes should represent common elements within the research topic yet remain concise. Coding should occur for any data that could be used to answer the study questions. Through frequent code repetitions, the researcher can determine what codes are helpful for deciphering themes and which should be deleted.

Generating Themes: In this phase, data items to be coded are identified once all relevant items have been identified. From interpreting the meaning of individual data items within the dataset, we shift our focus to analyzing the meaning of aggregated meaning and significance of things within the dataset. It is then possible to review and examine the coded data to uncover ways in which different codes may be combined and thus form themes and sub-themes based on their shared meanings. Typically, a method of operating such would involve merging multiple codes into one to make it easier for the user to know what data they are viewing in a specific location. As the data is explored, it might just happen that one particular code should be considered representative of a specific theme or sub-theme that emerges in the data. Themes do not exist in the dataset which waits to be unveiled, however instead they reside within themselves. It is not merely sufficient that the researcher creates the relationship between the codes in a way that will help the researcher conceptualize the narrative of a given theme. Still, the researcher should also actively construct this relationship. In terms of importance or salience, codes and data items part of a particular theme do not determine how important it is (Braun & Clarke 2021).

Reviewing Potential Themes: The candidate themes are considered along with the coded data items. In the current stage, some candidate themes might not be as useful as interpretations of the data or will not provide data that address the research questions. Additional inconsistencies may exist in the code and/or data items related to these themes. Therefore, researchers should consider the following key questions when reviewing potential themes, as outlined by Braun and Clarke (2021).

Defining and Naming Themes: Researchers are required to investigate the thematic framework in-depth and present a detailed analysis. Several themes and sub-themes related to both the dataset and the research questions should be expressed in relation to both. The themes should differ, summarize the data, and present an internally consistent interpretation. There is, of course, the need to bring all these themes together in a coherent and lucid synthesis, consistent with the content of the dataset as well as relevant concerning the research questions. During this evaluation point, last-minute changes may be made to the themes' names.

Producing the Report: A qualitative researcher does not write up analysis after the research has been conducted, as traditionally the writer would do in quantitative research (Braun and Clarke, 2012). A recursive approach to reporting will be required here, as with previous phases. Throughout the analysis, Codes and themes are dynamic and ever-evolving, as does the write-up. During this phase, it should be documented changes with notes and maintain research throughout the entire project. In his report, the researcher would have begun writing before completing their thematic analysis. In phase six, the report would be finished and inspected thoroughly.

Creation of Main Codes

As seen in Table 3, to make comparisons and conversions between studies, the studies that comply with the inclusion and exclusion criteria, the title of the studies, the study's subject, purpose, results and appendixes are categorized and determine two main themes. A coding form has been developed. Coding form, (1) STEM education criteria for determining the academic achievement of gifted students; (2) Determination of the contribution of STEM education to the social-emotional development of gifted students and gifted students (3) study results and result evaluations. Coders extracted qualitative data from each study during the first phase of coding. After that, the author categorized each analysis and extracted data from approximately 20 variables showing the main characteristics of the studies. As part of the coding process, all data sharing similar attributes were considered as one subcategory, and the original extracted data were reclassified. For example, academic achievement is grouped into 6 sub-categories: “academic achievement test results, mats success, science success”. Similarly, social sensory development had seven subcategories: “Self-awareness Attitude Satisfaction Social Relationship Self-perception Participation in activities Motivation”. In total, 100 hours were spent coding all 28 studies, ranging from 300 to 600 minutes for each. After the preliminary coding was completed approximately eight months after the original coding, a recheck of the coding for intervention features and a plot of the study results ensured that coding had been done correctly.

Table 3

Codes of Meta-Synthesis

	Codes	
Categories	**A priori**	**Emergent**
Cognitive dimension Individual competencies and personal development Motivational skills development	Academic Success	-STEM’s effect on academic success -Academic achievement -Test results -Math success -Science success -Attending school -Creative Thinking
Social, and affective development Autonomy	Social-Emotional Development	-STEM’s effect on Social and Emotional -Self-awareness -Attitude -Satisfaction

	-Social relationship -Self-perception -Participation in activities -Motivation -Self esteem -Underachievement -Perseverance/Passion -Self-perception -Self-esteem -Self-efficacy -Self-confidence -Positive attitude -Satisfaction -Peer relationship -Relationship between teachers and students -Motivation -Interest -Enjoying and exciting learning environment

Coding

The coding of studies depends on the identification and classification of outcome variables (See Table 1). The current meta-synthesis is based on two types of results. The first was academic success. 18 of the 28 qualitative studies evaluated the effects of STEM education on 18 specific outcomes. These results included math, science score, and GPA. These results were then divided into five a priori codes during the article screening process (Academic achievement, test results, Math scores, Science scores, attending school). The 15 qualitative studies identified 30 specific outcomes in relation to social-emotional development. Each of these 30 specific outcomes was further coded into five a priori codes during the article screening process, which include: (1) Self-awareness Attitude Satisfaction Social Relationship Self-perception Participation in activities Motivation Self-esteem.

Developing Categories

After coding all the articles independently, explanatory information (research design, sample size), final codes, and potential categories and themes were organized into a table for each article. The final categories were (a) Cognitive dimension, (b) Individual competencies and personal development, (c) Motivational skills development, and (d) Social and affective development, (e) Autonomy. After the categories were created, article citations and data notes were examined. Potential themes were prepared independently in each category. Finally, categories and themes were jointly reviewed, defined, and named in the context of the research questions (Braun & Clarke et al., 2021; Gough et al., 2017).

Results

Academic Achievement and Social-Emotional Development Overview in Meta-Synthesis

In this meta-synthesis study, two common themes are academic success and social-emotional improvement. Studies investigating the effect of STEM education on academic achievement and social-emotional development of gifted learners were examined. The findings of this study on STEM programs showed that attending a unique program can meet the needs of highly able students. When STEM education is viewed through the lens of the multifactor model, it can be said that it works to meet their academic, social, and emotional needs. While the literature focuses on how these needs are not met, it was refreshing to experience students with high learning potential who are mostly satisfied with their educational opportunities and social environment. Analysis of responses of students, teachers, and parents from programs provides quality programs that aim to provide bright students with good education insight on how to meet their needs and give them an advantage for the future.

The findings of 28 studies met the final requirements (See Table 2). When STEM education is applied, it has been noticed that gifted students make progress in terms of acceleration and enrichment. It has also been found in studies that STEM education increases the motivation of gifted students and the ability of programs to meet their educational needs through challenging content suited to their higher abilities. Thanks to STEM education, highly skilled grouping and teacher support are mostly seen to support gifted students' social and emotional needs in the programs and contribute to the academic success and participation of students in these. Highly talented students developed a better social atmosphere through a substantial focus with their peers in similar groups, which facilitated making friendships. When it comes to the findings of gender, it is observed that STEM education has revealed the academic self-concept of female students appearing positively. Females feel more confident from an academic perspective. STEM education also helps to eliminate stress and anxiety for highly talented black female students.

Cognitive Dimension

Gifted students need enriched education to achieve their academic goals and develop socially and emotionally—two academic goals in English, Language, and Art (ELA) to write evidence-based claims and write claim-proof-reasoning statements in science. STEM education improves the reasoning skills of gifted students. Students participated in a STEM-based unit on stars and constellations throughout Albert's (2020) study, and students learned to write claim-proof-reasoning scientific statements. Before and after the unit, the participants conducted research that evaluated their ability to understand evidence-based claims in ELA, claim-evidence-reasoning statements in science, and the content of stars and constellations. Overall, students grew in all three areas. These results showed that writing claim-evidence-reasoning statements in STEM positively affected fifth-grade gifted students' ability to write evidence-based claims in ELA (Albert, 2020).

In Zocher's (2020) study, the aim was to provide social support and foster a sense of belonging for the twelve STEM students. The group was intended to be a social environment where students could talk about things that they could not otherwise find a place to discuss outside of STEM education settings, thereby developing the social dimensions of science identity. As can be seen from students' voices and echoed in study, there was a definite development of the group as a community from the beginning of the term to the end. After overcoming the issues of academic, and social-emotional learning, students found an area of trust and comfort where they could support each other, find common identities, and make meaningful friendships (Mullet et al., 2018; Jen & Moon, 2015). The activities proved particularly effective in achieving the goals of the group by allowing students the freedom to share themselves in an environment devoid of judgment and other restrictions found in traditional academic settings. Additionally, such conversations encourage meaningful reflections on gifted students' own individual journeys (Zocher, 2020).

Individual Competencies and Personal Development

In parallel with the interaction between the disciplines, the integration of engineering design processes into the lessons has been realized with bridges, simple machines, and various robotic studies, which were made using various materials within the scope of in-school STEM applications (Bruce-Davis et al., 2014; Burt, 2014; Flowers III & Banda, 2019). These studies enabled students to approach a problem that they might encounter in daily life more systematically and supported their collaborative work. It has been observed that the inclusion of engineering design processes in school lessons has helped students gain 21st-century skills such as generating innovative solutions, critical thinking, and conducting scientific research. In-class STEM activities were generally conducted in science classes (Burt, 2014; Flowers III & Banda, 2019; Mullet et al., 2018; Sahin & Yildirim, 2020). In these studies, conducted on gifted students, their views on STEM activities were positive. It is concluded that classroom activities are effective on scientific creativity and problem-solving processes. Out-of-school STEM practices were generally carried out in after-school activities, projects, and summer camps. The studies in which these activities were carried out concluded that out-of-school activities were practical for students. The studies in which robotic activities were carried out concluded that students' interest in engineering fields increased.

STEM applications improve academic success of students. In the study conducted by Mun & Hertzog (2018), researchers investigated the STEM application effect on gifted students. According to the results of the t-test in the analysis, it was observed that the students in the experimental group in which STEM education were applied had higher academic success and their orientation to STEM teaching compared to the students in the control group who did not experience STEM applications. In this case, it can be said that the application of STEM education is effective in increasing the STEM orientation of the students and their academic achievement in science. The effect of STEM education on students' academic achievement in study (Haggerty, 2014) on STEM education with gifted students, it has been seen that STEM applications are more successful in increasing students' academic success than non-STEM applications. In short, it shows that STEM applications are effective in improving the academic success of students at knowledge, comprehension, and application levels.

Teaching each student as an individual and allowing education to be tailored to what works best for each student is one of the 21st-century skills. The STEM education program meets their social-emotional needs through different strengths, such as the ease of developing friendships and their preference for group work (Alrajhi, 2020; Flowers III & Banda, 2019). Therefore, it can be said that STEM education programs meet the general needs of gifted students. To meet their needs, teachers and educators must be aware of the differences between students. Whether in a particular program or a regular classroom, the level of ability, interests, learning style, gender sensitivity, and speed are important factors to consider when providing tailored education to these students.

Motivational Skills Development

Interdisciplinary relationships within STEM education help students find innovative solutions to 21st-century problems. STEM education is understood to motivate gifted students and develop them academically, socially, and emotionally. In the studies about STEM education, it is observed that the motivation of highly able learners towards STEM has developed positively. Enough challenging tasks through a focus on STEM and enrichment may be the reason for this. Another motivating factor for gifted students is that STEM education also takes place outside of school (Alcantara, 2015; Islam, 2019; Mullet et al., 2018). While intrinsic and extrinsic motivation can explain why a student in a STEM education increases their motivation after they perform above their standards after participating in the program, this can also be explained by non-STEM domain-specific giftedness. However, loss of motivation must be taken seriously as this can lead to boredom, failure, and dropout. Since one female student in each program reported that she decreased her academic self-concept after participating in the programs, there were cases where motivation was closely linked to academic self-concept (Hoyle, 2018). While it can be said that students' perceptions about the use of their creativity in programs are mostly positive, different perceptions about creativity may affect their reactions (Alcantara, 2015; Bruce-Davis et al., 2014;).

Gifted and talented students prefer positive interactions with teachers, parents being supportive and satisfied STEM education, and STEM allowing students to be creative. It is seen that gifted students prefer group work in STEM programs compared to regular classes. Participating in the STEM programs helps students overcome some stress and allows them to excel. However, even if there is minimal contact between students and teachers or parents and teachers, parents have indicated satisfaction with the provision of STEM education for their children. The fact that parents are generally supportive increases the academic success of gifted students and contributes to their social-emotional development. This indicates how students' interest in STEM and the competitive educational environment in the US enables young students to choose their educational paths based on convenience and attractiveness, not their interest in the university (Alcantara, 2015; Kohan-Mass et al., 2018). While STEM education has managed to meet the needs of creativity, it has created a challenging environment for gifted students and motivated them for the future in STEM.

Social and Affective Development

Development Learning new things for pure learning pleasure is something that characterizes many students with high learning potential in intrinsic and extrinsic motivation. STEM education seems to increase differences in motivational

interest for gifted groups. Suppose the intrinsic motivation that caused gifted students to participate in STEM education programs was triggered by other outcomes other than learning about STEM. In that case, they may be extrinsically motivated, which may explain their loss of motivation after participating in the program (Alcantara, 2015; Bruce-Davis et al., 2014; Mullet et al., 2018). This may also indicate that some of the gifted students of STEM education are just high achieving students. The reason for this high achievement; intrinsic motivation is a distinct feature in students with high learning potential. However, most people are driven by the mix of extrinsic and intrinsic motivation, and the type of motivation is context dependent. Furthermore, orientation and ambition for the future are characteristic of gifted students when talking about the future of STEM. As most students are motivated for a future in STEM, it seems that students have easier access to higher education and more likely experience intrinsic motivation. Gifted students may need to focus more on the future and consider the possible positive consequences of their education. Therefore, students participating in the program may be interested in STEM education that is more flexible than traditional education. Lange (2018) research showed that there were students with more extrinsic motivation in the technology program; this may be due to the increased focus on STEM education and career, higher pressure for higher education, and higher earnings.

Gifted children are individuals with higher-than-average intelligence or abilities. Understanding their needs in general due to their high-level cognitive capacities and meeting their needs that differ in time is significant. One of the factors in meeting their needs is related to the development of their social relations. Highly talented students often describe the peer group experience as very supportive in the STEM education program, mostly through finding positive relationships and interconnectivity. They also find that certain content is particularly useful in learning about each other's past experiences and travels to the university and beyond. Although less common, some students identify difficulties in the group related to time management, unpleasant content, and the lack of desire to share in a group setting (Moss-Everhart, 2020; Mullet et al., 2018; Zocher, 2020). Overall, many students describe STEM education as very useful during the focus group for gifted students. They also describe building diverse friendships, working partners, and an overall relaxed and supportive community, unlike other academic settings they had previously experienced. It is stated that students' sense of self and their science identities and self-efficacy is positively affected due to being in the group. As expected, students enter STEM program with various supports and challenges that affected their ability to continue (Chowdhury, 2016; Flowers III & Banda, 2019; Moss-Everhart, 2020).

Moreover, in STEM education, friends, peers, family, and educators are essential for gifted students' social, and affective development. A particular theme that emerges in STEM education is the importance of parent support. It is supported by previous literature emphasizing the relationship of such connections to student achievement (Alcantara, 2015; Flowers III & Banda, 2019 Stoeger et al., 2016). Factors are complex and often intertwined, such as the push and pull of self-regulation and family support. Often, when a student discusses internal discourse or feeling external influences, it changes for the better due to perseverance. Before starting a task, asking gifted students questions to explain the rules, talking about a plan to solve a problem, having them explore alternative problem-solving strategies, and helping to consider the consequences of the action before it begins builds perseverance. This situation clearly shows Bandura's claims that self-efficacy is extremely important in student development (Sloan, 2020). Gifted students' sense of self and identity are positively affected by STEM group work.

Autonomy

Gifted students highly value autonomy. The benefit of autonomy supports the successful effect of STEM education on giftedness (Gilson & Matthews, 2019; Mullet et al., 2018; Vlies, 2013). In practice, autonomy support includes giving the student a choice, encouraging them to take action, accepting their point of view, and limiting control over their actions. Respondents in this study indicate immense pleasure with the power of STEM education to create important careers and create unconventional opportunities for gifted students. Participants also express their relational ties to the cultural environment positively. For an individual to initiate an action, they must believe in their ability to perform the

tasks necessary to obtain results successfully. STEM supports highly able students, keeps them determined, encourages them to continue working, and offers realistic role models, factors that increase motivation (Flowers III & Banda, 2019; Gilson & Matthews, 2019; Kohan-Mass et al., 2018). Thanks to the analysis carried out to address the research problems, it is observed that STEM education contributes to the social and emotional development of highly talented students. The results are meaningful since changing affective characteristics such as interest, attitude, and motivation is time-consuming. In addition, it also has been seen that perceptions towards STEM education generally center around science concepts.

Discussion

This main focus of this research is to examine the effects of STEM education or gifted students on their academic and socio-emotional development for metanalytic perspective. Talented students thrive in situations where difficulties are encountered, or personal interest topics are incorporated (Kettler, 2016). The actual results found in the subsets of science and engineering can perhaps be attributed to this project's nature. The curriculum requires hands-on activities where students use problem solving and creativity to move from one aspect of the project to another (Kim et al, 2016; Ozkan et al, 2015). In this study, which aims to evaluate the effect of STEM applications on the academic achievements of gifted students, their inquisitive learning skills perceptions, motivation towards science, permanent learning, and attitudes towards STEM, the results were examined following the research questions. The first research question of the study discussed how STEM education affects academic achievement on bright learners. A positive impact regarding academic success was found in the group exposed to STEM education compared to the group who received the regular curriculum. These findings show that STEM education practices increase academic achievement.

STEM Achievement

STEM enhances gifted and talented students in each discrete domain, including academic achievement. Considering the differences between the group in which STEM education was integrated and other groups, it is evident that STEM education has a positive effect on the teaching-learning environment, increasing academic success at knowledge, comprehension, and application levels of gifted students (Jen & Moon, 2015; Tofel-Grehl & Callahan, 2014). However, low achievement of gifted students results from inadequate services, improper placement, and a lack of attention given to gifted programs, particularly by school leaders (Steenbergen-Hu et al., 2020). Therefore, although STEM education has a positive effect on gifted learners, there can actually be a negative effect on academic achievement under certain circumstances. The studies also show that STEM integration increases the academic success of gifted students (Cotabish et al., 2013; Robinson et al., 2014; Hoyle, 2018; Islam, 2019). While only the results obtained for gifted students are presented (Robinson et al., 2014), the group results are both gifted and typical ability students (Cotabish et al., 2013). The results of both studies are that STEM practices improve students' academic success. The results obtained from the present study are in agreement.

Additionally, STEM activities positively affected their academic achievement development (Dieker et al., 2012; Hoyle, 2018; Sahin & Yildirim, 2020). Further, activity evaluation forms to analyze activities of gifted students determined that their academic success improved as a result of STEM integration (Gilson & Matthews, 2019). Gifted secondary school students studying in a STEM program based on virtual and simulated environments impact academic achievement positively (Gilson & Mattews, 2019). An extra-curricular, school-based STEM talent development program for economically disadvantaged rural students increased the academic success of students (Hoyle, 2018; Morris et al., 2019).

With an integration of STEM and gifted education, learners have access to the development of many critical skills needed in today's society. The fact that the students participating in STEM education see math and science practically and integrated with engineering and technology has changed their perspective. The education of gifted individuals is of great importance in terms of scientific and technological research and development studies. The activities are based on science and mathematics achievements and require engineering skills (Hoyle, 2018). The design-based learning method

could effectively help teach challenging basic concepts in science courses and increase awareness about engineering among students (Coleman, 2016). Students' ability to integrate mathematical operations into the product creation stage and their abilities to use materials efficiently increased after such activities. Students improved their engineering design processes with STEM activities for elementary science students (Gilson & Matthews, 2019; Islam, 2019). The students' ability to create new and original products can be explained by the fact that they do not have anxiety to perform a certain way. This helps to draw a tighter connection between creativity and lack of anxiety. It can also be said that the engineering design skills of the students have improved significantly. Talented students are seen to be very involved in STEM measurements (Haggerty, 2014). They also claimed that STEM practices greatly helped gifted students build positive attitudes towards engineering and that positive attitudes are mainly towards engineering and then science. STEM integration has generated changes in many schools' approaches to learning, including an increase in making learning with fun and meaningful by incorporating problem-solving, critical thinking, concept teaching, strategy development, goal-setting, and non-distraction teaching, suitable for individual and group work.

STEM-related Courses

Another aspect of the integration of STEM education is the increase in positive behavior towards the lessons. The effect of STEM integration on students' perceptions and attitudes regarding STEM discipline areas are positive (Karahan and Unal, 2019). They worked with 17 gifted students and examined the project-based learning activity integrated with STEM. Before and after the event, questionnaires and semi-structured interviews were conducted to measure the attitudes of the students towards STEM. It has been concluded from the survey results that there are serious changes in students' attitudes towards engineering. Most of the students stated that STEM education is important in both engineering and science fields. Integrating STEM into project-based learning can allow students to learn by understanding and affect students' perspectives in their future career research and choices. They found that their perceptions and attitudes about STEM discipline areas developed due to the implementation of STEM activities and inquiry-based activities. As a result of attitude and perception tests applied, they determined a positive development in engineering, career, and technology. STEM education and engineering practices contributed to gifted and talented students' academic, social, and emotional development (Moss-Everhart, 2020) and improve middle school gifted students' awareness of engineering (Gilson & Matthews, 2019). STEM education's most significant benefit is an increase in attitude toward science and an improvement in motivation and interest in science subjects.

Integrating STEM contributes to gifted learners' positive interest and attitude toward the subjects. Gifted students have positive attitudes towards STEM education (Jeanpierre and Hallett-Njuguna, 2014). The conclusion that the activities implemented within the scope of this study have positive attitudes towards STEM education can be reached from the observation notes of the researcher-practitioner teacher. Special programs, including STEM activities, should be prepared for gifted students, and should be included in the programs developed for talented students (Bruce-Davis et al., 2014; Lange, 2018). These events include asking questions for science and defining engineering problems, developing, and using models, planning and conducting research, analyzing data, using mathematics and numerical thinking, creating explanations for science and designing engineering solutions, obtaining information, evaluating, and submitting. Thus, getting gifted students involved in STEM education results in improved interest and attitude. The effects of STEM integration on students' attitudes, feelings, and thoughts towards learning coding are considerable (Islam, 2019). After the integration their thoughts that they would have difficulty in coding changed. Besides, it was determined that students found coding easy and enjoyable. STEM activities improve students' attitudes towards science and their scientific process skills (Collins and Roberson, 2020). In addition to this, students have established optimistic attitudes towards STEM, the most important transition in education throughout the 21st century.

STEM applications cause a statistically significant increase in the motivation of gifted students towards the lesson. When the literature is reviewed, many studies show that STEM applications have an essential effect on increasing gifted students' motivation (Alrajhi, 2020; Heggerty, 2014; Hoyle, 2018; Gilson & Matthews, 2019; Stith, 2017). The impact of STEM programs on the motivation of students and found a positive effect (Morris et al., 2019). increase students'

interest and motivation (Rice et al., 2016). Many other studies also show that STEM applications do positively affect attitudes (Karahan & Unal, 2019; Vlies, 2013; Wu et al., 2019). Based on this result, it can be noticed that these integrations have a beneficial impact on the attitude of bright kids towards STEM. Furthermore, STEM based science teaching is an effective method for students to learn science subjects. Such design-based activities increase gifted students' motivation towards science learning (Dai et al., 2015; Lange, 2018; Stith, 2017). In these studies, the design activities carried out within the STEM application framework increased both the desire of highly able learners to participate in science classes and their desire and motivation towards science learning. As a result of the observations made by the researcher within the framework of STEM-based science teaching, it was seen that the design-based STEM activities developed the communication, collaboration, critical thinking, and psychomotor skills of gifted and talented students. It also supported self-directed learning.

Additionally, STEM education encourages students to cooperate and helps them develop their communication skills. Students can learn from each other in the process of cooperation and communication between them (Vlies, 2013). It can be considered that the difficulties encountered during the implementation of design-based STEM activities with gifted and talented students in the classroom include difficulty in group work, limitations arising from the perfectionist approach of gifted students, lack of equipment, lack of technological equipment, and time limitation. Since many gifted and talented students think that their projects or activities should be perfect, they may not be satisfied with what they have done and may experience low motivation and demoralization. Because STEM education improves collaboration and communication between gifted students, it can reduce these negative consequences.

Implications for Practice

Educational equality involves considering the level of understanding, individual differences, and readiness of each individual in providing education. STEM education for gifted students should be planned based on the needs of gifted students. To contribute to the self-perception development of gifted students, students' opinions should also be considered in the planning of education and decision-making. The most appropriate STEM education strategy should be determined according to the needs of gifted students as individuals. STEM education has a flexible structure in the integration process, which makes it easy to tailor learning to student needs. The training program planned should be adapted during the process, considering this advantage of STEM education. The key question for educators is not whether gifted students should be differentiated, but rather, how this process will be carried out. Level-based STEM education practices should be carried out at natural transition points, such as the beginning of the school year of term. Problems with STEM education are often due to incomplete or inadequate planning. In context, the careful planning of the whole process, including the stages of the process, the personnel to be assigned, the applications to be carried out, the family meetings to be held, and the limits' determination, will facilitate the implementation. Engineering has started to find more place in education with the increasing prevalence of STEM education approach. With design-based learning, it is aimed that gifted students encounter design problems that can be the context for learning science concepts and skills. The construction and testing of real devices will allow students to experience science and test their concepts, discovering errors and gaps in their knowledge (NGSS, 2013). For the successful implementation of STEM education in an education system, compulsory and elective engineering courses must be included in the program. Instructors who are equipped to conduct these courses must be assigned. Although engineering courses are sufficient at some K-12 levels, they cannot be useful since they are not integrated. At some levels, there are not enough engineering courses. Additional engineering courses should be given at these levels. The number of hours of existing engineering courses should be increased; not only should it be increased, but interdisciplinary cooperation should be established between courses.

Limitations

It is necessary to assess the present meta-synthesis in light of its limitations from a variety of viewpoints. As previously stated, the main restriction is due to the generally poor quality of the research, which is the primary drawback. Therefore, the results of this meta-synthesis should be taken with care in light of this information. We should successfully address

the academic achievement and social-sensory development of gifted people in the future. Furthermore, to address issues such as selection and detection biases, the accuracy of intervention practices, and the assessment of impacts – to improve the quality of evidence for the effects of interventions, increasing efforts by individual researchers are required.

Conclusion

Compared to previous research, the present meta-synthesis provides a complete, in-depth, and more nuanced picture of the effects of STEM education on the gifted in terms of academic performance and social-sensory development. He argues that more significant efforts in STEM education may be required to convert an increased desire for studying into actual improvements in academic performance. A differentiated curriculum may be the most effective method of teaching them to improve the performance of talented children and support their social-emotional development. Qualitative data help enhance our understanding of underachievement among gifted individuals (Steenbergen-Hu et al., 2020). Given the many reasons and routes for failure among talented kids, effective treatments may need the development of customized methods for each particular student.

Educational equality involves considering the level of understanding, individual differences, and readiness of each individual in providing education. STEM education for gifted students should be planned based on the needs of gifted students. To contribute to the self-perception development of gifted students, students' opinions should also be considered in the planning of education and decision-making. The most appropriate STEM education strategy should be determined according to the needs of gifted students as individuals. STEM education has a flexible structure in the integration process, which makes it easy to tailor learning to student needs. The training program planned should be adapted during the process, considering this advantage of STEM education. The key question for educators is not whether gifted students should be differentiated, but rather, how this process will be carried out. Level-based STEM education practices should be carried out at natural transition points, such as the beginning of the school year of term. Problems with STEM education are often due to incomplete or inadequate planning. In context, the careful planning of the whole process, including the stages of the process, the personnel to be assigned, the applications to be carried out, the family meetings to be held, and the limits' determination, will facilitate the implementation.

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Research Article

The inclusion of gifted children and talent as a geode of amethyst

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Abstract

The studies of Becchi (1962; 1963), Frabboni (1998), Cairo (20 01), Mormando (2011), Renati and Zanetti (2012) show that gifted children are excluded from the school context and therefore it would be necessary to promote inclusion in all fields. In our study we investigated the inclusion of pupils with giftedness at school, through the perceptions of some teachers, parents, and head teachers. The sample consisted of 37 primary school teachers, 3 school principals, 11 mothers and 4 fathers of 19 children with giftedness, with an average age of 9 years. To gather the voice of the teachers we used the focus group technique; however, for the leaders and parents we preferred the individual interview. In total, we audio-recorded 67 hours of interview that we transcribed obtaining 107.643 words. The data was analyzed using NVivo software (Edhlund & McDougall, 2019). The non-inclusion at school of some gifted children demonstrates the dominance of the medical model both in teachers and school principals, whereas parents confirm the malaise that gifted children experience at school, as their talents would neither be identified, nor recognized, nor valued. To promote the inclusion of gifted children it is urgent to introduce a pedagogical vision of talent through the metaphor of the amethyst geode.

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Introduction

The problem from which our research arises is based on some Italian studies that took place between the Sixties and the first decades of the Two Thousand. Egle Becchi in the Sixties argued that the "super-gifted" are excluded from the attention of teachers, as there would be an association between "super-giftedness" and genius. According to the scholar, teachers believe that *gifted children* are brilliant, and geniuses with the Kantian meaning, that is, as a permanent innate quality that pushes the individual to learn and excel regardless of formal education (Becchi, 1962; 1963a; 1963b). At the end of the Nineties, Franco Frabboni declares that *gifted children* are constantly forced to "quarantine", as there would be a whirlwind imbalance of attention by teachers towards students with disabilities, with a consequent neglect towards potential (Frabboni, 1998). Although as the years passed, it seems that the problem remains: *gifted children* would be

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excluded at school and the malaise between them would persist (Cairo, 2001; Mormando, 2011; Renati & Zanetti, 2012; Sandri & Brazzolotto, 2017).

First, we specify that on the international and national scene the definition of *gifted child* is not yet defined and clear. At the beginning of the Twentieth century, Terman (1925) and Hollingworth (1931) identified children with giftedness as those who prove to have an Intelligence Quotient (IQ) above the norm, with the passage of time other scholars had expanded the concept of *giftedness*. Renzulli was a pioneer: in the Seventies, in the U.S.A., he developed the Three Rings Model (Renzulli, 1986), through pedagogical reflections arising from a shift in focus: from the definition of *gifted child*, based exclusively on high IQ, to *gifted behavior*, favoring the study of behavior and attitude, putting label in the background. He went beyond the concept of IQ, to include creativity and motivation (or rather "determination") to achieve a goal. Another well-known scholar, Gagné (1999), defined *gifted children* as those who fall into a small group (10%) because they demonstrate strong potential in the following areas: intellectual, creative, social, perceptual and physical motor. Even today, according to a psychometric vision, *gifted children* are exceptional children, first for their intelligence, but also for their personality influenced by the context of belonging (Cornoldi, 2019). The various definitions of *gifted child* are so varied that Cinque (2019) believes that there is a "Babel of denominations" (p. 44), which constitutes a varied language that could favor strong prejudices or enrich with meanings a category of subjects still little (re)known.

Considering that *gifted children* benefit from the principles of Special Pedagogy (Pinnelli, 2019) because they belong to the category of subjects with Special Educational Needs (SEN), as explained in the Italian ministerial note n.562 of 2019. We wonder if currently: a. *gifted children* are still excluded and for what reasons; b. there are forms of inclusive education and what they are and c. there is a prevailing paradigm that guides the actions of teachers, parents and school leaders.

If exclusion is due to the presence of talents in the individual, we believe that it is essential to understand the link that exists between "inclusion" and "talents", in order to promote a democratic participation of all students because it is "in the formation of talents the very foundation of democracy" (Margiotta, 2018, p. 28). As Dewey (1916) argued, democracy is based on trust in the abilities of each one, to achieve the common good. We agree with Chiappetta- Cajola and Ciraci (2013) that talent is part of the identity of *each* individual and for this reason due attention is needed to the underlying meanings and to create bridges between Special Pedagogy and the "Pedagogy of Talents" (Baldacci, 2002, p. 166), so that disability or disorder is not a dominant part of an individual, but always be balanced with the talent that everyone has. Talent could be compared to the amethyst geode, in order to promote a pedagogical vision of talent and thus favor both the inclusion of gifted children in the school context and the recognition and enhancement of talent in *all* human beings in society.

The Education of *Gifted Children*: Inclusion Yes, Inclusion No?

In the past illustrious pedagogues have dealt with gifted children, such as: John Dewey, Ovide Decroly, Maria Montessori. They offered different visions of giftedness and shared their approach to educating and including gifted children at school.

According to John Dewey (1859-1952), it is not up to the teacher to compare the amount of gifts (among the children considered brilliant) but to put them in a position to reach their maximum potential. He wrote “we have created an abstract concept of mind and the idea of an intellectual method that is the same for everyone. And so we consider individuals as if they differ from each other in the *amount* of mind with which they are endowed. Ordinary people are therefore expected to be ordinary. Only exceptional ones are allowed to be original. The distance between the genius and the average student is measured by the absence of originality in the latter. But this idea of the mind in general is a fantasy. It is not at all about the master in what relationship the abilities of one person are with those of another. This is irrelevant to his work. What is required is that everyone be placed in a position to employ his powers in activities that have meaning. Mind, individual method, originality (interchangeable terms) condition the *quality* of guided and

motivated action. If we act according to this belief, we will achieve a greater degree of originality, even from the conventional point of view than is developing now" (Dewey, 1916, ed. It. 1988, pp. 221-222).

Moreover, according to Dewey, creativity is not just *about gifted children*, everyone has a type of creativity. Originality, which can emerge from every child, would be recognized if there is a comparison between peers (but not between child and adult). Finally, according to Dewey, intelligence is built thanks to the experiences that individual makes daily (Dewey, 1916, ed. it. 1988).

However, the point of view of Ovide Decroly (1871-1932) seems to be completely opposite to Dewey; in fact, the Belgian pedagogist makes it clear that the peculiarity of gifted children is due to an IQ above the norm, intelligence that depends on biological and hereditary factors. For these reasons, the task of the teacher, according to Decroly, is to identify children with giftedness and separate them from others, in such a way as to form homogeneous classes by level of learning. Decroly believes that "in each class two groups of children are sacrificed:

- *The Best Gifted, who could go ahead of others;*
- *The Insufficient, who do not profit from a teaching that only suits the average of children whose mentality is higher than theirs.*

To remedy the two defects reported [...] the lack of homogeneity of the classes and the discrepancy of the program with the intellectual level of an important part of the schoolchildren, the practical solution consists in forming two groups of less disparate elements, for each series of classes." (Decroly and Boon 1921, ed. It. 1955, p. 9)

Maria Montessori's thought (1870-1952) is decidedly more in line with Dewey rather than Decroly. However, a crucial passage emerges from initial Montessori's medical approach, based on label and the dominant value of IQ (as can be seen from Decroly's writings) to a bio-psycho-social approach (in line with Dewey's thought). Initially Montessori considered gifted children as bearers of particular and exclusive talents, then through an evidence-based methodology, she realized that every child has a talent. She wrote "the press began to talk about this "spontaneous acquisition of culture", psychologists said that it must be gifted children with special talent. I shared too this belief for some time, but even more extensive experiments soon showed that all children possessed these abilities" (Montessori, 1943, ed. It. 1970, p. 18).

The attention that the previously mentioned pedagogists have paid to children with giftedness have favored the start of a Pedagogy of Talents, with the meaning of Baldacci (2002) and Falaschi (2019), as a discipline that intends to devote itself to the recognition and development of the human talent of all individuals, regardless of the label gifted children. This outlines an idea of the School of Talents (Margiotta, 2018) where everyone can be valued and welcomed with their talent, in order to better express their excellence (Oliviero, 2019).

The studies of Becchi (1962; 1963), Frabboni (1998), Cairo (2011), Renati and Zanetti (2012), show that gifted children are excluded from the school context. Becchi (1962; 1963a; 1963b) makes a connection between "super-giftedeness" (a term used by the scholar in her articles) and genius. She considers that teachers exclude "super-gifted" children because they are geniuses. In her studies, Becchi believes that teachers adopt a romantic vision of the genius they associate with giftedness. The gifted child is like the genius. As Kant's Critique of Judgment state the genius is able to learn independently, spontaneously and without teacher's support. Becchi thought that there would be a pedagogical pessimism: the teacher believes that their intervention is not necessary to involve the *gifted children*. Frabboni (1998) in his article, with the subtitle "Super-gifted in quarantine", confirms Becchi's theses, demonstrating how for more than 35 years, in Italy, the exclusion of gifted children from daily teaching persisted. Frabboni's ideas are illuminating, as he argues that marginalization is due to greater attention from teachers to children with disabilities, and a bad habit of leveling learning on the basis of an ideal norm, as well as not considering potential and talents.

Gifted children at school could be excluded for two opposite reasons: to be considered excellences (as Becchi and Frabboni claim), or because of their special educational needs, as Cairo (2011), and Renati and Zanetti (2012) argues, which stand out in the management of emotions (Sartori & Cinque, 2019), and in the relationship with peers (Marsili, Morganti & Signorelli, 2020).

Teachers' perceptions play a crucial role in the process of inclusion, as well as in supporting pupils with giftedness (Kutlu, Akkanat & Murat, 2017); in fact, as established by the "Profile of inclusive teachers" (European Agency for Development in Special Needs Education, 2012), an inclusive attitude is based on the values in which one believes. Some teachers, considering students with giftedness as "different" compared to others, mainly due to their high IQ, are neutral towards the possibility of including gifted pupils through differentiated teaching (Laine, Kuusisto & Tirri, 2016). Barrington's research (2014) shows, and confirms, that although teachers perceive gifted children as belonging to the category of Special Education Needs (SEN), the attention is greater towards pupils with disabilities.

Ozcan and Kotek (2015), through a qualitative study on the perceptions of teachers, have shown that the difficulty in including gifted children depend on their pace of learning: they learn very quickly and therefore get bored in a short time. The positive qualities of pupils with giftedness would feed into practices of non-inclusion. Thesis also demonstrated by another study by Altintaş and Sukru (2016): teachers believe that gifted students show high skills in many areas: academic, personal, physical, social and creative and for this reason they believe that they need special and exclusive training for them. On the other hand, some studies show that teachers believe that the exceptional cognitive abilities of gifted should be considered even with social and emotional skills, often lacking in gifted, and therefore declare themselves unfavorable to exclusive teaching modalities such as acceleration (Hoogeveeen, Hell & Verhoeven, 2012).

A recent Italian study, conducted by De Angelis (2017), investigated teachers' perceptions of gifted children; 80% said they did not change their teaching because of the lack of knowledge in the field of gifted education.

Gifted students learn differently from peers regarding pace, complexity, and abstract comprehension. As a result, teachers should promote an inclusive learning environment to ensure success for *all* students (Callahan, Moon, Oh, Azano & Hailey, 2015) in all fields, such as language acquisition and for diverse gifted students (Novello, 2021). The teaching strategies that experts tend to suggest to teachers are to speed up the pace and content, engaging students through differentiated teaching based on different levels of learning that are deeper, more complex and abstract, encouraging independence and metacognition (Little, 2018).

The Paradigms of Gifted Education and Special Pedagogy in Comparison

According to a careful analysis of the scientific literature carried out by Dai and Chen (2013; 2014), there are three paradigms in Gifted Education, useful for interpreting some phenomena and intuiting their causes. Recall the concept of "paradigm", according to Kuhn (1962), it constitutes a theoretical perspective recognized and shared by the community of scholars in the same field and is based on previous acquisitions, orienting research both on the identification of the problem, and in the phase of conception of hypotheses, both in the choice of techniques to investigate the selected facts and finally in the interpretation of the data.

Dai and Chen (2013; 2014) defined the paradigms of gifted education based on a few simple questions: what? why? who? and how? The answers were given by retracing the theory and practical approaches. Each paradigm differs according to the different answers that are elaborated about: (a) what is the nature of giftedness? (b) why is there a need for gifted education? (c) who are gifted the and how they are identified, and (d) how does the training for gifted people takes place and what strategies and methods are feasible and effective (see Table 1). In the field of gifted education, Terman (1925) and Hollingworth (1942) are considered two pioneers, certainly two historical figures who left a solid foundation on which the first paradigm of the "gifted child" developed, on which the gifted education movement began to be built (Dai, 2018). They had the same strong conviction that giftedness, understood as high cognitive potential, measurable through the IQ, is genetically determined and, in these terms, educational practices could be developed to separate the children thus identified (remember that with their research they showed that the giftedness was homogeneous and permanent). First, they gave a categorical approach to gifted education: only those who are identified as "gifted" could take advantage of exclusive training (Delisle, 2002; 2014; Dai, 2018).

According to Borland (1989) and Dai (2018), there are two currents in gifted education: on the one hand, the care of the specific needs of gifted children and, on the other, the safeguarding of national resources, with a view to human capital.

The paradigm of "Talent Development", which emerged in the second half of the Twentieth century, became crucial in gifted education; the emphasis is on talent rather than the individual. According to Dai (2018), the first pioneers, including Julian Stanley and Joseph Renzulli, began to be active from the Seventies onwards, and both developed ideas and practices to struggle the rigid subdivisions of the traditional school based on age (Stanley, 1996) and on IQ and school performance (Renzulli, 1986; see also Subotnik and Olszewski-Kubilius, 1998). Starting from the conceptions of multiple and multidimensional intelligences (see Gardner, 1983; Sternberg, 1985), various researches created many models based on the development of talent (see Bloom, 1985; Gagné, 1985; Feldhusen, 1992; Feldman, 1992; Subotnik and Coleman, 1997; Tannenbaum, 1983); they identified talent in different domains and suggested educational practices based on specific domains with the aim of cultivating talent, creativity, in school and in life.

Subsequently, the paradigm of "differentiation" arose: the effectiveness of specific programs for only gifted children began to be questioned; already in the Sixties, Ward (1961) argued that the regular curriculum in schools should be adapted to provide a learning environment that met the needs of *all* pupils, even very good ones.

In summary, the three paradigms of Gifted Education (Dai, 2018) focus: on IQ and label (Gifted Child paradigm); on individual talent (Talent Development paradigm); on the potential and limits of gifted children (Differentiation paradigm), see the table below.

Table 1

The Paradigms of Gifted Education according to Dai (2018, p. 13)

Dimension	**Paradigm**		
	Gifted Child	**Talent Development**	**Differentiation**
Assumption (what)	Essentialism; exclusive categorical intake; definition of status; exceptionality as a general and permanent skill (independence from the context).	Evolutionism; hiring talent as diversity; modifiable status; increase in differentiated aptitudes for a particular domain; exceptionality is not assumed.	Individualization; emerging needs to differentiate; dependence on the context of exceptionality.
Purpose (why)	Support the *gifted*; the goals are the development of *leadership* qualities and creative thinking.	Support the domain of excellence and innovation; model on the basis of authentic professions and creativity.	Based on diagnosis; to respond to the individual needs expressed at school.
Students involved (who)	Classification based on psychometric measures of higher mental qualities.	Students are selected and placed based on aptitudes for a particular domain.	Assessment of strengths and needs for educational purposes in a particular educational context.
Strategy (how)	Programs must be adapted for *gifted*; models are based on the creation of special groups.	Various types of enrichment, authentic learning, tutoring at school and at home.	Appropriate pace of learning, adaptations of school programming and other interventions

In addition, in Special Pedagogy there would be three dominant paradigms: the medical, social, and bio-psychosocial model (Pavone, 2014). In a nutshell, the medical model focuses on pathology by subjecting the individual and his or her uniqueness; the role of the technician as the one who treats the pathology is emphasized; finally, the diagnosis is understood as an inevitable destiny (Pavone, 2014). In the social model, the perspective is reversed, as the social context is placed at the center of the reflections and it is attributed the role of reducing or increasing disadvantage; the point in common with the medical model concerns the need for a diagnosis to operate, in order to improve the well-being of the subject with disabilities. Finally, in the bio-psychosocial paradigm (promoted in the ICF, WHO, 2001) a new balance is

born between the participation of the subject and the activities he can carry out, focusing on the health condition and the abilities of the individual.

The paradigm of the Gifted Child is focused on diagnosis just like the paradigm of the medical model; the Talent Development's paradigm is oriented on the talent of the subject, therefore, considering that talent is a social construct, but that it also develops on the basis of the potential that manifests the subject, we could think that it has points in common with the paradigm bio-psycho social; finally, the model of differentiation is based on the strengths and limitations of the subject, and it seems to have some points in common with the bio-psycho social paradigm of Special Pedagogy.

Research Methodology[2]

In the research we used the technique of mixed methods with a predominantly qualitative approach.

The objective of our research was: to address the perceptions of teachers, parents, and primary school leaders about giftedness, and in particular:

- Identifying a dominant or multiple paradigms in teaching;
- Understanding which paradigm is privileged and when;
- Outlining the implications for teaching.

The research's questions were:

- Are children with giftedness included in school?
- If they are included, what didactics is adopted in the mixed classroom when there is at least one gifted student?

The Sample

The recipients of our research were teachers, parents, and school principals. The criteria that we established to compose the sample were:

- operate in the Veneto Region[3]
- teach or have gifted children in the primary school[4]
- teach to- or be a parent of- at least one child with a "certified" giftedness by a psychologist.

Those principals who belonged to the same district where the teachers worked were welcomed.

The voluntary adhesions were collected after sending an e-mail to all the Districts of Veneto (in total 400); of these 44 responded (11%); only 10 (or 2.5% of the total) agreed to collaborate.

Specifically, 37 teachers (36 females and 1 male) participated in the research; 3 school principals (2 males and 1 female); 11 mothers and 4 fathers of a group of 19 children with giftedness, of an average age of 9 years, scattered among the 10 I.C. Veneti who took part.

Data Collection Techniques

Teachers were grouped into six working groups on the basis of their place of residence or personal willingness to join colleagues from other countries. To achieve the research objectives, we carried out focus groups in six different provinces (see table 2).

[2] The research data were collected during the PhD programme at the University of Bologna and they were reported in the dissertation in Italian, see Brazzolotto (2020). However, the data analysis has been expanded and revised recently.

[3] Veneto was the only region in Italy that benefited from a project called "Education to Talent", funded by the region to promote teacher training on Gifted Education, for three editions in a row, from 2012 to 2015 (see Mangione & Maffei, 2013).

[4] In the project "Education to Talent" mainly primary school teachers participated, and this allowed us to interact with teachers who already knew something about gifted children.

Table 2

Breakdown of Teachers by Province

Province	N. Members	Gender
Padua	5	females
Venice	7	6 females and 1 male
Rovigo (Italy)	4	females
Padua	10	females
Treviso	5	females
Verona	6	females

Each focus group lasted a maximum of one hour; the group consisted of a minimum of 4 teachers to a maximum of 10.

The focus group questions were built on the basis of other studies and taking inspiration from the Index for Inclusion (Dovigo, 2014). Below is a summary table.

Table 3

Questions from the Focus Group and Interviews with the Respective Sources

Questions	Source
What is giftedness?	Laine (2016)
What ideas, perceptions about the clinical evaluation of giftedness?	B2.5 f. Tendency to label (Dovigo, 2014, p. 179)
What are the attitudes and behaviors of gifted children?	De Angelis, 2017, p. 190
How do classmates behave towards the pupil with giftedness?	Size A1 .3 pupils help each other (Dovigo, 2014, p.123)
What didactics are used with gifted children?	Size A2.4 f. inclusion concerns everyone (Dovigo, 2014, p. 143)
How is the relationship between the parents of gifted children and teachers?	Size A2.1 .h staff and families agree on a framework of values (Dovigo, 2014, p. 137)

We also asked the same questions to the parents, with whom we preferred to involve them in the research through an individual interview that lasted from a minimum of 15 to a maximum of 30 minutes. The school principals were also involved through a semi-structured interview, addressing the same issues.

Data Analysis

The focus groups were recorded with the prior written consent of the participants. All audio recordings were transcribed manually, turning the approximately 67 hours of audio into 107.643 total words. From the transcripts, we collected and divided the extracts on the basis of: a keyword (which concerns the theme of belonging), the code of the *focus group* (each group has a different code), and the number of the statement. The extracts were then grouped through the use of NVivo software (Edhlund & McDougall, 2019). The software allowed us to collect and assemble the extracts on the basis of the themes emerged and count the frequency (called by the software "references") between the different focus groups (sorted and divided by "files"); in the table n. 4. There is an excerpt of the analysis produced with NVivo.

Table 4

Extract from the Data Analysis Produced with the NVivo Software

Name	Files	References	Created On	Created By
Fam. Stimulates	6	21	6/3/2019 8:44	MB
velocity	6	13	6/3/2019 8:36	MB
socialization	6	12	6/3/2019 8:41	MB
class climate	5	22	6/3/2019 8:49	MB
superior skills	5	13	6/3/2019 8:25	MB
curiosity	5	10	6/3/2019 8:33	MB
propensity for the logical-mathematical field	5	8	6/3/2019 8:56	MB
no didactic change	5	6	6/3/2019 9:30	MB
label	4	20	6/3/2019 18:04	MB
Teacher-parents contrast	4	19	6/3/2019 8:47	MB
Teacher-parents collaboration	4	12	6/5/2019 9:26	MB
self-isolation	4	10	6/3/2019 8:42	MB
double speed- emotional learning	4	10	6/3/2019 15:34	MB
comparison learning disability and giftedness	4	9	6/3/2019 15:35	MB
impulsive	4	8	6/3/2019 8:48	MB
maturation over time	4	6	6/3/2019 8:51	MB
clumsiness	4	6	6/3/2019 15:51	MB

Results

Below we analyzed the prevailing perceptions of the teachers, i.e. emerged in at least four focus groups out of 6 (see table no. 5). From the 55.153 words of the teachers, it is clear that they believe that giftedness implies many positive qualities such as, speed in learning, above-average skills (as in problem solving), an alternative way of posing, curiosity; however, in all focus groups the difficulty in socializing is always accompanied, due to the impulsiveness of gifted children that results for some in strong crises of anger for others in forms of self-isolation. Inclusion also depends on classmates who tend to exclude when the gifted child perhaps puts too much emphasis on his or her talents, demonstrating envy; while they tolerate when there are outbursts of anger; in some cases, gifted children are valued by their classmates. In all the focus groups, most teachers declared that they have never changed their teaching despite knowing that in the classroom there was a pupil with giftedness, as they lack knowledge and tools, teachers are therefore disoriented or in some cases because the label is denied. In some cases, the clinical assessment of giftedness is experienced as an imposition or because teachers deny the presence of giftedness precisely in that perceived "misfit" pupil, as they do not notice the potential and talents. The minority of teachers who changed their teaching after learning that there was a pupil with giftedness stated that the main work was done on the classroom environment, as well as to differentiate teaching with more stimulating activities. Teachers justified the adaptation of teaching through the comparison of gifted children with children with disabilities and disorders, appealing to a sense of justice. In some cases, inclusion is hampered by the conflictual relationship with the family, which is accused of provoking giftedness in children through hyperstimulation. Inclusion, on the other hand, is fostered when there is mutual trust between teachers and parents and the family proves to be collaborative.

Table 5

Teachers' Perspectives on Gifted Education and Gifted Children

Giftedness	Clinical Assessment	Gifted Child	Classmates	Didactics	Family School Relationship
Speed	Not reliable	Difficulty socializing	Exclude	Class environment	Family that hyper-stimulates
Difficulty in socializing	Tool to know the student	Inclination for the mathematical logical field	Tolerate	No change in teaching	Conflictual relationship
Above average skills	Confirmation	Self-isolation	Enhance	Label	Collaborative relationship
Curiosity	Imposition	Impulsive	They show envy	Comparison of disability-giftedness	Isolated family
Alternate mode	Protection of rights	Clumsy	Scared	Disorientation	Giftedness as an extra problem
Problem solving	Know the value of IQ	Puts to the test	Welcoming	Individualized teaching	Family that neglects
		Highly developed language		Difficulty managing different rhythms	
		Eccentric		Groups by level	
		Boredom		Adding more complex tasks	
		Rejection of rules		Acceleration	

The 11.568 school principals' words show that the giftedness falls into the category of SEN, thus highlighting the difficulties of gifted children; however, they are aware of the presence of high skills, which favor that "going beyond" compared to peers. According to the school principals, gifted children are "problematic" students, as their questions would put teachers to trouble, and they would also have great difficulty in relating. Not all gifted children would be "problematic", but some would be quiet and respectful of the adult's role. According to the school principals, the inclusion of gifted children would be compromised by the prejudices of teachers who identify them as geniuses; moreover, teachers would find it very difficult to enhance their talents. According to the head teachers, to promote inclusion it would be necessary to include gifted children in classes where there are those teachers more sensitive or trained in Gifted Education; moreover, it would be essential to write a Personalized Education Plan (PEP), just as it happens for students with special educational needs. Inclusion would also be hindered by the opposition of the "other" students in the classroom. Other students would complain to the parents, and parents would go to the school principal to ask for explanations about the "unfair" differentiated teaching, as it is understood by the parents of the other students as a form of privileges or exclusive for the gifted pupil. The discontent that is created between school and family would also be due to the family that blames the school for not including the gifted child, as there is a total absence of awareness of talents (see table no. 6).

Table 6
School Principals' Perceptions on Gifted Education and Gifted Children

Giftedness	Behavior	Didactics	Family School Relationship
SEN	Problematic	Teacher bias	Opposition of other parents
Evidence of potential	Quiet, respectful	Entrust pupils with giftedness to the most sensitive teachers	Family blaming school
Ability to go further	Questions that put the teacher in crisis	Difficulty in valuing	Family that indulges too much
Higher capacities than peers	Speed	Comparison Learning Disabilities, Disabilities and Giftedness	Collaborative family
High IQ	Intensity	PEP/national guidelines	Training request
	Difficulties in relationships		A good relationship between child and teacher is required
	Frustrations		
	Inattention		

From the 40.922 parents' words that we collected, it emerges that giftedness consists mainly of positive qualities, such as: a gift, an above-average IQ, greater sensitivity, possessing a gift that offers more opportunities in life. The parents explained that the qualities of their children were confirmed by the clinical assessment. The document was requested by parents just when they wanted to confirm the qualities of their children or justify certain attitudes (such as difficulty managing emotions). In most cases, the clinical assessment of giftedness has been made explicit to the son, in fact, telling the son that he has potential and talents. The characteristic of the child that would most hinder the inclusion of the child with giftedness would be boredom in the classroom, due to the proposal of repetitive exercises or themes already known and studied. Indifference to the curiosity of gifted by teachers, according to parents, would lead to episodes of anger and non-compliance with the rules. According to parents, in order to promote inclusion in the classroom, it would be necessary for teachers to avoid prejudices towards gifted children, and to offer more stimulating activities, such as in-depth or additional activities. Parents are aware that teachers struggle to manage the different pace of learning in the classroom, for this, according to them, it would be necessary to increase training opportunities. Parents confirm the data already emerged from teachers, namely that the relationship with the teachers is often conflictual. Table 7 summarizes the prevailing perceptions we gathered among parents.

Table 7

Parents' Perceptions on Gifted Children and Gifted Education

Giftedness	Clinical Assessment	Gifted Child	Didactics	Family School Relationship
Gift	Explained to the son	Boredom	In-depth study	Contrast between parents and teachers
Diversity	Request from teachers	Anger	Teachers' Prejudices	Collaborative relationship
IQ above average	Doubts about the assessment	Curiosity	Opposite home-school behavior	
Increased sensitivity	Confirmation of potential	Hyperactivity	Difficulties managing behavior	
Positive and negative sides	Label	Clumsiness	Parents of other children	
A type of intelligence	Request from parents	Preferences for adults	Teacher training	
Super-smart	Disappointment	Polemical	Difficulties managing the different learning pace	
Thirst for knowledge	Not made explicit to the child	Failure to comply with the rules	More challenging lessons	
Opportunity	Destabilizing	Early writing	Additional activities	
	Evaluation as a pass	Low self-esteem		

Discussions

The words of the participants highlight that there are still too many prejudices about gifted children, in particular referring to the label that is understood in two opposite ways: as a mark of genius or as problem. Such perceptions show that little is still know about gifted children in the school context (De Angelis, 2017; Eyre & Geake, 2002; Chessman, 2010; Mormando, 2011; Renati & Zanetti, 2012). In Italy, if gifted pupils enjoy inclusive teaching, this happens when they are considered pupils with special educational needs (De Angelis, 2019; Pinnelli, 2019), because of their difficulties. The prevalence of a hypothesis of disharmony is thus confirmed (Baudson & Preckel, 2013). Sometimes, the vision of parents is opposite to teachers, as they are recognized and valued precisely for their children' talents (Eris, Seyfi & Hanoz, 2008; Young & Balli, 2014; Kadioglu Ates, 2018); among parents the vision of the gifted child as a model of virtue prevails (Persson, 1998). The dialogue, therefore, between parents and teachers turns out to be difficult, especially when the two opposite visions appear that inevitably lead to accusing, and sometimes blaming, either the school or the family when the failure of the gifted child manifests itself.

Teachers would tend to act on the basis of label, and to interact predominantly on the basis of prejudices. In this sense, a medical model would prevail (Sternberg, 1996; Ianes, 2005; Baldacci, 2002; Bocci, 2015; d'Alonzo, 2015).

Table 9

Main Results and Discussion on Gifted Children and Gifted Education

Results	Discussion
Children with giftedness are still little known in the school context.	De Angelis, 2017; Eyre, Geake, 2002; Chessman, 2010; Mormando, 2011; Renati, Zanetti, 2012
Gifted pupils are considered with SEN by the school principals.	«disharmony hypothesis» Baudson, Preckel, 2013; «gifted children are considered children with SEN» Ianes, 2005; De Angelis, 2019; Pinnelli, 2019
Children with giftedness are considered above all for their cognitive abilities by their parents.	Eris, Seyfi, Hanoz, 2008; Young e Balli, 2014; Kadioglu Ates, 2018; 'model of virtue' Persson, 1998; Young e Balli, 2014
Teachers tend to act based upon label.	Sternberg, Spear- Swerling, 1996; Ianes, 2005; Baldacci, 2002; Bocci, 2015; d'Alonzo, 2015;

Conclusions and Recommendations

Non-inclusion seems to derive from a struggle to recognize the talents of each one, regardless of the label to which they belong, given the dominant medical vision of seeking the pathological and the difficulties in the pupils. For this reason, it is necessary and urgent to reflect on the recognition and development of human talent in the school context. Moreover, could be useful to have an expert in gifted education and talent development in each school (Brazzolotto & Phelps, 2021). Gifted children have made us understand that to include everyone a change of perspective is necessary: from difficulties to talents. The talent perspective implies a change in the starting point without denying the difficulties that any student can experience. First, the talent perspective involves making an effort to identify what stands out in a person. The metaphor of the amethyst geode is useful for promoting the change of teachers' perceptions of gifted children and for fostering inclusion through profound reflections on talent in *all* children.

The contributions of teachers, parents, school principals, and the fascination of geology have inspired us to think of talent as an amethyst geode: on the outside it consists of a rock (individual) that could be similar to the others, but inside there are amethyst crystals (talent) that on the basis of light and temperature (context) can change the shades of purple (uniqueness); interesting to note that if amethyst it is exposed too much to light, it loses its color and becomes brown-yellow-orange (talent-context relationship), and consequently the loss of its characteristics destroys the essence and its amethyst being.

Including gifted children in the school context is only possible if you believe that they, like *all other children*, possess talent. This does not mean that the opposite is true: we cannot argue that all children are gifted. However, we can say that talent, as an intertwining of individual inclinations, experiences, passions, determination, dreams that is configured as the best part of each individual and constitute our identity. Gifted education is mainly based on the care of the classroom climate, that is, the care of "light and temperature" that favors the development of amethyst crystals in a balanced context. The justification for the inclusion of gifted children should not appeal to a comparison with another diversity, such as disability, but through a new perspective: *talent is in each one*. Using the metaphor of the amethyst geode in education can foster the development of everyone's talent and promote inclusion.

Discovering talent, as a geode of amethyst, means going beyond the outer rock to understand the shade of purple without pretending that it needs too much light, that is, those too much attention from teachers or those high expectations from parents that stifle talent and transform natural shades of purple into colors not typical of amethyst. The right balance between recognition, acceptance, enhancement of talent and that thrifty context based on respect for the specific nuance of the talent of each one, without the pretense that individual will become a genius or "change the world". Creativity and intelligence, understood as Corazza and Lubart (2021) defined them, could constitute the human

talent Talent is what allows us to live serenely only if society begins to understand the deep meaning of human talent without attributing it to a specific category of people. Talent concerns all human activities, such as cooking, embroidering, caring for animals, etc. Furthermore, to recognize talent it is necessary to give each type of talent the same value, without creating hierarchies among the talents. In this sense, technological talent should not be considered superior to the talent of taking care of the home. *Including means offering possibilities so that everyone can share and express their talent*. In every context it is necessary to promote inclusion, not only at school, to make society more just and fairer. A great revolution would be needed in universities where talent is too often overshadowed from power relationships or friendships.

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Table 10

Gifted Education, Paradigms, and Implications

Conclusions	Paradigm	Implications
Teachers tend *not* to include children with giftedness because they tend to favor labels.	-gifted child - medical	Develop teaching practices that allow teachers to identify, enhance and develop talent in each pupil (regardless of label).
The inclusion of pupils with giftedness takes place mainly thanks to the care of the classroom climate.	- bio-psycho-social	The classroom environment is the key to develop talents and include all students. Could we discover another paradigm on relationship between teacher and student to promote talents?
Gifted children are sometimes included with differentiated teaching methods.	- differentiation - bio psycho-social	We need to increase research in the educational field to explore the practices to include all students through talent development.
Gifted children are sometimes "supplemented" with activities specific to them (comparison with disability).	- Gifted child - medical	Using the metaphor of the amethyst geode in education can foster the development of everyone's talent.

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Martina Brazzolotto graduated in Primary Education (University of Padua) and specialized in Gifted & Talented Education by studying at various universities (University of Pavia; Irvine University, California, (U.S.A.); University of Connecticut (U.S.A.); Radboud University, Nijmegen, Netherlands). Since 2012 she has been involved in teacher training in the field of Gifted Education and Talent development with a pedagogical-inclusive approach (see c.v. www.didatticatalenti.com). In November 2020 she obtained the Ph.D. in Pedagogical Sciences (University of Bologna) with a thesis on teachers, parents, and school principals' perspectives on Gifted Education. In September 2021 Martina completed a post-doctorate at the Great Plains Center for Gifted Studies (Emporia State University, Kansas, U.S.A.). She was Member of the Technical Board set up by the Italian Ministry of Education to write national guidelines for Gifted children. Since 2019 she has been a member and delegate for Italy of the World Council for Gifted and Talented Children (WCGTC), a global non-profit organization for gifted

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Research Article

The see me statement: an action research investigation of a teaching strategy designed to promote understanding of non-traditional indicators of giftedness

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Abstract

This action research study explored the development and impact of an educational activity, the See Me Statement, designed for students enrolled in a gifted and talented teaching endorsement program. Driven by the pervasive issues of underrepresentation in gifted education, the See Me Statement was designed to scaffold understanding of diverse indicators of giftedness and encourage participants to view the classroom through the eyes of a gifted student who does not fit the mold of the stereotypical gifted child. Following an introduction to Frasier's Traits, Aptitudes, and Behaviors (TABs) tool, participants wrote letters from the perspective of unidentified gifted students and urged their teachers and administrators to see them and address their unique strengths and challenges. Thematic analysis of See Me Statements revealed examples of all ten components of the TABs, with an impressive representation of atypical behaviors that are likely to indicate giftedness. Analysis of participant reflections on the assignment indicated that writing from the perspective of a gifted child promoted empathy and encouraged current and future action to address the diverse strengths and needs of all gifted children. Findings support the continual need to carefully address potential misconceptions of giftedness, and reveal the positive impact of including an affective/attitudinal component in professional learning opportunities concerning the gifted.

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Introduction

How do we recognize gifted students by their every-day behaviors and attitudes in the classroom? Many educators are quick to share stories of bright students sitting eagerly at their desks, poised and ready to learn, or accounts of children who ask insightful questions and can't seem to get enough of school. But what about those who are more interested in writing song lyrics than paying attention in math? Or the students that rally their peers around social justice issues, but roll their eyes when the teacher tries to lead a class discussion about civil rights? These students may not fit the narrow and stereotypical image of gifted students, but they must be seen, lest we fail to provide appropriate educational services to support and encourage them to reach their full potentials.

This study utilized the action research framework to explore the development of an educational activity, the See Me Statement, and its potential impact on pre-service and practicing teachers enrolled in a gifted and talented teaching endorsement program. The See Me Statement was designed to encourage participants to view the classroom through the eyes of a gifted student who does not fit the mold of the stereotypical gifted child. Following an introduction to Frasier's Traits, Aptitudes, and Behaviors (TABs) tool, participants wrote letters from the perspective of unidentified gifted students and urged their teachers and administrators to ***see them*** and address their unique strengths and challenges. The aim of the activity was to personalize issues of underrepresentation in gifted education and scaffold the recognition of non-traditional characteristics of giftedness. Such increased recognition of and empathy for gifted students who don't fit the gifted stereotype lays the foundation for more inclusive identification practices and gifted services.

Review of the Literature

Issues of underrepresentation have been evident since the formal start of gifted services and remain pervasive today (see Peters, Gentry, Whiting, & McBee, 2019 for a recent analysis of disproportional representation in gifted and talented programs). Challenges include the underrepresentation of minority students, students from low socioeconomic backgrounds, and twice exceptional students. Statistics related to these issues are alarming: as of 2016, African American students were underrepresented in gifted education by 43%, LatinX students by 30%, Native American students by 13%, and students with disabilities and those learning English by 75% (Peters, 2019). The 2014 U.S. Department of Education Office for Civil Rights "Dear Colleague" letter highlighted "chronic and widespread racial disparities in access to rigorous courses, academic programs, and extracurricular activities" (U.S. Department of Education, 2014, p. 2). Such underrepresentation is "well beyond statistical chance" (Ford & Whiting, 2010, p. 132), and cannot be ignored. Thousands of gifted students from diverse backgrounds remain invisible: these students are sitting in our classrooms, unrecognized and underserved.

Frasier's Four A's

The works of Mary Frasier form a strong foundation to advocate for underrepresented gifted students. As a champion for gifted students from diverse backgrounds, Frasier used the term atypical gifted to describe gifted students who "simply didn't fit the mold" of the stereotypical gifted child (Martin, 2003, p. 158). Frasier's Four A's - Attitude, Access, Assessment and Accommodation provide a framework for educators to recognize and confront barriers to success for these underrepresented gifted students (Frasier, 1991; 1997).

Attitude encompasses both the explicit and implicit emotional positions towards Culturally and Linguistically Diverse (CLD) students. Studies have revealed negative teacher attitudes toward CLD students who are likely to express gifts and talents in an atypical manner (McBee, 2006; Elhoweris et al., 2005). Such teacher beliefs directly influence whether students are included or excluded from gifted programs (Ford, 2010; Siegle, 2001, Wright, et al., 2017). **Access** refers to the manner in which students enter into consideration for gifted services: students who fit the mold of a stereotypical gifted child are often given easier access to services, but educators must advocate for those who demonstrate giftedness in more unique manners (Grantham & Ford, 2007).

Assessment is described as the process of "appraising, estimating, or evaluating the presence of giftedness and to what degree" (Grantham & Ford, 2007, p. 2). It is imperative that we recognize the pervasive issues of inequity related to identification of minority gifted and talented students (Ford & Grantham, 2003; Johnsen, S.K., 2018). Issues of bias and lack of cultural relevance often lead to lower standardized test scores for minority and twice exceptional students, as well as those from challenging socioeconomic backgrounds. Given the overemphasis on such standardized aptitude and/or achievement tests for gifted identification, this presents a clear challenge to equitable representation in gifted services (Erwin & Worrell, 2012; Hunsaker, Finley, & Frank, 1997; Mun, Hemmler et al., 2020). As Ford (2004) stated, "In gifted education, low test scores often prevent diverse students from being identified as gifted and receiving services" (p. 3).

Finally, **Accommodation** refers to the educational services that are provided to meet the diverse strengths and needs of children identified as gifted. This is of equal, if not greater importance than assessment: why fight to provide students the opportunity to participate in gifted services if they will not benefit from being involved? Gifted services should not be "one-size fits all", but should rather be based in culturally responsive practices that ensure services are appropriately aligned to student populations (Ford, 2010).

The Importance of Attitude: Uncovering Misconceptions and Promoting Empathy

A dynamic and culturally responsive attitude forms the foundation for meaningful change in Access, Assessment, and Accommodation. Successful identification of and service for gifted students from underrepresented populations begins with the careful preparation of educators who are not only aware of their biases and prejudices, but also committed to being culturally competent (Ford & Grantham, 2003; Esquierdo & Arreguin-Anderson, 2012). As Frasier (1997) claimed "the most pervasive reasons for problems in identifying gifted minority students are related to attitudes about gifted potential in these groups" (p. 501).

McBee (2006) referred to teachers as gatekeepers to gifted services and emphasized that educators' intentional and unintentional biases create varying levels of access to gifted education. In order to address issues of underrepresentation, we must explicitly confront deficit attitudes and oppose temptations to acquiesce to the status quo (Ford, 2014; Grissom & Redding, 2016). As Frasier reported in her 2003 interview, "I think we ought to approach this whole notion of giftedness from the perspective of the child rather than the perspective of the adult who's going to come up with the perfect model to find the gifted child" (p. 162).

This assertion is akin to the concept of emotional perspective-taking, loosely defined as our ability to comprehend other people's feelings (de Vignemont & Singer, 2006; Decty & Jackson, 2006). Empathy, the ability to emotionally identify with another, is central to emotional perspective-taking and fuels the powerful moment when "I and you" becomes "I am you" or "I might be you" (Spiro, 1992). Warren (2018) suggested explicit attention to empathy development in teacher education serves two main purposes: first, to encourage teacher candidates to notice patterns in their own attitudes about race and cultural differences, and second, to equip them to use empathy to guide critical decision-making in their future classrooms.

Empathy is both emotional and cognitive in nature. Adopting the psychological view of others promotes compassion and fuels action: "The application of empathy through perspective taking links knowledge of diverse youth and families to teachers' professional decision-making" (Warren, 2018, p. 171). This is particularly important given the juxtaposition between teacher populations which are overwhelming white and female (Bitterman, Goldring, & Gray, 2013) and America's public-school population which is often described as a "majority minority" (Maxwell, 2014). Educators must recognize that their personal schema of a gifted child is often steeped in unintentional bias, and therefore must be critically examined and rebuilt to encompass the diverse characteristics of all gifted students.

Equipping Educators to Serve Gifted Children

Educators receive minimal training on how to identify, instruct and meet the needs of gifted and talented learners, and thus many do not feel qualified or prepared to teach their brightest students (Sayi, 2018; Spoon et al., 2020). On average,

teacher preparation programs in the United States devote a shocking two instructional hours to equip preservice educators to serve gifted students in the traditional classroom (National Association for Gifted Children [NAGC], 2015). Absent well-designed training, educators typically rely on assessments to determine if students qualify for gifted services, and seldom acknowledge student behavior as a potential indicator of giftedness (Ford et al., 2008; Ford and Whiting, 2010). If behavior is considered when identifying potentially gifted students, educators are likely to unknowingly search for stereotypical behaviors: students who are well behaved, earn straight A's, and show interest in school assignments are quickly nominated, while those unmotivated and potentially disruptive in the regular classroom setting are overlooked.

Research has shown that successful training in gifted education first acknowledges existing teacher beliefs and practices and then scaffolds buy-in for new initiatives (Little & Housand, 2011; Garet et al., 2001; Richardson, 2003). Impactful professional development provides avenues for meaningful reflection (see Means et al., 2009) and includes carefully designed learning activities that emphasize real-world, rather than ideal educational settings. Coherence between training activities and teachers' classroom goals motivates the application of research-driven best practices: in short, teachers must be convinced that content presented in professional development is both feasible and meaningful (Birman et al., 2000; Kwakman, 2003).

Recently, the National Association of Gifted Children intentionally shifted language from professional development to professional learning (PL), emphasizing the importance of continual learning and engagement on the part of both teachers and students (Learning Forward, 2011; NAGC, 2019, Spoon et al., 2020). Professional learning promotes reflection and long-lasting impact, which contrasts information-dense PD initiatives that often "focus on the symptoms rather than the root causes of ineffective teaching" (Yoo & Carter, p. 39). Intrator and Kunzman (2006) suggested effective professional learning mirrors an inverted model of Maslow's Hierarchy of Needs: emotional needs must first be met in order for true skill and knowledge development to occur. Professional learning that contains an affective component promotes long-lasting benefits; emotions are a driving force for teacher quality and effectiveness (Day & Lee, 2011), and content-heavy training that does not target professional aspirations and values will produce "overloaded teachers who work in isolation and will not retain what it takes to do their most inspired teaching" (Intrator & Kunsman, 2006).

"One-stop" PD in gifted education often overemphasizes content and neglects to provide meaningful context for participants. As a result, PD is often interpreted as a firehose of information, and participants are left overwhelmed and unmotivated (Edinger, 2020). This is particularly worrisome for PD that targets issues of underrepresentation in gifted education: inundating participants with alarming truths about the injustices experienced by students from diverse populations may produce a paralyzing effect, leaving participants both discouraged and unsure as to "where to start" in efforts to support students in their own classrooms.

Educators who are overwhelmed and unsupported find comfort in familiar and safe teaching practices, many of which are biased towards the majority culture (Bitterman et al., 2013; Boyd et al., 2013). Lortie (1975) described this tendency to maintain the status quo as the apprenticeship of observation, claiming that teachers operate under the conception of teaching formed throughout their own experiences as students, and thus rely on "ready-made recipes for action and interpretation that do not require testing or analysis while promising familiar, safe results" (Buchmann, 1987, p. 161). If we want to confront issues of underrepresentation, we must promote professional learning that provides both cognitive and affective scaffolding for educators to challenge the status quo.

Recognizing Diverse Indicators of Giftedness: Frasier's Traits, Aptitudes, and Behaviors (TABs) Tool

The pervasiveness of stereotypical representations of giftedness is what motivated Fraiser to devise methods to "recognize and nurture potential in its rawest stage, in whatever package it comes" (Martine, 2003, p. 160). Rather than solely relying on standardized test scores, research has shown that identification for gifted education services should consider a student profile, which "provides the most effective and efficient way to display data for interpretation from test and non-test sources" (Grantham & Ford, 2007, p. 2). Given the focus on the whole child, identification based on student

profiles results in gifted education programs that are more inclusive of children from diverse cultural, economic, and language backgrounds (Frasier & Passow, 1994; Grantham & Ford, 2007).

Frasier's Traits, Aptitudes, and Behaviors (TABs) tool is a particularly effective framework which guides educators to recognize gifted potential in all students, particularly those from underrepresented populations (Frasier et. al, 1995). For the purposes of this assessment tool, *traits* refer to relatively consistent patterns of behavior, *aptitudes* are a student's abilities in a field or their future ability for performance in that field, and *behaviors* are the responses a student has to a stimulus (Grantham & Ford, 2007). The TABs model identifies ten overarching characteristics that are commonly exhibited by gifted and talented students: Communication, Motivation, Humor, Inquiry, Insight, Interests, Reasoning, Memory, Problem-Solving, and Imagination/Creativity (Besnoy et al., 2016; Frasier & Passow, 1994; Grantham et al., 2005). Based on extensive review of the literature, these ten themes are meant to give teachers, or other assessors, guidelines for which behaviors, attitudes, or traits may indicate a child's giftedness or talent (Table One includes a description of each component of the TABs). Trained teachers or other school officials may use the TABs to structure observations of a student as they work to assess the child's eligibility for gifted and talented education programs. These observations may take place during normal instructional activities, lowering the stress on the student and offering results with increased validity.

The TABs tool is unique in that it offers descriptions of *unexpected* behaviors which depict giftedness (Besnoy et al., 2016). For example, where a teacher or parent might see a child's behaviors as defiant of authority, the TABs observation checklist indicates that this behavior may reflect the child's motivation. A student that doesn't get along with peers and is seen as bossy or manipulative may actually be displaying common behaviors listed in the leadership, communication skills, and insight domains. Not all behaviors exhibited by gifted or talented students will be positive! Using only identification tools that measure a student's positive behaviors or progress will not allow us to accurately identify all students who are gifted or talented, leaving many students behind in the process as invisible gifted children who will not receive the services they need in school (Besnoy et al., 2016; Dunn, Dunn, & Treffinger, 1992). Fortunately, the TABs can serve two simultaneous purposes: first, it provides a framework to organize evidence of giftedness across students from diverse populations, and second, its holds teachers and administrators accountable to maintain a more inclusive image of gifted children.

Research Design and Methodology

This study utilized the action research framework to systematically examine the impact of the See Me Statement, a teaching activity strategically designed to scaffold the recognition of non-traditional characteristics of giftedness and thus equip educators to appropriately serve the invisible gifted in their own classrooms. In hopes of inspiring current and future educators to address local issues of underrepresentation, the main author embarked on a journey of teacher inquiry (see Mertler, 2021) to explore the efficacy of her own instruction in an introductory Gifted and Talented Endorsement class.

The study was centered on two research questions:

- Do See Me Statements reflect student understanding of non-traditional gifted characteristics in diverse populations?
- Do student reflections suggest the See Me Statement helps promote teacher empathy for unidentified, thus underserved, gifted students?

Overview of Action Research

Teacher inquiry is rooted in the successful application of action research to educational problems of practice; it is unique in that the research is "conducted by insiders, those who work directly with the problem being studied" (Mertler, 2021, p. 1). For the past four years, the main author has been examining and reflecting on the impact of the See Me Statement,

utilizing the action research cycle to investigate how to best address stereotypical conceptions of giftedness within the unique context of her teacher preparatory classes.

Within an educational setting, action research can be understood as a systematic exploration of pedagogy to improve the quality of instruction and bridge the gap between educational research and teaching practices (Dana & Yendol-Hoppey, 2019). Action research is often depicted as cyclical or spiral in nature; one complete cycle of research builds the foundation for additional research to examine problems in greater depth (Barcelona, 2020; Johnson, 2008, Vaughan & Mertler, 2020). Mertler (2021) described four stages of the action research cycle: *Planning,* during which the problem is defined and a research plan is formulated; *Acting*, which centers on the collection and analysis of data related to the research question; *Developing,* which involves the development of an action plan driven by data analysis; and *Reflecting*, during which the researcher critically examines the results and thus paves the way for the next cycle of the research process. It is this cyclical nature that brings depth and rigor to action research; with each cycle, more is learned, and greater credibility is added to the findings (Stringer, 2013).

Action research is centered on solving a context-specific problem; unlike traditional, more controlled forms of research, the researcher becomes engrossed in investigating and solving the problem at hand. As Mertler (2021) asserted: "It could be argued that literally no one else has the insight and levels of experience necessary to understand and to solve a particular context-specific problem of practice than the practitioners who are involved in that setting and with that problem on a daily basis" (p. 2). Nevertheless, it is essential that action researchers ensure findings are sound; since the researcher is clearly invested in the study, there is danger that findings are clouded by outcomes the researcher hopes to see (Stringer, 2013).

The quality of action research is directly related to the practical application of findings for the intended audience (Mertler, 2022). Such quality is often generally referred to as rigor, and associated with terms such as validity and reliability (for quantitative analyses) or accuracy and dependability (for qualitative analyses [see Melrose, 2001]). There are various strategies which provide evidence of rigor within action research, ensuring findings are not simply reflective of the limited view of the researcher (Chapman, Paterson, & Medves, 2011; Stringer, 2013). These include, but are not limited to: repetitions of the cycle, member checking, participant debriefing, and triangulation of data (Melrose, 2001; Mertler, 2021; Stringer, 2013).

Member checking brings diverse voices into data interpretation; participants are provided the opportunity to review raw data and analysis, and work alongside the researcher to validate outcomes of the study (Stringer, 2013). Participant debriefing captures the emotional experience of action research participants, thus providing affective data to further contextualize findings. Of course, simple repetition of the Action Research Cycle is not enough to ensure credibility: the cycles must be strategically designed to capture quality information, allowing for triangulation of data and thus enhancing credibility and usefulness of findings.

Researcher Positionality

Before further explaining the study, it is important that the main author divulge her personal interest in the research and thus acknowledge how subjectivity may influence the study and its findings (Peshkin, 1988; Holmes, 2020). I come to this research journey directly motivated by my own experiences as an identified gifted-student, but more importantly by the "a-ha" moments of realizing my own biases throughout my pre-service teacher education and doctoral studies in gifted and talented education. As a well-behaved and high-achieving white female, I easily fit the mold of the stereotypical gifted child. Some of my earliest memories revolve around excitement for school and dreams of one day having a classroom of my own. However, throughout my experiences in gifted services, my love for learning was increasingly tainted by the "game" of school: Advanced Placement course instructors informed me there was "no time for creativity", pressure to perform overshadowed genuine curiosity to learn, and, most significantly, gifted classrooms became smaller and more homogenized. These negative experiences fed my desire to become an educator: I wanted to make a difference.

Throughout my educational studies, I completed diverse field experiences in many Title 1 schools and spent significant time teaching abroad. Such experiences brought me out of my comfort zone, revealing the messy biases I unknowingly held about teaching and learning, and the truth that my personal understanding of giftedness was far from inclusive. I distinctly remember sitting in the parking lot of a Title 1 school, having just completed an enrichment activity for a group of third graders along with other doctoral students in gifted education. Nothing had gone as planned: students misbehaved and the classroom had quickly become chaos. However, as our group reflected on the experience, we uncovered diverse indicators of giftedness in the midst of our "failed" lesson: student curiosity was evident in their unending (and inappropriate!) questioning, and motivation was clear, although it challenged our lesson plan. I remember my stomach clenching as I realized *I was part of the problem – their giftedness didn't look like mine, so I didn't recognize it.*

To this day, I think back to that parking lot and promise myself to take the uncomfortable route in my work as an educator and scholar. In no way will I ever fully comprehend the experiences of underrepresented gifted students, nor could I fathom that I have the ability to "give them a voice". All gifted students have their own voice; it is my hope to equip educators who are adept to listen.

The See Me Statement: Context and Design

The See Me Statement was designed for a graduate-level gifted endorsement course, the Nature and Needs of Gifted and Talented Students. This is the first required course for gifted and talented endorsement, and a common elective for pre-service teachers at the university. Like many gifted education endorsement courses, 100% of instruction is only and asynchronous. According to the course description, the class "emphasizes the developmental nature of gifted learners and their related learning characteristics and needs". Given the introductory nature of the course, a vast amount of information must be covered, leaving little room for in-depth exploration of essential topics such as underrepresentation.

Since my personal journey in confronting implicit biases concerning gifted education was rooted in challenging emotional experiences, I was determined to design a learning activity that would facilitate a similar "a-ha moment" in my students. This was particularly important since the course does not contain a field component; I had to be careful to convince students of the real-world application of our content, lest they assume a passive stance and view course material as purely theoretical. With only two instructional weeks to cover issues of diversity in gifted education, I focused on addressing teacher attitudes and values, rather than attempting to cover a large quantity of content related to underrepresentation. The See Me Statement was designed to create a meaningful learning experience that challenges students to examine issues of underrepresentation from an emotional perspective. It was hypothesized that the empathy developed through the assignment would naturally motivate students to examine issues of underrepresentation well beyond the content included in the short learning module for the course.

Participants completed the assignment during the Invisible Gifted Learning Module, which was fifth out of the course's seven content modules. Prior to this module, students completed modules on the following topics: Defining Giftedness and Talent, The Characteristics and Needs of Gifted Learners, Legislative Issues Related to Gifted Education, and Gifted Education Programming. The Invisible Gifted Learning Module was aligned to the following student learning objectives: describe the unique characteristics of culturally and linguistically diverse (CLD) gifted students, explain issues of underrepresentation in gifted education, discuss a myriad of factors that lead to issues of underrepresentation, and argue the importance of dynamic, rather than deficit thinking when identifying and teaching gifted learners. In the first week of the learning module, students investigated the literature on issues of underrepresentation in gifted education through an interactive online case-study, with specific emphasis on Frasier's Four A's and Trait's Aptitudes, and Behaviors tool.

The See Me Statement was assigned during the second week of the Invisible Gifted module, and designed to target teacher attitudes and values towards gifted students from diverse populations (see Table Two for full directions for the See Me Statement assignment). Participants used the literature covered in week one to write research-based personas (see

van Rooij, 2012; Baek et al., 2008) of unidentified gifted students and thus "put a face" to issues of underrepresentation. These personas were written in the form of a letter: the assignment required students to assume the role of an unidentified gifted child and write a letter to teachers and administrators urging them to recognize and serve her gifts and talents. Students were challenged to "become" their persona and use the letter to provide evidence of giftedness that is expressed in diverse manners.

Table 2

See Me Statement Directions and Requirements

After reviewing the materials on the Invisible Gifted, **assume the role of a student** who may, unfortunately, not be identified for gifted and talented services via traditional identification procedures. Using your knowledge of issues of underrepresentation in gifted education, write a letter urging teachers and administrators to "see" your gifts and talents and better support your learning.

Your letter should include the following:

- A clear description of who you are: Paint a picture of the student's life – is he or she from a traditionally underrepresented population? Perhaps an English Language Learner? A culturally diverse student? A student who may be twice-exceptional? A student growing up in poverty?
- Evidence of your gifted characteristics: Provide anecdotal evidence that you are gifted, and remember that giftedness manifests in diverse manners. Be sure to review Frasier's Traits, Aptitudes, and Behaviors (TABs) identification tool.
- An honest description of some of the unique challenges you may face as a student from a traditionally underrepresented population in gifted services
- Suggestions for how teachers and administrators can support you in the regular and/or gifted education classroom

Personas are commonly used in the marketing field: fictitious representations of potential clients are carefully designed to "convey the needs, wants, and attitudes of the user in the context of the product/service being designed" (van Rooij, 2012, p. 79). Research has shown that personas help students gain empathy for the individuals they will serve; while fictitious, personas make the strengths and challenges of future students feel "real", and thus promote an empathic connection between teacher and student (van Rooij, 2012, Kelchtermans et al., 2009). Research around first-person narrative writing has also focused on the medical field, since quality clinicians must be able to empathize with their patients (Dean et al., 2010; DasGupta & Charon 2004). Challenging physicians to view illness from the patients' perspectives has resulted in more successful medical practices: increased empathy leads clinical students to ask better questions and demonstrate greater emotional connection with their patients. Such emotional connections in the medical field are often called Points of Contact, and form a foundation of trust and collaboration between clinicians and their patients (Dean et al., 2010).

The See Me Statement was designed to promote similar Points of Contact between teachers and students: the challenge to "walk in the shoes" of an unidentified gifted child brings an emotional connection to the content in the Invisible Gifted Module. Creating a persona challenges students to consider the diverse characteristics, attitudes, and behaviors of gifted children from a personal lens (see Hammond, 2009), thus promoting the empathy that is central to the attitudinal component of Frasier's 4 A's Framework. In short, the goal was for students to experience what it feels like to be an unidentified gifted child who is not receiving appropriate educational services.

Cycles of the Action Research Process

Figure One summarizes the progression of the action research process since the See Me Statement was first assigned in Spring 2018. As depicted in the figure, there have been four distinct cycles, each characterized by a new data-driven action to strategically examine the research questions. While the majority of the research was conducted from 2018 –

2019, it is important to note that the COVID-19 pandemic significantly delayed formal data analysis and sharing of findings.

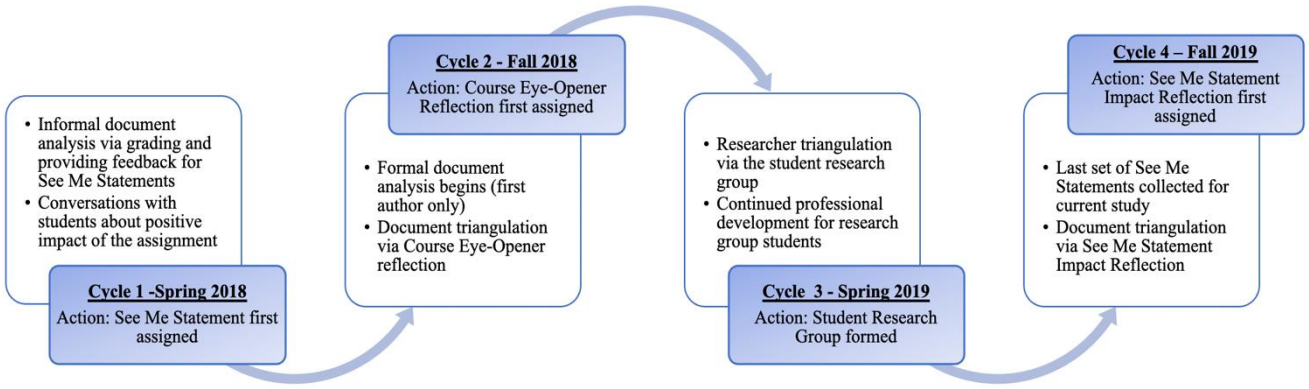


Figure 1

Cycles of the Action Research Process

Cycle One: See Me Statement first assigned. Initial reading of the first See Me Statements had a profound impact on the main author. The process of reviewing and providing feedback for these statements organically mimicked the ongoing and reflective nature of thematic analysis techniques. I was shocked by the vivid personas that brought Frasier's TABs to life, and several of my online students stopped by my office to discuss the impact of the assignment in person. Furthermore, almost half of my students chose to further examine issues of underrepresentation in gifted education for their final independent study project. Students chose to examine populations such as English Language Learners, African American girls, and Native American students, and many cited the See Me Statement as the initial inspiration for topic selection. This anecdotal evidence of the positive impact of the assignment inspired a more formal analysis of student learning demonstrated in the See Me Statement and an investigation into the prolonged impact of the activity.

Cycle Two: Course Eye-Opener Reflection first assigned. The Course Eye Opener Reflection was created to formally capture the potentially positive impact of the See Me Statement and thus provide data triangulation for the positive anecdotal evidence which characterized Cycle One of the action research study (Stringer 2013).At the end of the semester, students were required to reflect on their biggest take-aways from the course and discuss essential content they would want all educators to understand about gifted and talented education (see Table Three). These reflection questions were purposefully written to be general and open-ended; it was important not to implicitly suggest the Invisible Gifted Module and See Me Statement should have had the most impact on student learning. Students completed these reflections at the end of the course, five weeks after the See Me Statement was assigned. In addition to collecting evidence of student learning through the Course Eye Opener Reflection, See Me Statements were also formally analyzed for evidence of student understanding of non-traditional characteristics of giftedness.

Table 3

Course Eye-Opener and See Me Statement Impact Reflection Prompts

Course Eye-Opener Reflection Prompts (Fall 2018 – Fall 2019)	See Me Statement Impact Reflection Prompts (Fall 2019)
▪ What was the biggest eye-opening concept covered in class? ▪ What are the top 2-3 things you would want your colleagues to know about gifted education?	▪ Think back to the See Me Statement assignment that you completed for the Invisible Gifted Module. What student did you choose to "become" when writing this assignment, and why? ▪ What was the impact of writing from the perspective of a gifted student from an underrepresented population?

Data Analysis

Document analysis techniques were used to examine both the Course Eye Opener Reflections and the See Me Statements. Document analysis is a common form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around a topic of study (Bowen, 2009). In contrast to more rigid research procedures, document analysis is meant to be both ongoing and reflective: "the investigator moves between concept development, sampling, data collection, data analysis and interpretation" in search of underlying meaning and emergent themes and patterns within documents (Wood et al., 2020, p. 457). Given the cyclical nature of document collection and interpretation, there is seldom a clear stopping point between data collection and analysis (Corbin & Strauss, 2008; Wood et al., 2020).

Bowen (2009) described three stages of document analysis: superficial examination (e.g., quickly skimming through all documents), thorough examination (carefully reading all documents in full), and interpretation. Thematic analysis is a common interpretive strategy: qualitative data is systematically analyzed, organized, and described via emergent themes (Braun & Clarke, 2006). Wood and colleagues (2017) proposed the following steps to conducting a trustworthy thematic analysis: familiarizing yourself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report.

Thematic analysis represents large quantities of qualitative data as meaningful patterns and themes, but it is imperative to address the fact that this reductive process is highly impacted by researcher positionality (Green, 2000; Wood et al., 2017). Credibility of thematic analysis addresses the alignment between true document content and the researcher's representation (Tobin & Begly, 2004). Several techniques have been shown to improve credibility, such as prolonged engagement with data, data collection triangulation, and researcher triangulation (Lincoln & Guba, 1985; Wood et al., 2017). Triangulation provides a confluence of evidence and reduces the impact of potential bias by examining multiple sources of information (Bowen, 2009). Triangulation also protects against a "garden path analysis" in document analysis, in which researchers are unknowingly tempted to follow attractive themes that confirm bias (Bazeley, 2009).

Course Eye Opener reflections were analyzed using inductive coding; it was essential to let this data "speak for itself" rather than to approach analysis with a preconceived notion of overall course impact (see Bazeley, 2009). All student reflections were initially reviewed in one sitting, allowing the author to become fully engrossed in the data (Tucket, 2005). Initial codes were developed, and the data was reviewed again through this framework to begin examining emerging themes. Thematic analysis became richer with time; as more students completed the See Me Statement and reflection over various semesters, multiple cycles through the coding process produced a rich narrative of the impact of the course and assignment. See Me Statements were analyzed via deductive coding, utilizing Frasier's TABs as the coding framework. This analysis followed a similar procedure: all See Me Statements were initially reviewed in one sitting, and then the work was coded for examples of each of Frasier's traits, aptitudes, and behaviors. It is important to note that document analysis spanned three cycles of the Action Research Study, thus providing ample opportunity for triangulation of findings across both time and student populations (Creswell, 2008; Mertler, 2022).

Cycle 3: Student Research Group formed. In Spring 2019, the main author formed a student research group, in hopes of providing continued professional development for students in gifted education and enhancing credibility of the analysis of the See Me Statements via researcher triangulation and member checking (Stringer, 2013; Wood et al., 2017). Students were selected based on: 1) commitment to gifted education demonstrated throughout the course, 2) advanced writing ability, and 3) interest in professional involvement in the field of gifted education. The research group was composed of five students, and met weekly during the Spring and Fall 2019 semester (Note: Members of the research group are listed as second authors for the study). Students played an active role in the writing process, and thus gained experience in advocating for gifted children in a more formal manner. Throughout the process of writing this article, it became clear that students were deepening their knowledge of issues of underrepresentation in gifted education through the data analysis and writing process. While data from research group interactions was not formally captured, the

conversations with these students provided a contextual richness for the understanding of the ongoing impact of the See Me Statement.

Cycle Four: See Me Statement Impact Reflection assigned. Up until this point in the study, ongoing analysis of Course Eye-Opener Reflections had revealed a prolonged impact of the Invisible Gifted module and student commitment to raising awareness of diverse characteristics of giftedness in their own classroom and school settings. For this reason, we were less concerned about pressuring students to report positive learning experiences related to the See Me Statement, and thus created the See Me Statement Impact Reflection to collect targeted data about the impact of the assignment (see Table Three). These See Me Statement Impact reflections were analyzed using inductive coding, in hopes to capture the authentic learning experiences that arose from the assignment. This added another layer of data triangulation to the study, providing further credibility to analysis of the See Me Statement and Course Eye-Opener Reflections submitted from Fall 2018 onward.

Results

Document analysis techniques were used to examine See Me Statements (collected across three semesters, beginning in Fall 2018); Course Eye-Opener Reflections (collected across three semesters, beginning in Fall 2018) and See Me Statement Impact Reflections (collected Fall 2019).

See Me Statements

Deductive coding of See Me Statements revealed evidence of each of the ten Traits, Aptitudes, and Behaviors in Frasier's TABs, as depicted in Table One. It is particularly notable that these excerpts challenged stereotypical depictions of gifted students. For example, rather than depicting motivation as a student who eagerly completed all assignments, one participant painted the picture of a resilient child writing her autobiography (even if that meant ignoring school assignments!). Another described a student who asked thought-provoking, yet dark questions that "often focus on the bad parts", illustrating how inquiry can often manifest in an intense, almost disturbing manner. Finally, rather than depicting a student's reasoning skills in an academic context, one participant described a seemingly rebellious child who challenged the teacher's rules and proposed a *better way* of running the classroom.

Table 1

Sample Excerpts from See Me Statements that Correlate to Frasier's Traits, Aptitudes, and Behaviors

TABs Component	Description	Correlating Excerpt from See Me Statement
Motivation	Evidence of desire to learn Forces that initiate, direct and sustain individual or group behavior in order to satisfy a need or attain a goal	"Mommy's working late again tonight, so I'll stay up late so I can say hi. That will give me some time to work on my book. My autobiography. I used to bring it to school, but one time the teacher took it while I was trying to write during math class – well math is stupid (and easy) anyway!"
Interests	Intense (often unusual) interests Activities, avocations, objects, etc., that have special worth or significance and are given special attention	"My test scores aren't that high even though I'm told I'm smart. Not like anyone ever gives me anything else to learn about – I find that stuff all by myself. I have friends in the GT program, but they all look and act the same. There aren't any kids in there that look like me. Maybe that is why I'm not a part of it."
Communication Skills	Highly expressive; effective use of words, numbers, symbols	"You are going to have to see me soon, because some of the students are making fun of me for being a "nerd", so I'm thinking about trying to be not so smart somehow.

	Transmission and reception of signals or meaning through a system of symbols (codes, gestures language, numbers)	I've heard some people in the office say that there aren't many gifted kids at our school. I do not understand that. If giftedness is genetic, I do not think it avoids certain people. Blue eyes do not avoid poor people, and that is genetic. If it is not genetic, then maybe it does have something to do with how much money we have, but many gifted historical figures had nothing growing up. Maybe I should research what it took for someone to see them and use that to make someone see me."
Problem-Solving Ability	Effective, often inventive, strategies for recognizing and solving problems. Process of determining a correct sequence of alternatives leading to a desired goal or successful task completion	"Hispanic students, like me, are less likely to be identified as gifted than other white students because of stereotypes. When we first start school, we meet with ELL teachers a lot. Does the gifted teacher meet with them? Do you have training for teachers to identify gifted students? To teach gifted students? To see different students as gifted?"
Memory	Large storehouse of information on school or non-school topics Exceptional ability to retain and retrieve information	"Although I may not always understand what my peers and teachers are saying, I know that I understand some things faster than my peers do; I have also realized that I understand things a lot differently than my peers do. You know those people on the game show Jeopardy? Those people that have a lot of useless facts memorized? I like to think that will be me one day. I have a memory like no other and I remember a lot of useless facts when I hear them."
Inquiry	Questions, experiments, explores Method or process of seeking knowledge, understanding of information	"Sometimes it can be hard to focus on tasks at school because I have so many questions during class. I am constantly asking thought provoking questions about the content and mixing it with real world problems that can come from it. Most of the times these questions are dark and focus on the bad parts of it. But this is just me trying to get the whole picture of everything."
Insight	Quickly grasps new concepts and makes connections; senses deeper meanings Sudden discover of the correct solution following incorrect attempts based primarily on trial and error	"I never do well on these math tests – I know all the answers, but can't tell you how. My teacher back home explained it differently. What's up with all those steps we have to do, just to get the obvious answer? I just know. The word problems take forever to figure out – and they are about random things like football. American football!"
Reasoning	Logical approaches to figuring out solutions Highly conscious, directed, controlled, active, intentional,	"When my teacher does not give clear directions, I get frustrated. I like knowing what my teacher is expecting from me so that I can perfect my work and make her proud. Sometimes I question her procedures, but it is only because I am curious of what we are doing and why we do it that way. I tend to be bossy because I do not like

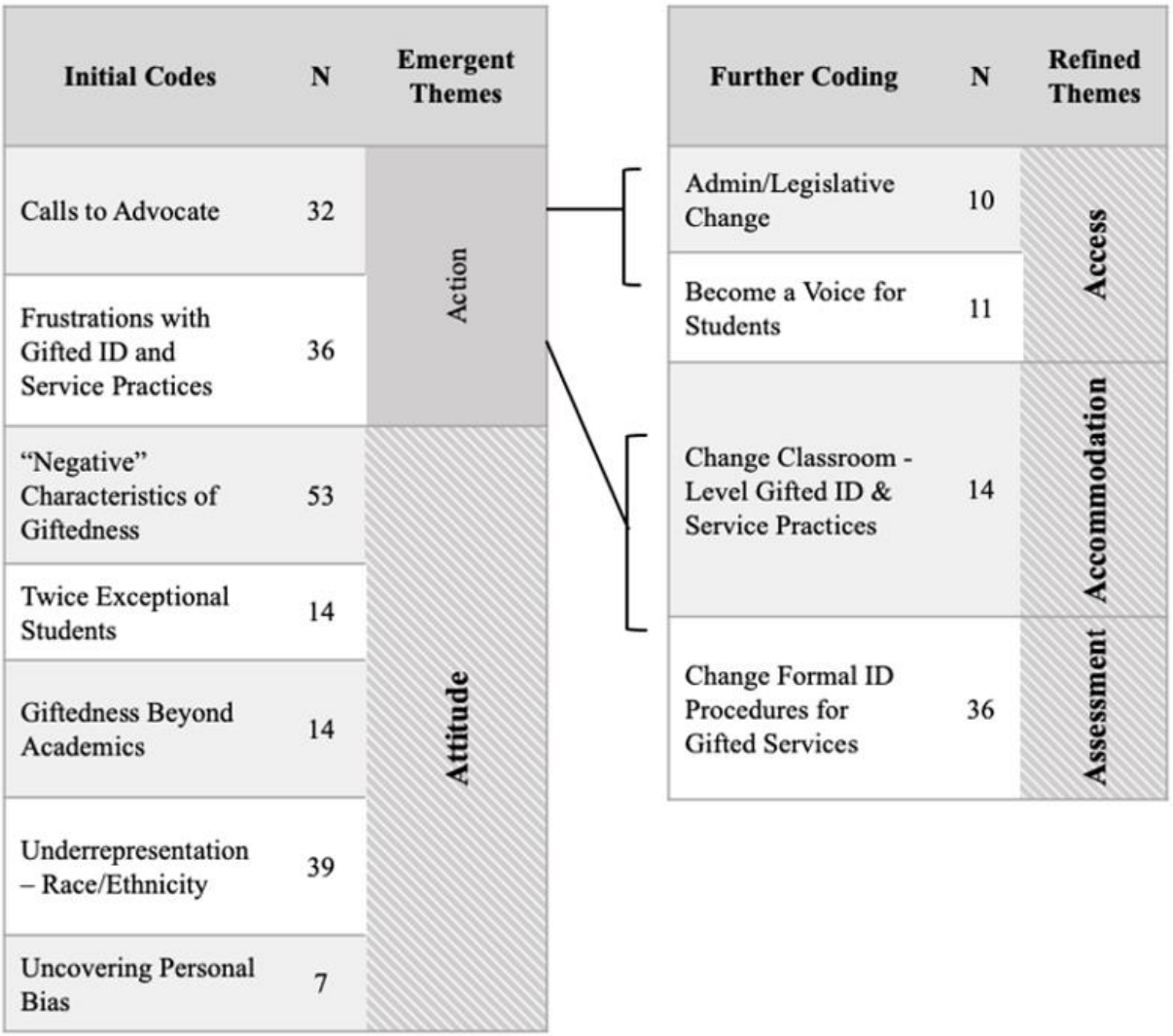
	forward-looking, goal oriented thought	my peers' input. I think I know what's best. I often am seen as different from my peers, but it's not a bad thing. Some of my responses to you are not meant to be disrespectful, it is how my parents have talked to me."
Imagination/Creativity	Produces many ideas; highly original Process of forming mental images of objects, qualities, situations or relationships which aren't immediately apparent to the senses. Problem-solving through nontraditional patterns of thinking	"My teacher always fusses at me for drawing on the back of my paper after I have finish my classwork. It seems like I am always done way before everyone else, but I don't know what she wants me to do instead – I stay quiet the whole time. Sometimes I get bored in class, and I chose to doodle instead. I can always doodle what I want, but sometimes we learn about things I don't care to learn about. Why do we have to learn those things?"
Humor	Convey and picks up on humor Ability to synthesize key ideas or problems in complex situations in a humorous way	"Unfortunately, not many of my teachers or peers take me very seriously though because I am really funny and try to make my questions humorous and am looked at as the class clown. I am also pretty disruptive because they come to me really fast and I interrupt a lot from my ADD. I don't take medicine for it because I need a really high dose and don't like the way it makes me feel."

Note. Samples were strategically selected to illustrate understandings of nontraditional (e.g., "problem child") manifestations of giftedness.

Course Eye-Opener Reflections

Student submissions for Eye-Opener reflections centered on two questions: *What was the biggest eye-opening concept covered in class?* and *What are the top 2-3 things you would want your colleagues to know about gifted education?* Seventy-five percent of the student reflections explicitly mentioned the Invisible Gifted module as the most eye-opening concept covered in class, and seventy-nine percent of students reported that issues of underrepresentation and stereotypical conceptions of giftedness were among the top things they would want colleagues to know about gifted education.

As depicted in Figure Three, inductive coding revealed two initial themes in student reflections: commitment to action to improve gifted education and a changed attitude towards giftedness that challenged stereotypical representations of gifted children. The theme of a changed attitude harkened back to Frasier's Four A's framework, which inspired the main author to further code student responses that revealed a commitment to action into themes of the remaining components of Frasier's Four A's: Access, Accommodation, and Assessment.



Note. Frasier's Four A's were used as final themes.

Figure 2

Qualitative Analysis of Course Eye-Opener Reflections

The theme of **access** was characterized by determination to advocate for administrative/legislative change in gifted education (N = 10), as well as a commitment to become a voice for students who are not receiving appropriately challenging and supportive educational services (N = 11). Reflections asserted that teachers must "notice the characteristics of the invisible gifted student" and be "vigilant in identifying students who may be minorities or may fly under the radar." As one student wrote,

> *As a classroom teacher, you can refer students for services, nurture their unique needs, and advocate for their success. Every student deserves to have their needs met to ensure their academic success. As a teacher, you can be their voice and be a positive role model. It all starts with awareness of the topic [of giftedness] and then steps can be taken to make sure every student is receiving appropriate services.*

It was most encouraging to see that students recognized the connection between a dynamic **attitude** toward the gifted and increased access for diverse populations: "Our misconceptions can cause way more problems than we realize, especially with the students who are missed in the identification process being likely to get bored in class and even drop out. Underrepresented populations are not underrepresented because they don't exist, but because we have a rigid view of what a gifted student looks like". Such assertions indicate that students resisted the comfortable, narrow-minded

conclusion that issues of underrepresentation are "someone else's problem", and instead recognized the potential impact of their own attitudes and assumptions concerning gifted children.

In addition to advocating for more inclusive identification practices, students expressed concern for creating supportive learning environments that appropriately challenge all students: "I would also encourage them [my colleagues] to evaluate their own classroom environment. Do all students feel safe to fail? Do all students feel safe enough to show off their brilliance in a way that does not lead to bullying or peer pressure?" Such statements were ultimately coded under the framework of **accommodation** (N = 14), and focused on practical changes that students were determined to make in their own classrooms. Widened views of giftedness convinced students that "gifted children truly need educational services in order to reach their full potential". As one student wrote, "It is our responsibility as educators to provide differentiation to all learners, not just ones who struggle. Gifted students deserve to have more challenging tasks, not just more tasks. They need something to allow them deeper thought".

Commitment to action was largely characterized by a frustration with narrow identification and service practices for gifted education (N = 36). As one student wrote, "If someone is not aware of what concomitant problems or different lifestyles and cultures look like, they may not identify certain gifted students, making groups disproportionately represented in gifted services and forcing students to go without the services they need." Such assertions were ultimately categorized under Frasier's **assessment** framework, as they reflected a commitment to improve assessment practices that identify students for gifted services. Students advocated for the use of multiple identification criteria, criticized an over-reliance on biased standardized tests, and supported ongoing observation of behaviors that may indicate giftedness. Six students shared that they planned to propose the TABs and/or F-TAP as potential tools for identification of gifted services in their own school/work environments. As one student wrote,

> *The biggest thing I would like my colleagues to know about gifted education is that there are no cookie-cutter students in gifted. Gifted students come in all shapes, sizes, ethnicities, cultures, genders, and levels/types of abilities. I would want them to know that they cannot judge a book by the cover. Another thing is that they need to help create supports for minority and impoverished students. They need to make concerted efforts to make sure that those students are considered for gifted services as well. They need to observe, evaluate, and recommend those students equally.*

The most evident theme across student reflections was a changed **attitude** towards the meaning of giftedness (N = 127). Students discussed previously narrow perceptions of gifted children, and were most surprised to learn the "negative" characteristics (or concomitant behaviors) of gifted students (N = 53). One student shared,

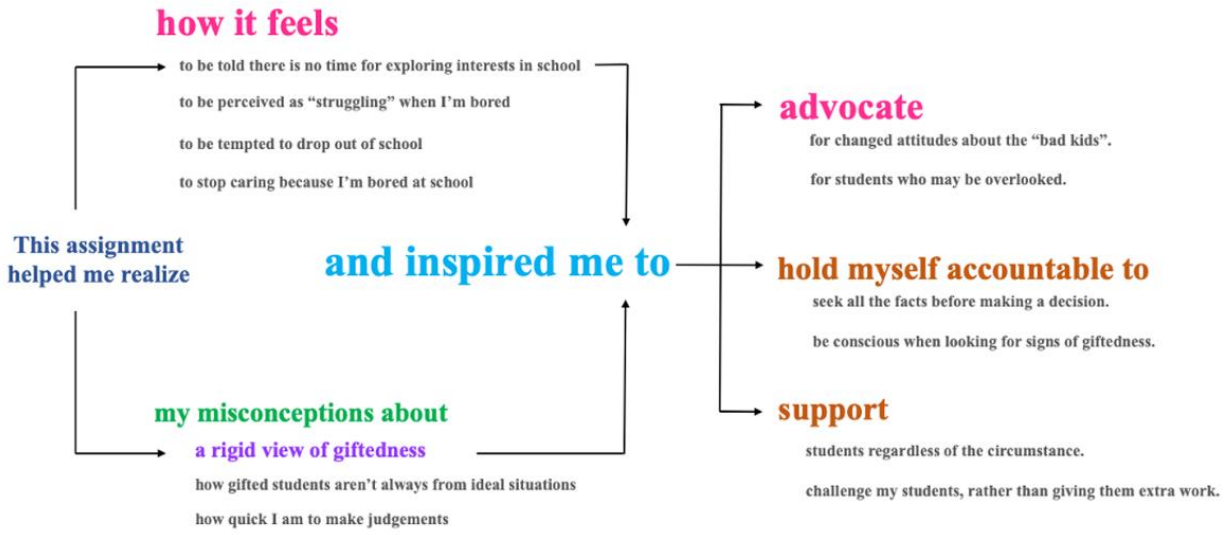
> *When I become a classroom teacher, the first thing I want my colleagues to know is that gifted students may all share the same title, but each of them brings their own unique needs to the table. Some students may be gifted but present their gifts in a negative manner. Often your most troubling students may actually be gifted and [absent appropriate services] these students are unaware of or have not been given the chance to explore and foster their gifts.*

Many students confessed they had previously assumed that "gifted students were obviously gifted" and painted the image of a gifted student as an "eager child sitting in the front row of the classroom". Students discussed the detrimental impact of such stereotypical views of the gifted, and admitted that they previously thought issues of underrepresentation were "simply not a problem due to wishful thinking". Reflections indicated a realization of the negative impact of a turning a blind eye to the challenges of CLD gifted students: "I did not realize how many students lack gifted education services either due to the biases educators hold about the students' race or socio-economic status, or due to the students' behaviors that are seen as "bad" behaviors by educators, when really these behaviors are indicators of giftedness". One student shared how a such a narrow mindset may have impacted her ability to appropriately serve students in her third-grade classroom:

> *I have referred many students for additional testing based on classroom performance and test scores. After completing this [See Me Statement] assignment, I wondered if I had missed anyone. Many students with low incomes are not always identified and are often overlooked. Many people stereotype or judge them based on income which is extremely wrong and immoral. Thank you for making me reflect back on my previous students to make sure I did the right thing.*

See Me Statement Impact Reflections

Participants in Fall 2019 responded to additional reflection prompts that explicitly addressed the impact of the See Me Statement: *Think back to your "See Me Statement". What student did you choose to become? What was the impact of writing from the perspective of a student from an underrepresented population?* As summarized in Figure three, thematic analysis indicated that completing the See Me Statement promoted empathy for underserved gifted students and scaffolded the realization of previously narrow-minded views of giftedness. Students were inspired to advocate for gifted children who don't fit the "stereotypical mold" and expressed commitment to hold themselves accountable and appropriately serve gifted students in their own classrooms.



Note. Larger font sizes and colors indicate more common responses.

Figure 3

Word Tree Summarizing Qualitative Analysis of See Me Statement Impact Reflections

Students expressed an impactful emotional connection with the gifted students they chose to become for the assignment: "Writing from the perspective of a student from an underrepresented population was rather humbling. It reminds you to have empathy and to seek understanding and all the facts so you can best serve your students". Participants placed themselves in the shoes of gifted students "who are told to rush to the next assignment rather than pursue their passions", "who are gifted but perceived as the opposite because of where they are from or the languages they speak", and "who are seen as boisterous and annoying, and thus not expected to succeed". One participant shared that "writing the See Me Statement made her slow down and really think about the implications of teacher actions". In short, viewing the classroom through the lens of an unidentified gifted student shined a new light on teacher attitudes and actions, which inspired participants to take action and advocate for the rights of all gifted students.

Indeed, the most commonly used term in See Me Statement Impact Reflections was *inspiration*, leading participants to take actions that are clearly rooted in Frasier's Four A's. Assertions to advocate for changed attitudes concerning "bad kids" and those who may be overlooked align to **attitude**, while commitment to hold themselves accountable to "seek all the facts before making a decision" and to be "conscious when looking for signs of giftedness" demonstrate this dynamic perspective seeping into both the **access** and **assessment** framework. Finally, desire to support students

"regardless of the circumstances" and appropriately "challenge, rather than give extra work" demonstrates **accommodation** that is designed to reach specific students, rather than a blanket approach. As one student wrote,

> *The impact of writing from that perspective [of an unidentified gifted student] is that I was put in the shoes of the gifted person who was left out. The one who wasn't helped and the one who learned to give up and stop caring because they were bored and not developing their talents. This further pushes my need to help these students and to change teachers attitudes about the "bad" kids.*

Implications for the Field

Issues of underrepresentation in gifted education are indisputable and cannot be rectified by a simplistic approach. The challenge lies in crafting learning experiences that promote both cognitive and affective (attitudinal) learning outcomes. While analysis of See Me Statements revealed cognitive understanding of diverse indictors of giftedness, the more compelling finding was the emotional impact of the assignment. Overemphasis on content ultimately disengages teachers who are driven by a sense of purpose and meaning (see Yoo & Carter, 2017), while the promotion of empathy bridges gaps in professional teacher preparation (Dolby, 2012; Peck et al., 2015). As Warren (2018) proposed, "Empathy is the piece of the student-teacher interaction puzzle that connects what a teacher knows or thinks about students and families to what he or she actually does when negotiating appropriate responses to students' needs, or when the teacher is arranging learning experiences for students" (p. 171).

The positive impact of the See Me Statement reveals the power of stepping outside of one's perspective and creating a personal connection to big-picture issues such as underrepresentation. The Invisible Gifted Learning Module spanned two weeks, but the See Me Statement required students to personalize the issues of underrepresentation and consider how they impact individual learners who teachers may find in their own classrooms. As one student reflected on the assignment, "writing from their [an unidentified gifted child] perspective really made me think about education in a different light. It made me internalize the information we had been learning and think of ways I can serve all gifted students".

When taking on the persona of an unidentified gifted child, students are able to empathize with the unique challenges that the invisible gifted are likely to face. This empathy promotes an understanding of another's experiences, which has been shown to encourage individuals to be more careful when interacting with those who may act or look differently than themselves (Fairbairn, 2002). Research in the field of medicine has indicated that the connection between reflection and empathy is bidirectional (affecting both caregiver and patient), as well as mutually nourishing: "When doctors or medical trainees reflect on their own lives in medicine and when they inspect the memories and associations triggered by their care of the sick, they become all the more available and useful to their patients" (DasGupta & Charon, 2004, p. 352). Such assertions can also be applied to professional learning opportunities in education: by reflecting on students that are harder to see as gifted and confronting potential misunderstandings about gifted students, participants in the study developed a more inclusive conception of the gifted and talented. Not only did this empathy help them identify or 'diagnose' underrepresented students as gifted, it also led them to establish methods to 'treat' these students by leading them to the resources they deserve.

Inspired by the positive impact of the See Me Statement, the authors propose the following practical suggestions to craft meaningful instructional activities to better equip educators to recognize and serve gifted students who break the stereotypical gifted mold.

Less is more. There are a plethora of issues with underrepresentation in gifted education, but we must be careful not to paralyze learners with data without providing appropriate opportunities to internalize content covered in professional learning. Resist the temptation to "cover everything", as this often results in participants taking a passive stance throughout the training.

Prioritize affective learning outcomes. Presenting content outside of an affective context is unlikely to have a lasting impact. Purposefully design learning opportunities to promote attitudinal change: utilize emotional perspective-

taking strategies (such as the See Me Statement) to encourage a personal connection with the content covered throughout the professional learning experience.

Make it personal. Alarming statistics of underrepresented populations in gifted education can be jarring, but putting a face to these statistics can motivate change. Discuss the nation-wide context of underrepresentation, but focus the conversation on issues that are closer to home. Ask teachers to critically examine the gifted population in their own school – what would it feel like to be the only English Language Learner in the gifted program? Why do the same ten students seem to be nominated for every award?

Embrace the uncomfortable. Effective professional learning opportunities challenge participants to confront potential misconceptions. Many participants are more comfortable sitting through a slideshow about diversity in gifted education than they are engaging in emotional perspective-taking tasks. Expect resistance from some participants: this is an indicator that true learning is taking place.

Conclusion

This action research journey was characterized by faces, rather than nameless data. Behind our findings lie current and future educators that are determined to act and ensure all gifted students are *seen,* and thus appropriately served. It is our hope that the findings in this study inspire other educators to craft meaningful learning experiences that promote not only cognitive understanding, but affective commitment to making change in their communities.

Imagine you are the child that is "left out" of the game of gifted education, silently sitting on the outside of the circle, looking at your friend's cards and thinking of more than one way that she could win. Imagine being dealt into a game that was played by rules written in a different language, or rules that contradict your culture and upbringing. *This is the reality for too many of our brightest children. As educators, administrators, parents, and friends, we must see these students, and we must provide culturally-responsive services that meet their strengths and needs.*

Biodata of Authors

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Research Article

Gifted students' achievement in Natural Sciences: a modeling study

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Abstract

The purpose of this study is to empirically analyze the effect of father involvement, mother involvement, teacher-student interaction, and peer support on achievement in natural science of gifted students with self-regulated learning as a mediator. The subjects of this study were 45 gifted students with a minimum IQ of 130 (WISC-IV) who studied at the junior high school level. Data were collected from the father involvement scale, mother involvement scale, peer support scale, teacher-student interaction scale, and achievement test in natural science of gifted students developed by the researcher. The analysis was then conducted using Structural Equation Model with Partial Least Square (PLS). The results of the path analysis show that: Teacher-student interactions and peer support have affects the achievement in natural science of gifted students, while the father's and mother's involvement do not affect the achievements in natural science of gifted students. Teacher-student interactions and mother's involvement have effects on self-regulated learning, while father's involvement and peer support have no effects on self-regulated learning. The achievement in natural science of gifted students is not influenced by self-regulated learning. Thus, self-regulated learning is not a mediator variable between social environmental factors and achievement in natural science of gifted students.

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Introduction

The academic achievement of gifted students is an interesting study in the world of education. The academic achievement of gifted students is the basis for developing the contribution of gifted students in community life. Gifted students as individuals with extraordinary potential, bring great expectations for high achievement and success

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(Marisano & Shore, 2010). The community hopes that the higher the potential of gifted students the more they can contribute to various fields of life.

Empirical facts show that the potential of extraordinary from gifted students is not automatically actual in academic achievement at school. The emergence of the phenomenon of gifted underachiever students, namely gifted students with low academic achievement, shows that their intelligence potential is not functioning optimally. Robinson (2002) views that gifted students who have low achievement are a disaster in modern society. Reis and McCoach (2002) said that if there is no effort to help gifted students who have low achievements, society will lose valuable potential for the progress of a nation.

Achievement in Natural Sciences of the Gifted Students

The extraordinary intellectual potential of gifted students will actually become the achievement in natural science, requiring the contribution of non-cognitive and environmental factors. Heller (2004) explained in the Munich Model of Giftedness that the intellectual potential of gifted students can be an achievement in natural science influenced by non-cognitive personal characteristic factors. The non-cognitive factors play an important role in actualizing the extraordinary intellectual potential of gifted students in the achievement in natural science

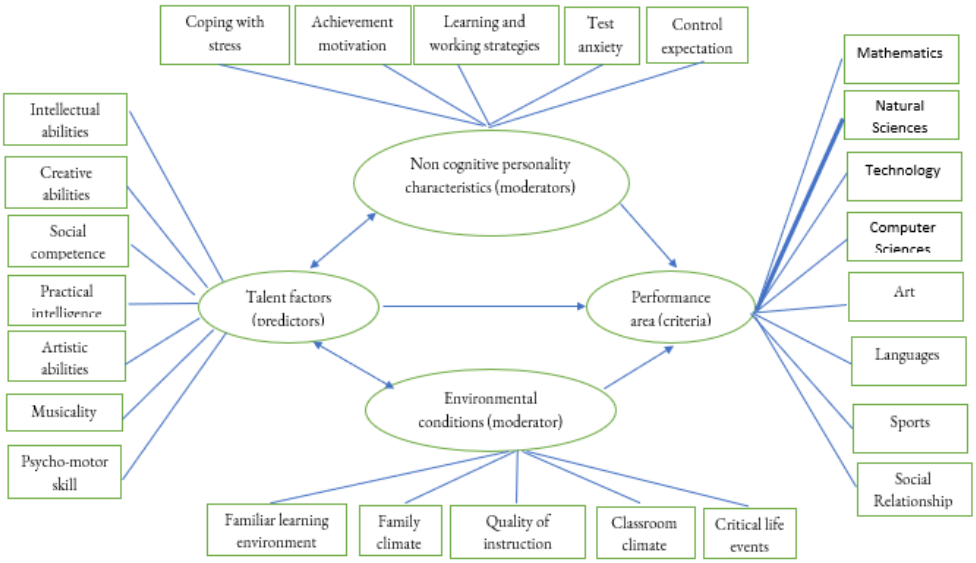

Figure 1

The Munich Model of Giftedness. Adapted from "Identification of Gifted and Talented Students" by (Heller, 2004)

Heller (2004) explained that non-cognitive factors are personal characteristics, such as: achievement motivation and learning and working strategies. These two non-cognitive factors are integrated in self-regulated learning activities. Tanemmbaum (1983) explains that one of the non-intellectual factors that influence the achievement of gifted students is meta-learning and dedication to the chosen field. Meta-learning and dedication are manifestations of self-regulated learning. Heller (2004) and Tanemmbaum (1983) mention the contribution of social environmental factors, but there is no explanation of how the relationship between social environmental factors and self-regulated learning is. This opens up space for research so that theoretical needs for models that explain the relationship between the social environment, self-regulated learning, and achievement in natural science for gifted students are explained.

Self-regulated Learning

Baslanti and McCoach (2006) and Alsa (2005) explained that self-regulated learning is the best predictor of distinguishing gifted students with high and low academic achievements. Gifted students with high achievement have good self-regulated learning abilities, while gifted students with low achievements have poor self-regulated learning abilities.

Zimmerman (1989) explains that the difference in the level of self-regulated learning between students can be explained in the perspective of social cognitive theory. Self-regulated learning is influenced by personal, behavioral, and environmental aspects. Bandura (1986) explained that the interaction of personal, behavioral, and environmental aspects does not mean something symmetrical. At certain times the environment has a stronger influence than personality and behavior. The environment consists of the social and physical environment.

Social Environment

Research by Reis & Greene (2014) illustrated that social conditions can affect how gifted students develop self-regulated learning. Social conditions are related to support and encouragement from teachers, parents, and friends in teaching, modeling, and strengthening self-regulated learning strategies for gifted students. The solution to develop self-regulated learning for gifted students is to provide support and encouragement to implement self-regulated learning strategies by teaching, modeling, and appreciating the choice of self-regulated learning strategies for gifted students by parents at home, teachers, and friends at school. Reis & Greene explained that developing self-regulated learning in gifted students requires support and encouragement from the social environment.

Zimmerman (1989) explained that the influence of the social environment is the most influential factor in developing self-regulated learning, especially for developing students' self-efficacy. The social environment serves to establish standards of self-evaluation and provide reinforcement on behavior (Bandura, 1986). So far, there has not been much research on the effect of the social environment of gifted students on self-regulated learning of gifted students and achievement in natural science of gifted students with comprehensively

Efforts to increase achievement in natural science are also carried out by increasing students' self-regulated learning. Various studies have shown that self-regulated learning improves student learning outcomes in natural science (Olakanmia & Gumboa, 2017). Likewise, increasing the achievement of gifted students in natural science can be done by increasing self-regulated learning abilities (Yoon, 2009; Moote, Williams, & Sproule, 2013).

Based on the literature review and previous research, it was concluded that non-cognitive factors contributed significantly to the academic achievement of gifted students. Self-regulated learning as a non-cognitive factor is the main predictor in the academic achievement of gifted students. Self-regulated learning is formed from the interaction of cognitive processes and social processes. Gifted students need social support to optimize cognitive processes in self-regulated learning.

Self-regulated learning is developed with support from the social environment. Teachers, parents, and friends are the main social environment for gifted students. The existence of a social environment can be a facility for gifted students to increase the use of self-regulated learning and will further increase the achievement of gifted students in natural sciences.

Problem of Study

The theoretical problem that arises at this time is that there is no strong concept of the influence of the social environment on the self-regulated learning of gifted students and achievement in natural science. Previous research partially tested the influence of the social environment on self-regulated learning and achievement in natural science for gifted students. This still leaves a problem when faced with the complexities of academic achievement of gifted students in natural science. Does the social environment have a direct effect on the achievement in natural science of gifted students, or the influence of the social environment on the achievement in natural science of gifted students is mediated by self-regulated learning? Based on this question, the purpose of this research are to empirically analyze the effect of father involvement, mother involvement, teacher-student interaction, and peer support on achievement in natural science of gifted students with self-regulated learning as a mediator.

Method

Research Design

This quantitative research uses the correlational method. Correlation coefficient can be used to test hypotheses about the correlation between variables or to state the size of the correlation between variables. In this study there are three variables, namely the predictor variable, the mediator variable, and the criterion variable. This is in line with the research objectives set by the researcher, namely empirically testing the effect of father involvement, mother involvement, teacher and student interaction, and peer support on achievement in natural science of gifted students with self-regulated learning as a mediator.

Research Variable

This study uses five variables: father involvement, mother involvement, teacher-student interaction, peer support, self-regulated learning, and achievement in natural science of gifted students. Achievement in natural science of gifted students is the criterion variable. Father involvement, mother involvement, teacher-student interaction, and peer support are predictor variables. The mediator variable is self-regulated learning. The model of relationship between the variables can be seen in Figure 2.

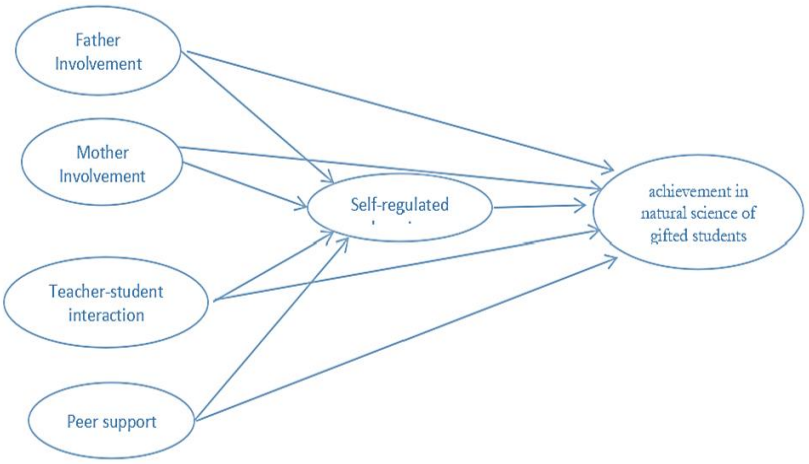

Figure 2

Determinant Model of Achievement in Natural Science of Gifted Students: Self-Regulated Learning as Mediator

Instruments

There are five psychological scales used in data collection: father involvement scale, mother involvement scale, teacher-student interaction scale, peer support scale, and self-regulated learning scale. Data on achievement in natural science of gifted students uses an achievement test in the form of a written test. The number of questions in the test is six and students choose three questions to solve.

Father Involvement Scale

The father involvement scale has two dimensions: home-based involvement and academic socialization involvement. The items on the father's involvement scale are 21 items with a loading factor between 0.6 - 0.852. The reliability score for the home-based involvement dimension is 0.872 and the social-academic involvement dimension is 0.865.

Mother Involvement Scale

The mother involvement scale has two dimensions: home-based involvement and academic socialization involvement. The items on the father's involvement scale are 21 items with a loading factor between 0.6 - 0.899. The reliability score for the home-based involvement dimension is 0.808 and the social-academic involvement dimension is 0.869.

Teacher-student Interaction Scale

The teacher-student interaction scale has three dimensions: emotional support, class organization, and instructional supports. The teacher-student interaction scale items totaled 27 items with a loading factor between 0.6 - 0.904. The reliability score of the emotional support dimension is 0.924, the classroom management dimension is 0.844, and the learning support dimension is 0.897.

Peer Support Scale

The peer support scale has four aspects: informational support, instrumental support, friendship support, and esteem support. The friend support scale item is 12 items with a loading factor between 0.6-0.972 and a reliability score of 0.845.

Self-Regulated Learning Scale

The self-regulated learning scale has three dimensions: metacognition, motivation, and behavior. The self-regulated learning scale items consist of 30 items with a loading factor between 0.600-0.934. The core reliability of the metacognition dimension is 0.909, the motivation dimension is 0.719, and the behavioral dimension is 0.795.

Achievement Test in Natural Sciences

The quality of the achievement test was evaluated from content validity, reliability, item difficulty index, and item discriminatory power index. The content validity test for the achievement test was carried out by teachers who teach science subjects at State Junior High School 1 Surabaya. Reliability testing is based on the alpha coefficient (α) of 0.432. This achievement test has an item difficulty index of 0.556 for the first item, 0.267 for the second item, and 0.333 for the third item. In addition, this achievement test has an item discrimination index for the first question of 0.864, the second item of 0.545, and the third item of 0.682.

Population and Sample

The population of this study were junior high school students with acceleration program at East Java, Indonesia. The total population is 357 students. The sample selected is students with a minimum IQ of 130 based on the Wechsler scale. Students identified with a minimum IQ of 130 based on the Wechsler scale (WISC-IV) were 45 students (12.605% of 357 students).

Table 1

Characteristics of Research Sample

Variables		Number	Percentage
Age	*12-year-old*	4 students	9 %
	13-year-old	22 students	49 %
	14-year-old	19 students	42 %
Sex	*Male*	26 students	58 %
	Female	19 students	42 %
Father's Education	*High School*	2 students	4 %
	Diploma	2 students	4 %
	Undergraduate (S1)	25 students	56 %
	Graduate (S2)	10 students	22 %
	Post Graduate (S3)	6 students	14 %
Mother's Education	*High School*	2 students	4 %
	Diploma	2 students	7 %
	Undergraduate (S1)	35 students	78 %
	Graduate (S2)	4 students	9 %
	Post Graduate (S3)	1 students	2 %
Working Mother		25 students	56 %
Program	*Gifted*	26 students	58 %
	Regular	19 students	42 %
Loving Natural Sciences		28 students	62 %
Total		45 students	100 %

Data Analysis

Data analysis was conducted to test the hypothesis. The hypothesis in this study is that achievement in natural science of gifted students is influenced by father involvements, mother involvements, teacher-student interaction, and peer support with self-regulated learning as a mediator. Testing the research hypothesis using the Structural Equation Model (SEM) using Partial Least Square (PLS). The purpose of using PLS is to predict the correlation between constructs. The PLS SEM test was carried out by looking at the correlation between the constructs, the significance value, the Stone-Geisser Q-Square Test for predictive relevance and the Normed Fit Index (NFI) of the research model.

Results

There are several things that are conveyed in the study of research results, such as the relationship between variables, analysis of direct and indirect paths, and analysis Structural Equation Model (SEM). Relationship between the variables shown on the Table 2.

Table 2

Relationship between the Variables

	Father's Involvement	Mother's Involvement	Teacher and Student Interaction	Friends' Support	Self-Regulated Learning	Academic Achievement
Father's Involvement	1.000					
Mother's Involvement	0.703**	1.000				
Students and Teachers Interaction	0.300*	0.057	1.000			
Peer Group Support	0.350*	0.320*	0.431*	1.000		
Self-Regulated Learning	0.427*	0.471*	0.544*	0.576*	1.000	
Achievement in natural science	0.238	0.242	0.594*	0.586*	0.520*	1.000

Note::* p < 0,05, ** p < 0,01

Table 3

Coefficient of Direct Path

Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistic	P Value
Self-regulated learning → Achievement in natural science	0.062	0.093	0.252	0.246	0.806
Father involvement → Self-regulated learning	-0.107	-0.045	0.255	0.422	0.673
Father involvement → Achievement in natural science	-0.197	-0.228	0.262	0.753	0.452
Mother involvement → Self-regulated learning	0.399	0.355	0.184	2.165	0.031
Mother involvement → Achievement in natural science	0.219	0.257	0.262	0.838	0.402
Teachers-student interaction → Self-regulated learning	0.377	0.386	0.101	3.715	0.000
Teachers-student interaction → Achievement in natural science	0.467	0.398	0.217	2.151	0.032
Peer support → Self-regulated learning	0.216	0.199	0.147	1.472	0.142
Peer support → Achievement in natural science	0.375	0.384	0.147	2.011	0.045

Based on the path analysis, it is known that there are only four significant paths, namely:

- Teacher-students interaction on self-regulated learning (T = 3.175; p < 0.01)

- Teacher-students interaction on the achievement in natural science of gifted students (T = 2.151; p < 0.05)
- Mother involvement on self-regulated learning (T = 2.165; p < 0.05)
- Peer support on achievement in natural science of gifted students (T = 2.011; p < 0.045)

Table 4

Coefficient of Indirect Path

Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Value
Father involvement → Achievement in natural science	-0.007	0.005	0.073	0.091	0.927
Mother involvement → Achievement in natural science	0.025	0.034	0.106	0.233	0.815
Teacher-student interaction → Achievement in natural science	0.023	0.040	0.104	0.225	0.822
Peer support → Achievement in natural science	0.013	0.011	0.064	0.212	0.832

Analysis of Indirect path on table 16 can be explained as follows:

- The effect of father involvement on achievement in natural science through self-regulated learning (T = 0.091; p > 0.05). Conclusion: self-regulated learning does not function as a mediator
- The effect of mother involvement on achievement in natural science through self-regulated learning (T = 0.233; p > 0.05). Conclusion: self-regulated learning does not function as a mediator.
- The effect of teacher-student interactions on achievement in natural science through self-regulated learning (T = 0.225; p > 0.05). Conclusion: self-regulated learning does not function as a mediator.
- The effect of peer support on achievement in natural science through self-regulated learning (T = 0.212; p > 0.05). Conclusion: self-regulated learning does not function as a mediator.

Analysis of Structural Equation Model

Analysis of Structural Equation Model (SEM) using Partial Least Square (PLS) was carried out by looking at the correlation between the constructs, the significance value, the Stone-Geisser Q-Square Test for predictive relevance and the Normed Fit Index (NFI) of the research model. The Q-Square value is 0.78462. Q-Square value greater than 0 indicates that this model has predictive relevance.

Based on the calculation of the Normed Fit Index (NFI) value from the determinant model of achievement in natural science of gifted students with self-regulated learning as mediator are 0.617. If the NFI value is closer to 1, then the model is getting better (fit) and can be used to test the hypothesis. Based on the analysis of the structural equation model, it is known that the achievement in natural science of gifted students with self-regulated learning as mediator is a fairly good model and has predictive relevance, but is unable to explain the contribution of mediating variables.

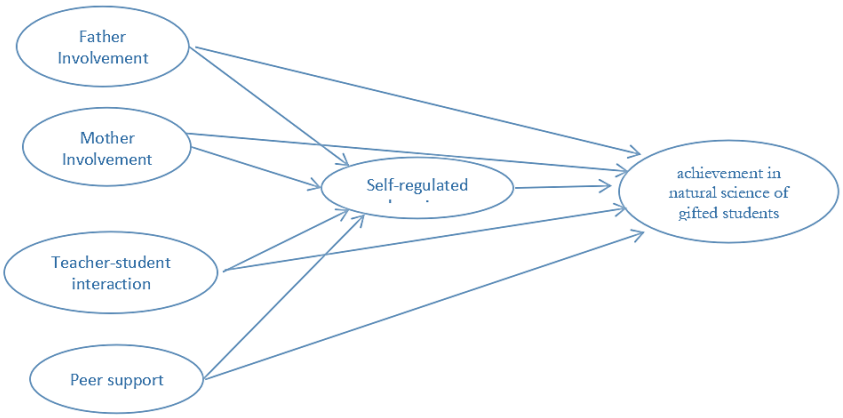

Figure 3

Determinant Model of Achievement in Natural Science of Gifted Students

Table 5

R-Square of Predictor and Mediator Variable

Variables	R-Square	P-Value
Father involvement, mother involvement, teacher-student interaction, and peer support self-regulated learning	0.555	0.000
Father involvement, mother involvement, teacher-students interaction, peer support, self-regulated learning → achievement in natural science of gifted students	0.516	0.000

The contribution of the predictor variable to the mediator variable is 55.5%. The contribution of the predictor variable and the mediator variable to the criterion variable is 51.6%. The rest is the contribution of other variables.

Discussion

Achievement in natural sciences of gifted students is influenced by the teachers-students interaction and the peer support. This shows that social environmental factors that play a major role in influencing achievement in natural sciences of gifted students are teachers and friends. The results of this study strengthen the concept presented by Heller (2004) in The Munich Model of Giftedness that environmental conditions are a factor that plays an important role in actualizing cognitive potential into academic achievement for gifted students, especially achievement in natural science. Without the support of environmental conditions, the potential for gifted students does not function optimally.

Environmental conditions include the classroom atmosphere and learning environment. The interaction of teachers and students in learning at school and classmates is part of what affects the classroom atmosphere. Teachers and friends are the learning environment in schools. Gifted students spend eight hours a day with teachers and classmates while studying at school. Teachers and students spend a lot of time interacting academically. This interaction provides an opportunity for teachers to show concern, fairness, and respect for students. The ability of teachers to create a conducive atmosphere in interacting with students plays a significant role in fostering a positive learning environment and promoting student achievement (Pianta, 2008).

The teachers-students interaction is positively correlated with academic achievement. The higher the quality of teacher-student interaction, the higher the academic performance. The quality of teacher-student interaction is one of the most important factors, which affects the emotional health and learning of students while at school. When students have a positive interaction with the teacher, they have a positive attitude to learning, and finally the student's academic performance improves (Omrod, 2008).

The teacher's ability to create a conducive atmosphere in interacting with students plays a significant role in fertilizing a positive learning environment and promoting student achievement. In teacher-student interaction, teachers improve academic achievement through the provision of emotional support, class organizing, and learning support (Pianta, 2008).

Especially for emotional support, it is very much needed for gifted students in learning natural science. Problems in learning in gifted students occur due to high curiosity (Van Tiel & Widyorini, 2014). This causes gifted students to ask different questions in different points of view. When the teacher provides emotional support, a conducive learning atmosphere will be created. Students do not feel afraid to explore their various curiosities as a provision to explore the science subjects they study.

Similar research results were also conveyed by Jin & Moon (2006) that special classes with challenging curricula and professional teachers caused gifted students to feel more valued. Based on the existing curriculum, the teacher arranges the objectives and methods used so that teacher-student interactions occur in a conducive learning atmosphere. This will improve the achievement in natural science of gifted students.

The peer support affects the achievement in natural science of gifted students. Gifted students enter adolescence while studying in Junior High School. The subjects in this study were 12-14 years old. The emotional center in adolescence shifts from the family to individuals outside the family, namely peers (Tanner, 2006). Peers play an important role for adolescents to meet their emotional needs. Adolescents have a strong need to be liked and accepted by their peers or groups. As a result, they will feel happy if they are accepted and on the contrary they will feel very depressed and anxious if excluded and belittled by their peers. For adolescents, the views of their friends towards themselves are the most important thing so that adolescents will try to follow the opinions of their peers to be accepted as part of the group.

The impact of peer support affects the learning motivation of gifted students. Gifted students often experience a decline in academic achievement during adolescence (Hill, 2005, when entering the education level in Junior High School. The need to be accepted by peers is greater than the motivation to achieve academic achievement. Therefore, gifted students need the support of friends to maintain their learning motivation so that they achieve academic achievement in science subjects.

Various studies have shown that peer support has an effect on academic achievement (Gallardo, et. al. 2016). Selection of friends predicts learning achievement, behavioral problems, and levels of teacher involvement in schools (Benson et. al., 2006; Rubin et. al., 2006). When students choose friends who are academically oriented, their academic achievement will be better. On the other hand, if students choose annoying friends, their academic achievement will decrease and their behavioral problems will increase. If gifted students have friends who are oriented towards achievement in natural science, gifted students will have better achievements of natural science.

Baker (2016) found that the peers of gifted students who were around him had a significant influence on their learning activities. Gifted students who interact with peers, who have low learning motivation, will cause them to be less enthusiastic in learning. The desire of gifted students to be accepted by their peers causes them to reduce their learning motivation. This has an impact on the decline in achievement in natural science of intelligent students.

Based on previous research, it was explained that peer pressure in regular classes hindered the academic motivation of gifted students because gifted students often got reproach if they conveyed their special talents (Delisle, 1984), scientific opinions, and as bookworms (Silverman, 1993). Peer pressure in regular classes was also investigated by Reis and McCoach (2000) and Rimm (2002) where they found that peers had a very significant effect on the low achievement of gifted students. About 66% of the gifted students said that their peers opposed them to rank highly in school. Often, gifted students face a conflict between accepting peer pressure and the need for academic achievement. This is what causes gifted students who excel in choosing to leave the group (Mawson, 2002). Conflicts of need to get recognition from peers often arise at the age of 13 years, when gifted students enter adolescence. Especially in gifted students who have an IQ of more than 160, they have problems with social acceptance.

However, the results of this study indicate that gifted students also receive the support of friends from the regular class. This shows the social competence of gifted students in a good category. With good social competence, gifted students are able to build relationships and maintain social relations with the social environment, including with peers in regular classes. Good social competence in gifted students is influenced by positive self-concepts in gifted students (Aslan & Yukay-Yuksel, 2018). So gifted students are accepted and get support from friends because gifted students have a positive self-concept. Gifted students have a positive view of themselves, both on their strengths and weaknesses so that they can interact with peers with different levels of intelligence and identity.

The self-concept of gifted students is the result of interaction with their social environment (Cross, et al. 2015). The development of self-concept starts at home when gifted students interact with their parents, after entering school age, gifted students interact with teachers and peers at school. It seems that gifted students get good care from parents and teachers at school and have peers who appreciate and support their potential so that positive self-concepts become the personalities of gifted students.

Achievement in natural science of gifted students is not influenced by the involvement of fathers and mothers. The explanation why the achievement in natural science of gifted students is not influenced by the involvement of fathers and mothers can be viewed from the factors of fathers and mothers, gifted students, and the characteristics of science subjects. Father and mother factors, including time, type of parenting, and parents' belief in their abilities. The factors of gifted students include internal motivation and psychological conditions during adolescence. Meanwhile, the characteristic factor of natural science is science as an integrated science that requires broad insight.

The time that fathers and mothers have is often a reason to be more involved in children's learning. Fathers spend more of their time working so that all matters relating to children's learning activities are left to the mother. Fathers who spend more time working causes their involvement with children to decrease (Doherty & Beaton, 2004). Fathers will be more involved in children's learning activities when fathers have more flexible time.

The time for children finally becomes even more narrow when the mother is also working. All the fathers of the gifted students in this study were employed and more than half of the mothers of the gifted students were also employed. A working mother spends what she has for work. Mothers have more free time to be involved in children's learning activities during holidays. The limited time of father and mother causes parents of gifted students to be less involved in children's learning activities. Likewise, the time that children have. Gifted students spend part of their time studying at school. Study time in Junior High School is approximately eight hours a day. Gifted students go to school in the morning and return home in the afternoon. They met with father and mother in the afternoon because father and mother had also just returned from work in the afternoon. This results in fathers and mothers spending only a few hours with their children before bedtime at night.

Apart from time constraints, in general, parental involvement in children's learning decreases as children grow older (Seyfried and Chung, 2002). The involvement of parents when studying in elementary school is higher than when children study in junior high school. Likewise, the involvement of fathers and mothers in gifted students decreases when entering the Junior High School level because gifted students are more independent in learning, especially when studying at home (Deur, 2011). In addition, gifted students during adolescence increasingly understand the advantages and disadvantages in the academic field (Jeynes, 2007) so that they rarely involve parents in learning activities compared to when they were in elementary school.

Parents of gifted students as Generation Y provide exploration space for gifted students when studying at home so that gifted students feel free from various rules, unlike when studying at school. Parents as the authority at home provide a wider exploration space in learning. Learning for gifted students is an activity that is driven by internal motivation and self-needs of gifted students (Renzulli & Reis, 1997). So parenting styles that provide exploration space for gifted students will increase the independence of gifted students in learning so that parents do not affect the achievement in natural science of gifted students.

The internal motivation factor for achieving achievement from gifted students also causes father and mother involvement to have less effect on academic achievement of gifted students. As it is known that gifted students have high internal motivation to learn (Gottfried and Gottfried, 1996). This contributed significantly to his academic achievement. Internal motivation to learn is the main factor in achieving success in academic achievement (Seyfried and Chung, 2002) including in achieving achievement in natural science of gifted students. This means that the involvement of fathers and mothers in learning is not the main factor for gifted students in achieving achievement in natural science. Even without the involvement of father and mother, gifted students can achieve achievements in natural science because of high internal motivation for learning.

The interesting thing from the results of this study is that the achievement in natural sciences of gifted students is not influenced by self-regulated learning. Previous research on self-regulated learning is one of the internal factors related to motivation and learning strategies that affect the academic achievement of gifted students (McCoach & Siegle, 2003; Alsa, 2005). However, in this study, the contribution of self-regulated learning to the academic achievement in natural science of gifted students was very low so that self-regulated learning did not affect the achievement in natural science of gifted students. The cause of the low contribution of self-regulated learning to achievement in natural science can be explained from external factors. The external factor referred to here is the development of internet technology which gave birth to the internet generation with characteristics that do not support the development of self-regulated learning.

Gifted students with IQ above 130 have very high internal motivation in learning (Gottfried, et al., 2005). Internal motivation is part of the dimensions of self-regulated learning. However, as Generation Z, high internal motivation in learning for gifted students is not oriented towards achieving academic achievement. The internal motivation of gifted students to grow the insight on natural science matter is to meet the needs of gifted students to think at higher levels, be creative, independent in learning, group work, and research skills (Taber, 2007). Various studies have shown that gifted students have learning goals to learn (Silverman, 1993), to study to become a master in the field of interest, not to get academic achievement in that field (Nicholls, 1984).

As it is known that in learning activities there are two goals, namely: learning (mastery) goals and performance goals. The purpose of learning (mastery) goals is to develop competence (Kaplan & Maehr, 2007). Students with learning (mastery) goals will develop themselves and grow in accordance with behaviors related to achievement and engagement with assignments. Learning with performance goals aims to demonstrate their competence. Students who will be oriented towards academic achievement will actually avoid challenging assignments because they are anxious about failure (Dweck & Leggett, 1988). Research showed that these two learning objectives are negatively correlated (Nicholls, 1983). This means that the higher the learning (mastery) goals, the lower the performance goals, or vice versa.

It appears that gifted students are more oriented towards learning (mastery) goals so that they prioritize the development of their competencies rather than achieving academic achievement (performance goals). Gifted students interpret learning activities do not have to be correlated with academic achievement. It is also found in Chan's research (2009) that gifted students have learning goals that are more oriented to learning (mastery) goals than performance goals. So gifted students use self-regulated learning to become masters in natural science instead of achieving academic achievements in natural science. Academic achievement is a measure of success set by the authorities in schools, not the needs of gifted students.

There are differences in learning objectives between gifted students with teachers and parents. This difference in learning objectives occurs because of differences in views on learning objectives between generation Y, namely parents and teachers and generation Z, gifted students. Gifted students are more oriented towards learning goals than performance goals. This affects the achievement in natural science of gifted students. If gifted students are more oriented towards learning goals, they do not consider important achievement in natural science.

Learning goals and self-regulated learning have a positive correlation. Gifted students who have learning goals to learn will carry out higher self-regulated learning activities (Pintrieh, 2000). So, based on the relationship between self-

regulated learning and learning goals, it can be explained why self-regulated learning has no effect on academic achievement in science subjects for gifted students. Self-regulated learning and learning goals essentially have the same goal, which is more oriented towards self-development rather than academic achievement. Not surprisingly, even though gifted students have high self-regulated learning, achievement in natural science is not always high.

The influence of personality on academic achievement has been widely studied (Caprara et al., 2011). Personality affects the attractiveness of individuals to the choice of activities. For individuals with certain personalities, achieving high academic achievement is something interesting. Conscientiousness and openness of dimension were strong predictors of academic achievement. This also happens to gifted students. Academic achievement of gifted students can be predicted based on their personality type, especially conscientiousness and openness (Mammadov, 2016). The personality of gifted students as generation Z is an open personality. Gifted students as generation Z are individuals who are open in thinking and social interaction so that gifted students have characteristics as independent and self-taught learners. It appears that gifted students have the character of being true learners and opening up opportunities for achievement in natural science.

Self-regulated learning in gifted students is influenced by mother involvement and teacher interaction, but is not influenced by father involvement and peer support. This shows that social environmental factors that influence the self-regulated learning of gifted students, especially from mothers and teachers. As it is known that self-regulated learning is a behavior that is learned from the social environment. This strengthens the theory that explains that self-regulated learning can be taught, learned, and controlled (Zimmerman, Bonner, & Kovatch, 1996). Mother involvement in learning and teacher-student interaction with gifted students contribute to teaching the use of self-regulated learning. Students learn various learning strategies from mother involvement and teacher interaction in learning.

Mother involvement in learning is a multidimensional activity. Mothers are involved in school activities, accompany learning at home, and instill values that contribute to learning activities (Preston, 2008). Thus, mother involvement includes activities related to school, developing cognitive potential, and monitoring children's learning activities at school (Grolnick, Benjet, Kurowski, & Apostoleris, 1997). It appears that the mother's activities will help the child to use metacognitive abilities, maintain motivation, and strive to create a conducive environment for learning.

Research conducted by Kim & Hill (2015) shows that the involvement of fathers and mothers has an equally strong contribution to children's learning achievement, but mothers have higher involvement than fathers. This is proven in this study. Mothers were more active in home-based engagement and intellectual enrichment. This encourages the development of self-regulated learning in gifted students. Mother is able to become a model, strengthen, and choose self-regulated learning strategies for gifted students. According to the explanation of Zimmerman, Bonner, & Kovatch (1996) that self-regulated learning can be taught, learned, and controlled. Mother as the closest social environment serves to set an example and strengthen self-regulated learning activities (Reis & Greene, 2014).

In addition to the involvement of mothers, self-regulated learning of gifted students is influenced by teachers-students interactions. Teachers-students interactions are positively correlated with self-regulated learning. The quality of teacher-student interaction is one of the most important factors affecting the emotional health and learning of students while at school. If students have positive interactions with teachers, they have a positive attitude to learning, are more involved in learning, and become more self-regulated (Omrod, 2008).

Teachers as one of the main actors who create sociable ambience for gifted students have the ability to teach, model, and appreciate various efforts made by gifted students in increasing their self-regulated learning activities (Reis & Greene, 2014). Teachers can improve self-regulated learning of gifted students by providing feedback, provide alternative learning strategies, serve as models in implementing effective learning strategies, and control their learning activities (Zimmerman, Bonner, & Kovatch, 1996).

Teachers are the creators of students' social ambience who have the best capability to understand the potential of gifted students. Such ability becomes the basis for teachers to design learning activities according to the needs of gifted

students. Teachers also teach various appropriate learning strategies, provide examples of practicable learning strategies, and provide reinforcement for learning strategies that have been practiced by gifted students. The results of this study strengthen the theory that explains that teachers can improve the self-regulated learning of gifted students by providing feedback, alternative learning strategies, as well as models in implementing effective learning strategies and controlling learning activities (Zimmerman, Bonner, & Kovatch, 1996). This fact shows that teacher and student interactions have an important role in increasing self-regulated learning (Dignath and Büttner, 2008).

Self-regulated learning of gifted students is not affected by father's involvement due to paternalistic culture, job characteristics, father's time, and mother's occupation. In Javanese civilization which is paternalistic in nature, fathers is in charge of making a living instead of taking care of the children. Everything related to child care is mothers' task (Renk, et. al., 2003). Parenting is also related to childrens' learning activities of which responsibilities are handed over to the mothers. This study illustrates that the involvement of mothers in learning is higher than the involvement of fathers. Yeung (2012) explained that in Asia, fathers spend less time with their children. This also happened in Indonesia, especially in East Java, namely Surabaya, Sidoarjo, and Malang, which were dominated by the Javanese.

Father involvement in learning is also influenced by the characteristics of the father's work. Father's time flexibility is determined by father's job characteristics. If the father has more time to work, the father's involvement in learning decreases (Doherty & Beaton, 2004). Father involvement in children's learning requires adequate amount of time allotment. Gifted students have fathers with less flexible jobs, such as becoming doctors, auditors, managers, employees of State-Owned Enterprises, and soldiers. This causes a decrease in the contribution of fathers' involvement in children's learning.

The results of this study explain that the self-regulated learning of gifted students is not influenced by peer support. This is in accordance with research conducted by Laka (2015). Laka showed that peer support has no direct effect on self-regulated learning. According to Laka, self-regulated learning is influenced by internal factors such as self-efficacy and mastery goal orientation. This means that the factors that directly influence the self-regulated learning of gifted students are self-efficacy and mastery goal orientation instead of the support of friends.

Bandura (1997) says that self-efficacy is basically the result of cognitive processes in the form of decisions, beliefs, or awards about the extent to which individuals estimate their abilities to carry out certain tasks or actions needed to achieve the desired results. Self-efficacy factor plays together with environment, pre-established habit, and other personal variables, especially the expectations of outcomes which may further produce certain behavior. Self-efficacy will affect several aspects of an individual's cognition and behavior. Self-efficacy leads to different trait among individuals with the same ability because self-efficacy affects one's choices, goals, problem solving, and persistence in trying to reach his or her achievement (Zimmerman, 2000).

Mastery goal orientation is the purpose of learning to learn, namely learning to achieve learning goals. Exceptionally intelligent students who have a learning goal to learn will develop new skills, try to understand learning activities, improve their level of competence, or achieve a sense of mastery based on personal standards. Self-efficacy and mastery goal orientation are manifestations of the metacognitive and motivational dimensions of self-regulated learning. So gifted students develop self-regulated learning abilities based on self-confidence and learning goals for learning not because of the support of friends. This causes peer support does not predict self-regulated learning of gifted students.

Peer support is needed by gifted students to meet their emotional needs. Meeting the emotional needs of peers is realized by providing friendship support in the form of appreciation and friendship for gifted students. As teenagers, gifted students need peer support to meet their emotional needs. Gifted students want to be accepted by their peers. Support from friends is needed not to increase self-regulated learning in gifted students, but to get their emotional needs fulfilled. It is important for gifted students to develop positive self-concepts, both in academic and social contexts.

Peer support for gifted students is more frequently received from the peers from special classes. In accordance with the research by Rogers (2002) who concluded that there is a good correlation between gifted students and their peers

in special classes. This means that gifted students do not have social problems with their classmates, who have the same potential. They respect, honor, and understand each other because they have the same level of intelligence as well as identity. However, it does not mean that gifted students do not get emotional needs from their peers who are sitting in regular classes. In this study, gifted students also came from regular classes. Peer support is also received by gifted students as well as from peers in regular classes. As the internet generation, friendship is getting more intense because gifted students do not only interact in the real world but also in cyberspace. Meeting the emotional needs of peers becomes the primary need for gifted students during adolescence.

Gifted students who are in their pre-adolescent phase need peers like their fellow teenagers to develop their attitudes and values, social skills, and get social support (Disti, 2006). Positive influences related to support and nurturance are given by students in interactions with their peers. The interactions with their peers have certain level of contribution to the growth of children's self-esteem as well as develop their social understanding when in the age of pre-adolescent, i.e. when they are comparing between their own views about themselves and the views aired by their friends (Arnett, 2013). Feeling of being honored, respected, and understood by peers is a psychological capital that will contribute to the achievement in natural science of gifted students

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Research Article

Teachers of gifted children: the essential core competencies

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Abstract

Teaching is an exceptionally challenging task but teaching gifted/talented/creative learners presents even more challenges, while at the same time providing excellent opportunities for professional growth and development. This paper reviews some of the main skills needed to teach gifted children, examines the competencies of teachers of gifted children and highlights the protocols that should underpin and facilitate exceptionally competent teachers of gifted children. The previous era had required an education for stability, the coming era requires an education for instability. In this review, the differences of teachers of gifted students, especially their knowledge level about diagnostic processes, their expertise and competencies in intellectual assessment, high-level, critical and philosophical thinking skills are discussed in detail.

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Introduction

There are teachers, and then there are teachers, and there are special education teachers, developmental/remedial teachers, and teachers of specialisms, subjects, teaching at home, at school, indoors and outdoors. Life is about learning and teaching about life takes place in many varied environments and setting. One challenging area of teaching which we argue informs all other teaching contexts and content is the teacher of the gifted children. Just as there are different contents and skills to be taught in different settings and contexts, there are minimally competent, competent, and exceedingly competent teachers of gifted and talented and creative children and adolescents. This paper will examine the vast panorama of skills that teachers of the gifted need and will explore the various competencies needed by these teachers in addition to core teacher competencies which underpin effective and valuable teaching practice.

What are the Differences of Teachers of Gifted Students?

Every child deserves to learn something new at school every day; gifted children are no different from any other child in this respect. Gifted and talented children should learn from teachers who are prepared to deliver the appropriate

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curriculum, using the most effective strategies, to ensure this learning occurs. School should also be a place where gifted and talented children's social and emotional needs are understood and met. Gifted and talented children thrive when they are taught by teachers who understand the ways that their learning and their social and emotional needs differ from their peers of the same age and who know how to address those needs (World Council for Gifted and Talented Children, 2021).

Obviously, before the teaching process begins, a teacher may want to check the child's file to gain a certain degree of perspective and information about the child. The child may have certain strengths and weaknesses- identified by either the parents or a previous teacher or a school psychologist who has evaluated the student.

Identification Process Knowledge

Teachers need to be aware of the various tests used to identify gifted children and have at least a minimal understanding of the meaning of the scores and numbers. Such purview will give teachers at least a gross evaluation of the child and perhaps where intervention is needed. A child may be mathematically precocious or be "high verbal" or have well developed visual spatial skills. A child may at the same time be oppositional, defiant, hostile, or negativistic as their needs may not have been addressed in the past.

It follows that already in the very early discussion about identifying competencies that are required to be a successful and effective teacher of the gifted learner several key competencies identify themselves.

- Listening: by which we mean gathering information about the gifted learner in the round
- Listening some more: it is an essential feature of any teacher of the gifted that the teacher listens to what a young learner wants from learning and being taught. Let the learner guide you the teacher is a good rule.
- Reflective listening: Having gathered a lot of information about who you are teaching now it is time to listen to yourself. How will you work with this particular child?

If a teacher only teaches in one way, then they may conclude that the learners who can't develop and evidence learning do not have even basic abilities thus blocking the possibility of any particularly gifted or talented abilities. Sometimes gifted children must survive the ignorance and mono skills evidenced by a mono-teaching style of choice which matches a teacher's limitations or preferred learning style.

- Being very relaxed about not meeting predictable measures of measuring knowledge.
- Being able to be humble in the face of an Everest/ Mount McKinley size intellect evidenced in a gifted two-year old or older child.
- More listening: an imperative present in all gifted teachers of the gifted learner is the ability to self-reflect, adapt and refresh to make and identify progress in the learning relationship.
- Be happy to carry the bag and help negotiate puzzlement in a young learner when faced with incomprehensible stupidity in the world.
- Recognise the full range of learning needs a gifted child will be interested in including developing spiritual intelligence.

I doubt very much if it is possible to teach anyone to understand anything, that is to say, to see how various parts of it relate to all the other parts, to have a model of the structure in one's mind. We can give other people names, and lists, but we cannot give them our mental structures; they must build their own (Holt ,1964).

Courage in accepting that teaching is about learning for everyone involved – a partnership not a dictatorship. Importantly, an important skill-competency of a gifted teacher of the gifted learner is to recognise when another and others need to become involved in the education of a gifted child.

A highly competent teacher performs a type of intellectual triage in terms of attempting to ascertain what goals and objectives to work on immediately in the short run and what skills and abilities need to be ameliorated in the long run.

The Senior-Shaughnessy Test for Gifted Teachers of the Gifted Identification Process Knowledge

"The Turing test, originally called the imitation game by Alan Turing in 1950, is a test of a machine's ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human. ... If the evaluator cannot reliably tell the machine from the human, the machine is said to have passed the test."

The Senior-Shaughnessy Test for Teachers (with apologies to Alan Turing) is a test of a teacher of the gifted that is a test of a teacher's ability to exhibit intelligent responses equivalent to, or indistinguishable from that of an able learner. If the evaluator cannot reliably tell the gifted teacher from the gifted learner, the gifted teacher is said to have passed the test.

Listening- Listening to gifted students is important. Listening to all students is imperative- but more so with gifted students as they have their own interests, their own concerns, their own past negative experiences and sometimes, quite divergent interests and idiosyncratic realms of interest. Some gifted students are suspicious of adults based on past educational experiences, and not all adults go to the trouble of trying to establish rapport with them. Some gifted students have invested a great deal in a certain area of study (for example mollusks) that is foreign to the average person or teacher (Piaget started out studying mollusks).

Listening Some More- By "listening some more" we mean that there are always underlying themes and threads- emotional or social that need to be reflected upon. Their past relationships with parents may become apparent, their past relationships with teachers- even siblings may become apparent as they discuss certain things. In the past, teachers may have given them "short shrift" as we say- listened for 2-3 minutes then moved on to another agenda or area of interest.

Humble Listening- Being very relaxed about not meeting predictable measures of measuring knowledge- Teachers need to understand that the process of "measuring knowledge "is not an easy task- and information gained today may not be used until weeks or months or even years later.

Being able to be humble in the face of an Everest/ Mount McKinley size intellect evidenced in a gifted two-year old or older child. Teachers must grasp the humble fact that they are adults with years of experience, and the child is, well, still a child. He or she may have an I.Q. of 150- but they may have not experienced the many things that an adult has experienced—a car accident, a death, hospitalization or much worse- cancer.

Even More Listening-As the student progresses from topic to topic- subject to subject and teacher to teacher. Be happy to carry the bag and help negotiate puzzlement in a young learner when faced with incomprehensible stupidity in the world. Gifted students are perceptive- they see the inconsistencies in the world. They see the illogic in certain things. They see what is valued, and they see poverty, illness, and injustice in the world. And they are saddened by it. Engaging gifted students in the use of their spiritual intelligence provides opportunities for them to honor life's most meaningful questions: How can I make a difference? Why am I here? Does my life have meaning? Discussing such questions allows students to focus on something larger than their egos; they can connect to the lives of others, the community, the earth, and the cosmos to build a global aware-ness of the growing challenges in the world (Sisk, 2008).

Intellectual Assessment- Higher Order Thinking Skills vs Critical Thinking Skills

First, a good competent teacher of the gifted should review whatever testing has already been done on the child. A deep understanding of the meaning of I.Q. scores and the tests administered is imperative. Two students may both be in the same gifted class- but one was given the Wechsler Intelligence Scale for Children- 5th Edition and another may have been given the Stanford Binet- Fifth Edition. While both students may have received a Full-Scale I.Q. score of 140- there may be many subtle differences between these two students. And each student may show different strengths and weaknesses and perhaps even different learning styles.

Often consultation with a school psychologist who has administered the test will provide additional insights into how the student processes information. Some students evaluate, integrate, synthesize, and compare and contrast information quite well, effectively and efficiently and other student think critically about every word and sentence that they hear and refuse to take anything a face value. They are critical thinkers who are always looking for the proof, the

data, the evidence. The juxtaposition of higher order thinking skills and critical thinking skills which have been outlined by Shaughnessy (2012) with contributing chapters from many of the world's leaders in thinking and problem-solving skills.

Scientific Reasoning versus Philosophical Thinking

For some students, math is a preferred subject while for others, science, biology, chemistry, and physics are their preferred areas. Mathematical thinking is quite different than scientific reasoning and scientific reasoning is far different than philosophical reasoning. Some students enjoy the scientific method- examining independent and dependent variables and hypotheses and outcomes, and formulating conclusions, and suggestions and recommendations based on their science projects, while others prefer to debate the pros and cons of abortion.

Social Skills (with others) versus Emotional Coping Strategies (with self and others). The skilled teacher of gifted assesses, sometimes formally, sometimes informally the social and interpersonal skills of their students. They may observe male to male interactions, female to female interactions and student to teacher interactions.

Reading

Many gifted students are voracious readers. They consume magazines, books, and periodicals and one thing we want to do is to encourage their reading. A good teacher of the gifted is able to analyze and assess what the student is currently reading, and encourage additional reading, and determine the author or authors that a student may enjoy, and which books would benefit the student. There is an art and a science to recommending books and authors. Although we cannot train teachers in this brief article, we can suggest some individuals and some resources. Halsted (2009) has an excellent book entitled "Some of my best friends are books "and this text is now in its third edition. The book is subtitled "Guiding Gifted Readers "and this is what many very competent teachers of the gifted do - they guide readers to books and authors which they believe may benefit the student.

The Gifted Educator: Competencies Protocol

Any Competencies Protocol is going to necessarily be built on a bedrock of basic teacher competencies such as exemplified by Abbotsford School District

Teaching Competencies

- Effective - Communication and Interpersonal Skills.
- Professional - Organization and Planning.
- Efficient - Classroom Management.
- Transparent - Facilitation and Engagement.
- Knowledgeable - Assessment and Coaching.
- Committed - Collaboration and Teamwork.
- Tolerant - Caring and Inclusiveness.
- Empathetic - Flexibility and Adaptability.

It is the essential additionality that we can focus on in order that we may feel confidence in our support for the teacher of the gifted.

As we move to consider the future of gifted education being carried out by educators with essential competencies specifically applicable to the needs of the gifted learner it is worth us taking a quick glance at a pre-pandemic paper from 2017 which, still being valuable and relevant to our discussion, seems to be from another distant time.

To face the continuous changes that impose on all the orders of life around us, such as a global economy and rapid scientific and technological advances, we find ourselves obliged to acquire new personal, social, and professional skills that nowadays are essential. The school context is no exception.

To do this, teachers require a new educational approach, more critical and ingenious, to develop creative projects, where they are the facilitators of learning (Feldhusen,1985).

From his research, Mazariegos (2020) identified skills the 21st-century teacher would needs to develop.

- Organize and implement learning situations. Must have the ability to engage the students in the participation or development of research that provides them with tools to cope with everyday situations.
- Manage the learning progress. Implement strategies to manage the development of learning through problem situations that are part of the reality of each student.
- Practice strategies of inclusion**.** Encourage collaborative work based on tolerance and respect for the integrity of others.
- Involve students in their learning and work. Create strategies that involve students in developing the capacity for self-assessment of their knowledge to become aware of the progress they have made.
- Work in teams. Have the ability to engage students in teamwork and take leadership so that they can work enthusiastically toward achieving its goals and objectives.
- Participate in school management. Get involved in school management by developing management competencies, coordination, and organization of human resources to create an excellent institutional climate.
- Learn and apply innovative technologies. Be able to use new technologies, incorporating current methods, using technical and educational skills.
- Face duties and ethical dilemmas of the profession. Face responsibilities and ethical dilemmas to cultivate communicative competency, that is, a person's ability to compose him/herself and communicate effectively and appropriately.
- Train continuously. Have the ability to organize and promote one's continuous training to be continually competitive in a globalized world (Mazariegos, 2020).

We can compare Mazariegos's conclusion with earlier research by Feldhusen who identifies five areas for consideration when looking at the competencies required by a teacher of the gifted and the considerations of what is required to encourage and develop 'teachers of the gifted.'

- Personal and psychological characteristics of the teacher of the gifted
- Competencies which the teacher ought to possess
- The design of in-service training
- The professional education of teachers and
- the professional capabilities of teacher trainers (Feldhusen,1985).

Mazariegos raises a crucial point in regard to considering the necessary competencies required by a teacher of the gifted, namely that of being highly responsive and adaptable to changes in the global and local world experience of both themselves as an educator and of the living experience of their gifted learners. This would indicate a competence of key importance being both reflective and reflexive resilience. Additionally the teacher of the gifted needs to be both aware of and skilled with both high order thinking skills and essential critical thinking skills. The other point worth mentioning is that a consideration of the abilities and competencies of the teachers of the teachers of gifted learners also needs deep – thoughtful – informed consideration. This perhaps is a discussion for another time.

Competencies Protocol

Ten competencies for today and the future guidance for what we used to call teachers of the gifted student and now must identify as gifted co-learners who can swim with the storm, adapt to changing circumstances with an ample intelligence to survive.

Manage the learning progress. Working with gifted learners to identify, derive and implement strategies to manage the development of learning through problem situations that are part of the reality of each student as a co-learner.

Face duties and ethical dilemmas of the profession. Face responsibilities and ethical dilemmas to cultivate communicative competency: to compose themselves, be fearless and communicate effectively, honestly, and appropriately with co-learners.

Lifelong learning. Recognizing that learning is not a finite activity and to have a readiness to be curious, take risks, accept failure, accept success.

Continuous development. Actively pursuing the co-learner/educator's personal and professional interests. Being cognisant of best professional practice in a globalized world.

Risk taking. Demonstrating the self-confidence and freedom to fail and keep trying

Social-Cultural awareness. Welcome difference and celebrate difference and who know how to address individual needs

Humble listening. To recognise that careful, critical listening is the teacher of the gifted learners best guide to a gifted learners thinking.

Emotionally literate. To role model and share emotional resilience, and wellbeing empowerment

Communication competencies. To be able to understand how a question asked should be a question answered.

Generous understanding. Gifted and talented children thrive when they are taught by teachers who understand the ways that their learning and their social and emotional needs differ from their peers of the same age.

Although it is hard to discourage the investigations of a 2-year-old, it is all too easy to discourage those of 7-, 11-, or 15-year-olds. In one classroom I observed, a 9th grader raised her hand to ask if there were any places in the world where no one made art. The teacher stopped her mid-sentence with, ''Zoe, no questions now, please; it's time for learning." (Berliner, 2020) .

For now and the near future we urgently need to be offering guidance as to who will be the most effective co-learner to collaborate with the gifted and insatiable learner. The days of the teacher in the traditional sense are over. The skills and resources, both physical, intellectual, and philosophical all demand attention. From the past we can draw an essential list of competencies that whilst not exhaustive, are helpmates in managing a modern ever changing, highly demanding learner environment where the one key competency is being empathetically flexible to the needs of other co-learners. The question for educators today is not 'What should schools teach the gifted learner? The question we must ask and answer now is how can we help the gifted learner learn what they want to learn?

Final Words

While as a guide the United Nations Charter offers many interesting points to consider and for education authorities to provide such as:

- Every student should have the right to have access to a process in order to be identified as gifted and/or talented considering all the complexity of giftedness and/or talent. This complex process, when possible, should be free of charge or, in any case, economic status and cultural background should not be an obstacle for taking part of this process.
- In every school or district there should be a trained person for the identification of gifted and talented students (this person could be the psychologist of the school or a trained supervisor). This person should interview, monitor, and recommend testing if he/she thinks that one or more students can be gifted and/or talented. The testing can be done at any age.
- Every teacher should receive a basic training in how to identify talented and gifted students in order to assist in the identification process (United Nations, 2016)

"Teachers' competencies have been broadening with respect to reform studies in education, development of teacher education, scientific results of educational science and other fields. Kress (2000) pointed out that "the previous era had required an education for stability, the coming era requires an education for instability." Kress' ideas can explain why teachers' professional development should be redefined for sustainability. The aims of education change very quickly depending on the demands of the era requiring more capability. These demands directly affect educational system."

It is time now to focus on the real challenge facing us in the 21st Century regarding our responsibility to our gifted learners. How do they want to learn and who do they want to be a co-learner with them. Now we suggest that in 2022 and for the immediate future that the capability to be a co-learner in addition to facilitation is a key competency in other words the educator as an insatiable learner.

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Supplementary notes

(PDF) Teachers' Competencies. Available from: https://www.researchgate.net/publication/283961538_Teachers'_Competencies

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