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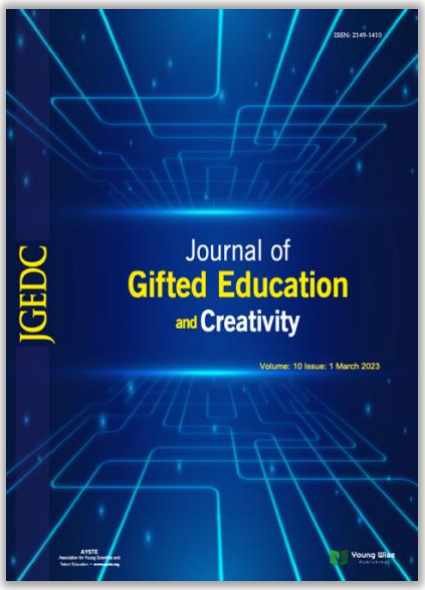

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Book Review

Book Review: AI and Developing Human Intelligence: Future Learning and Educational Innovation

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Educational Studies, Eastern New Mexico University, United States.

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AI
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Abstract

Artificial Intelligence and its effects on the field of education are among the most curious subjects. I reviewed the book "AI and Developing Human Intelligence: Future Learning and Educational Innovation" by John Senior and Eva Gyarmathy on the impact of developing technologies on future learning and education processes. Although it is written for general education, some codes for the gifted can also be analyzed from this book.

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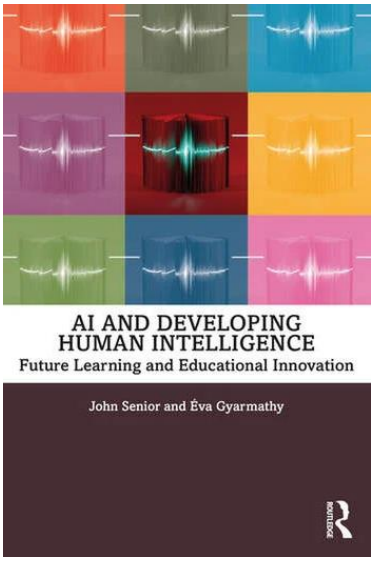

Title: AI and Developing Human Intelligence Future Learning andEducational Innovation
Author(s): John Senior and Éva Gyarmathy
ISBN: 9780367404888
Pages: 264
Published Date: September 17, 2021
Publisher: Routledge

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This book about Artificial Intelligence and developing human intelligence is quite relevant to those teachers who provide educational intervention for gifted/talented and creative children. This book further helps to elaborate on the current status of AI in terms of what is transpiring in terms of educational innovation. And the past two years have taught us a lot about educational innovation as so many of us have had to go online and provide education to students via Zoom or Microsoft Teams, perhaps using Prezi or Skype or (gasp !) even Power Points.

No one was really prepared for COVID and the chaos that ensued. However, the authors attempt to provide a sort of survival kit for the 21st century. We are confronted with a new learning landscape. We are confronted with platforms that are not necessarily " user-friendly" (this term will be encountered more and more over the next ten years) while at the same time, the amount of skills, knowledge and information is increasing at an exponential rate.

Information processing and the learning curve will become increasingly important. Students will need to be able to peruse a lot of information, think critically about it, evaluate, integrate and synthesize it and then reach some conclusions as to it's validity.

Each chapter is full of relevant realms of exploration. Topics such as " cultural arrears "," disability and difference" and " the new " learning landscapes". All the while, the authors truthfully and honestly look at and examine the deficiencies--- of a stimulus rich environment, deficiencies in constructive coping strategies, material resources, and knowledge and abilities.

Key word that permeates the book- intelligence- what is it, is it culture-dependent are there different kinds of intelligence, and how does one's environment and perhaps culture influence intelligence. Is there " adaptive intelligence' and how does social-emotional intelligence fit into the big picture.

Certainly, the world is changing and the authors recognize this and attempt to address the changing nature of employment and what they regard as the needed necessary learning behaviors of the future.

And just when you think you had a grasp on what the authors were proposing- they throw the reader yet another curve ball with a chapter on " the mental health of machines".

Throughout the book, the authors provide some books for future recommended reading and they ask provocative questions that need to be mulled over thoughtfully-something that teachers do not always have the time to let students do.

This is a challenging book- one that should be read carefully and slowly- and perhaps purchased in paperback so that one can take copious notes, and reflect on the insights of the authors. Not everyone is facing the future head on- but for those who are trying to do so- this book has ample guidance and assistance for those future thinking individuals who will be on the forefront of education, teaching and learning in the next decade.

Biodata of Author

Prof.Dr. **Michael F. Shaughnessy** is currently Professor of Educational Studies at Eastern New Mexico University in Portales, New Mexico USA. He has served as Editor in Chief of Gifted Education International and can be reached electronically at Michael.Shaughnessy@enmu.edu. His orcid i.d. is 0000 0002 1877 1319. His current research interests include talent development and intellectual assessment as well as the role of personality in giftedness, talent and creativity.

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Research Article

An interview with Todd Lubart : creativity and contemporary concerns

Michael F. Shaughnessy[1] and Connie Phelps[2],

Educational Studies, Eastern New Mexico University, United States.

Article Info

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Keywords
Todd Lubart
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Abstract

Todd Lubart is an important scientist known worldwide for his work on creativity. We asked him questions on important issues related to creativity and he answered sincerely. We would like to state that this interview contains important codes for researchers and practitioners study on the field of creativity.

To cite this article:

Shaughnessy, M.F., & Phelps, C. (2023). An interview with Todd Lubart : Creativity and contemporary concerns. *Journal of Gifted Education and Creativity, 10*(2), 143-146.

Michael Shaughnessy and Connie Phelps: Dr. Lubart, what is your current definition of creativity?

Todd Lubart: Creativity can be conceived as an ability to produce content (ideas, work, etc) that is both original (for the producer and more generally for a wider audience) , and valuable (meaningful, responding to a need, adding something to what already is available). This basic definition can cover creativity at the intrapsychic level, little c level in contexts with family or friends, professional level, and eminent level (which is an extension usually if the professional domain creativity).

Michael Shaughnessy and Connie Phelps: What advantages or benefits does EPoC testing offer as an assessment instrument?

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2 Prof.Dr., Department of Elementary Education, Early Childhood, and Special Education, Emporia State University, United States. E-mail: cphelps@emporia.edu ORCID: 0000-0001-5081-4545

Todd Lubart: EPoC , the Evaluation of Potential Creativity, allows two main processes (divergent-exploratory thinking and convergent-integrative thinking) to be assessed in a set of productive domains. Currently, we have the graphic-artistic, verbal-literary, social, scientific, mathematical; musical, and body-movement domains available or being finalized. Thus, there is the possibility to assess the two main thinking modes , by domain. The structure of the test involves two measurement points for each domain, to get a stable assessment. Finally, there is a form A and form B, to allow for pre - and post-test studies, or developmental studies. Our studies indicate that the task factor structure is stable across several different samples from various countries. The battery can be used as a research tool, and also as a detection tool to identify the creative gifted, provided that there are norms available in a given context, usually by country., and a diagnostic tool to provide information on students' ability profiles, for educational exercises and indic=vidualized pedadgogical approaches.

Michael Shaughnessy and Connie Phelps: What qualifications or training do test administrators need?
Todd Lubart: EPoC administrators need to be professionals in the education, psychology or affiliated research domains. There is no specific training required, as all the details are provided in the manual.

Michael Shaughnessy and Connie Phelps: What time commitment does test administration require?
Todd Lubart: To assess one domain (such as graphic-artistic, form A) , a child will be engaged in testing for approximately 25 minutes during two sessions, spaced about one week apart. This Is the maximum testing time, if the child uses the full time allowed for each task. Each domain has a similar format. In order to test together the graphic and verbal domains, considered the base domains, the child will be seen twice (50 minutes each time), with one week apart.

Michael Shaughnessy and Connie Phelps: What ages are appropriate for EPoC?
Todd Lubart: Children from 5 years old to young adults (high school, or university, such as 18 years old).

Michael Shaughnessy and Connie Phelps: What are some of the problems associated with a) measuring it and b) assessing who has creative potential?
Todd Lubart: Measuring creativity has often been seen as problematic because there was a confusion between creative performance (real-world achievement) and creative potential. EPoC focuses on potential to be creative. Also, there is debate on whether creativity is a general , or set of more domain specific abilities. EPoC provides measurement by domain. There is no general creativity score. Finally, there is an inherent complexity to measure creativity with a standard scoring system, as the task is open-ended and therefore limitless new answers can be proposed. In EPoC , we measure the number of ideas (fluency) in the divergent-exploratory tasks, as a proxy for the capacity to think originally in the divergent mode. For the convergent-integrative mode, the creative synthesis tasks, EPoC provides judges with prototype exemplars that get 1 to 7 on the scoring system, and judges need to see which exemplar is similar in kind to the answer produced by the testee.

Michael Shaughnessy and Connie Phelps: What is the difference between divergent exploratory thinking and convergent integrative thinking?
Todd Lubart: Divergent-exploratory thinking is the process that leads to many different ideas, it involves an expansive mode of generative cognition. Convergent-integrative thinking is the new synthesis, involving the capacity to bring elements together in new way, leading a single response. The creative process involves both processes that combine in a dynamic way.

Michael Shaughnessy and Connie Phelps: Who developed the EPOC- Evaluation of Potential Creativity and where was it developed?
Todd Lubart: It was developed in France, based on twenty years of basic research with children and adolescents. The authors are: Todd Lubart (Professor of Psychology, Université Paris Cité, France), Maud Besançon (Professor of psychology, Université Rennes 2, France), and Baptiste Barbout, (Professor of Psychology, University Catholique de Louvain, Belgium). During test development, all the co-authors were in our Parisian lab.

Michael Shaughnessy and Connie Phelps: We understand that there are 4 main domains- what are they and how were they chosen?

Todd Lubart: In fact, there are in total 7 domains: graphic-artistic, verbal-literary, social problem solving, mathematics, scientific, music, body-movement. These domains map onto major fields of creative endeavor in the larger society, and relate to professional domains. Of course, the graphic and verbal domains are the most often measured, considered as the "base " domains.

Michael Shaughnessy and Connie Phelps: After identified, how can teachers best enhance and develop the potential of students?

Todd Lubart: The EPoC test allows a student to be situated compared to other students, and to have a personal profile of strengths and weaknesses, related to : divergent-exploratory thinking, and convergent-integrative thinking, by productive domain (graphic, verbal, social, etc). This initial information can allow teachers to propose useful training activities to the students, activities to reinforce skills in divergent or integrative processing , and by domain. Also, as a diagnostic tool, teachers and students can measure their progress on creative thinking.

Michael Shaughnessy and Connie Phelps: We understand that there are 2 forms- tell us about them. There are 2 forms, form A and B. they are essentially identical, for example, each form has graphic divergent-exploratory and convergent-integrative. The only difference is that the stimuli are specific. For example, in one task a banana shape is used, in another task, it is a carrot shape. In a literary creation task, there are three characters to include. The details concerning each character are different in Form A and B.

Michael Shaughnessy and Connie Phelps: Is there ongoing research on this test?

Todd Lubart: Yes, several studies have used EPoC as a pre - and post- test measure to see if a school program impacted children or adolescents' creativity. This is illustrated by an OECD study in more than 10 countries (Vincent-Lancrin et al,).

Also, we have several studies using EPoC that show how it relates to the WISC, and examines the factor structure of the battery in various cultural - language groups. Finally, we are continuing to finalize the development of musical, scientific, and body-movement test domains.

Michael Shaughnessy and Connie Phelps: What have we neglected to ask?

Todd Lubart: PoC is currently being developed in several countries, with translated versions in progress in English, Spanish, Portuguese, Slovenian, German, Turkish, Croatian, Russian, Chinese and others. There are also norms being collected for these versions.

Michael Shaughnessy and Connie Phelps: Where can one find more information on this test?

Todd Lubart: The battery is available at : www.hogrefe.fr

It is possible to contact me at : todd.lubart@parisdescartes.fr

There are publications about the test, available mostly in English and French.

Michael Shaughnessy and Connie Phelps: Thanks

Autobiography of Todd Lubart

Todd Lubart is Professor of Psychology at the Université Paris Descartes, and former Member of the Institut Universiatire de France. Affilation: Université Paris Descartes, France and Laboratoire Adaptations Travail-Individu (LATI) He received his PhD from Yale University and was an invited professor at the Paris School of Management (ESCP). His research focuses on creativity, its identification and development within the multivariate, investment approach, creative potential and creative giftedness, the creative process and the effect of context on creative work. He is Director of the scientific laboratory “LATI” (Laboratoire Adaptations Travail-Individu); Todd Lubart has been in charge of several research grants on creativity (such as a study of creative giftedness) and has organized international scientific congresses on

creativity. He is author or co-author of approximately 100 scientific reports (journal papers, book chapters) on creativity, including Defying the crowd : Cultivating creativity in a culture of conformity (NY: Free Press, 1995), Psychologie de la créativité (The psychology of creativity, Paris: Colin, 2003),Enfants Exceptionnels, Rosny: Bréal) (Exceptional Children). Finally, Todd Lubart, with Maud Besançon, and Baptiste Barbot is author of EPoC (Paris:Hogrefe), a new measure of creative potential in children (Web 1).

Biodata of Author

Prof.Dr. **Michael F. Shaughnessy** is currently Professor of Educational Studies at Eastern New Mexico University in Portales, New Mexico USA. He has served as Editor in Chief of Gifted Education International and can be reached electronically at Michael.Shaughnessy@enmu.edu. His orcid i.d. is 0000 0002 1877 1319. His current research interests include talent development and intellectual assessment as well as the role of personality in giftedness, talent and creativity.

Prof. Dr. **Connie Phelps** directs the Gifted, Talented, and Creative Special Education program, teaches gifted program courses, and supervises PK-12 gifted practica experiences. Prior to her appointment as assistant professor in 2004, she taught middle school language arts and social science classes for diverse gifted learners, provided high school gifted consultation services, and delivered staff development for elementary school staff in USD 259 Wichita Public Schools. She received her MS in Special Education-Gifted, Talented, and Creative from Emporia State University, MEd from East Texas State University, and EdD from the University of Arkansas. Phelps's contributions in the field of gifted education include serving in the Kansas Association for Gifted, Talented and Creative Board of Directors; being the National Association for Gifted Children Professional Development Network Chair; being selected as a World Council for Gifted and Talented Children USA alternate delegate, and Future Problem-Solving Program International Board of Advisors. She leads site team accreditation visits for the Council for the Accreditation of Educator Preparation. S

References

Web 1. https://mic.fgm.it/index.php/mic-conference-2013-committees/lubart

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Research Article

An interview with Dr. Matt Zakreski

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Matt Zakreski
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Abstract

Matt Zakreski is an important scientist known worldwide for his work on creativity, neurodiversity, and giftedness. I asked him questions on important issues related to his research field and he answered sincerely. I would like to state that this interview contains important codes for researchers and practitioners study on the field of gifted education.

To cite this article:

Shaughnessy, M.F. (2023). An interview with Dr. Matt Zakreski. *Journal of Gifted Education and Creativity, 10*(2), 131-140.

Michael Shaughnessy: Dr. Zakreski, can you begin by telling us about your education and experiences with gifted?
Matt Zakreski: I grew up as a gifted kid in Fair Haven, a small town in NJ. I was identified in second grade and got gifted programming in the school throughout elementary and middle school. I was diagnosed with ADHD in high school, which frankly explained a lot. At the time, I didn't the words for twice-exceptionality, masking, or neurodivergence, but I sure wish that I did! I really leaned into my nerd/counter-culture identity in high school (musical theatre, improv, choir) in addition to soccer and all the classes and extra-curriculars. I attended the Center for Talented Youth (CTY) program for FIVE summers and can genuinely say that it changed my life; it allowed me to understand that I wasn't alone and could connect with other gifted people authentically.

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Fast forward, I attended Wake Forest University for undergrad and then worked at Harvard University as a research intern for a summer. At both places, I saw different types of gifted kids, from the artists to the high achievers to the multipotentialities, but it always came down to connecting with the right community to make you feel supported. I got a little bit burned out on academia after working at Harvard and ended up working in educational travel at EF Tours for four years; honestly, it was a fantastic job (I got to travel all over the world!) but I started to miss working with kids. I moved to Philadelphia, got a job working with severely autistic kids at Bancroft's Lindens Program and learned a lot of tough professional lessons. As hard as it was, I loved it more days than not (though getting knocked unconscious wasn't fun), and it helped me get into graduate school.

I attended Widener University in Chester, PA for grad school. During my first year, I had an opportunity to work as a counselor with kids at a school for neurodivergent learners (Hill Top Prep School) and loved it. Looking back on it, my whole professional career launched in that moment. I sought out as many opportunities as possible to work with kids, learn about neurodivergence, and develop the skills as an IQ tester. I found some amazing mentors along the way who guided me in asking the right questions and understanding where the field was heading. Additionally, I was able to do my post-doctoral training at The Grayson School, a school for gifted learners in Pennsylvania.

After completing my post-doctoral training, I opened my own therapy and consultation practice, the Neurodiversity Collective. I wanted to center mental health and educational practices in neurodivergence and provide a space for neurodivergent people to get what they needed. Meanwhile, I was submitting proposals for conferences all over the country and getting to speak on all manner of topics in social and emotional learning (SEL) for neurodivergent kids, from impostor syndrome to emotional regulation to gamifying social skills. I never saw myself doing as many talks as I do, but I absolutely love it. It's such a pleasure to able to help educators and parents all over the country.

At this point of my career, I've gotten to speak over 300 times all over the world. I've done thousands of therapy sessions, some good and some.... Not so good. I've gotten to do hundreds of psycho-educational evaluations, helping kids to learn how their brains work and getting their academic accommodations met. More and more schools are contacting me to ask for my help in creating systems that better support gifted and neurodivergent learners, which is really cool to be able to do. There is so much need out there and I suppose I embrace all of it.

Michael Shaughnessy: Hopefully COVID is now over- but what impact has it had on gifted kids and gifted education?

Matt Zakreski: I truly hope that COVID is over, but I don't think that it will ever truly leave us. We will have to learn to live with this virus and understand that we, as a global society, are far more susceptible to pandemics than we believed. The COVID impacts are varied and multisystemic, and I think will continue to emerge more and more as we move forward. As a psychologist, I saw three major impacts of COVID on gifted kids and education. The first is a positive one, actually. The first positive impact that I saw from COVID Was that it really normalized and demystified the process of telehealth and tele-education. A lot of my colleagues had already started working in the online space, both in education and in mental health, but there were a lot of people, (myself included) who really believed that the best therapeutic work got done in person. But when COVID took that away from us, all of a sudden we were all forced to adapt to not sharing a room but suddenly sharing a Zoom Room. And I realized very quickly that even if therapy is only 80%, as good online as it is in person, that's still pretty darn good. And for a lot of kids, who either live in mental health deserts or don't have access to specialists, telehealth is the best option. Now, telehealth is not a good fit for every kid, of course, and I wouldn't think anybody would want to think about it that way. But it lowers the threshold and the barrier to entry, and that's a huge thing.

The second thing I noticed was that there are a lot of incredible resources online. And for all we know about the internet and its incredible, almost infinite potential, a lot of the dialogue around being online is around the negatives, social media comment sections, porn, spam, etc. And I can pretend that those things aren't real because they are. But the best thing about being online is that there are all these beautiful little pockets of affirming and welcoming space; there are communities that have sprung up around niche interests and learning styles and people seeking connection.

These communities allow for not only people to connect and feel less alone, but to share resources and advice and support and language. And it's really amazing to watch people find each other in those spaces.

While I knew some of them existed before COVID, being thrown into an almost solely virtual world very quickly forced my hand to learn a lot more about what was going on in these different online spaces. And the vast majority I found were not just good, it was great. So, places like Outschool and Life of Fred and the Gifted Homeschoolers Forum really became go-tos for me, almost like lighthouses, right? I could see them in the distance and they gave me a point of reference when I felt like I needed an additional tool to offer a kid therapeutically.

The third and final thing that I saw was that COVID laid bare a lot of this country's mental health infrastructure. And while that finding or is not a new thing, (many of my colleagues have known that the mental health infrastructure in this country has been faulty for a long time), now it is out there in the public discourse. Because all of a sudden there was this invisible, insidious deadly thing that was killing 1000s of people, basically daily. And we didn't know what to do with it. And it completely disrupted our lives and our routines and our connections.

All of a sudden, we saw this incredible spike in anxiety, and depression and trauma. And thankfully, a lot of people turned to therapy and mental health support as a way of navigating those challenges, which is something that I don't know what have happened earlier in American history. As a reference point, 20 years ago, I was a senior in high school during the 9/11 terrorist attacks. And for as traumatic as that was, I don't remember a lot of people rushing to the therapy office.

This COVID moment felt different. And I think it's created an incredible awareness around the need for mental health awareness and its impact on our lives. But unfortunately, it's also laid bare the fact that there are not enough therapists and not enough school counselors, and insurance doesn't cover these things enough. Strangely, we went from there being too many therapists and not enough awareness to plenty of awareness and not enough therapists. So, you know, there's still a lot of work to be done. But COVID really peel back the curtain on the bubbling and burgeoning mental health problems that are going on, especially in our kids and teens. And now it's up to us to figure out what to do with that.

Michael Shaughnessy: A clarifying point- what is your main thrust of interest-gifted, talented or creative?
Matt Zakreski: My main focus is on giftedness, but there has always been a strange relationship between giftedness and talent. Often I find myself saying to parents when I give talks that every kid has gifts and talents, but not all kids are gifted and talented. It is important to note here that gifted and talented is a statistical designation as much as it is anything else, for students in the top 98th percentile for the various types of intelligence and the top 90th percentile for those with particular skills.

Frankly, I love seeing all the different ways that giftedness can manifest in kids and teens. To use myself as an example for a moment, I am a gifted individual; I was identified in 2nd grade and have an IQ of 144. And I am a gifted artist. So, I have gifts in the verbal types of thinking; I've always been a strong writer and reader. Unlike a lot of my STEM genius clients, I'm strong in the humanities, but I also am a a gifted cartoonist and illustrator. I think those are two completely different skill sets. And the research on the gifted brain backs that up.

So anybody who brings exceptionalities to the table, be they in thinking or dancing, or drawing or parkour, or math, or something I've never even heard of. I want to meet with those kids and learn about them and learn from them. So I can help them fully operationalize the gifts they have in the way that feels most authentic to them.

Michael Shaughnessy: An opinion- are gifted kids, in general getting an appropriate education?
Matt Zakreski: Hahahahaha oh boy, no. Gifted kids do not receive an appropriate education for many reasons, most of which is based in the design of the American education system. The American education system is built for neurotypical learners, the 68% of people with an IQ of between 85 and 115. And if you were going to build a logical system that was designed to educate as many people as possible, frankly, you could do a loss worse than the system that we have. The American education system is built on redundancy and repetition and moving at a slow and steady pace. Many people learn well this way!

The problem is that gifted learners learn quickly, require less repetition, want deeper dives and more engagement, seek enrichment opportunities, and push back against the commonly accepted ideas of how kids should learn. So oftentimes, gifted kids get on the nerves of teachers and administrators, because they're asking for different things and in different ways than the way the system is built. Many regular education classroom teachers (where the majority of gifted education takes place, by the way) report that they don't like their gifted students, probably for the above reasons. The fact is that we really need to argue that gifted education is special education. We do a great job in this country of touting the importance of special education for kids on the lower end of the IQ spectrum. And you will never hear me say that those kids don't deserve all the support and respect in the world, because they do. All I'm saying is that we have to do as good of a job of advocating for the educational needs of kids on the higher end of the IQ spectrum. The Tier Three educational changes that are common in special education can be as applied as thoroughly for gifted learners as they can for kids with learning disabilities. So, when we push gifted education into every school and every classroom, then we're going to make the necessary changes for gifted kids to get what they need. Because when gifted kids don't get what they need, they develop bad habits, they don't have the opportunity to lose their sense of fear, they don't develop resiliency as quickly, and they may not get the opportunities necessary to hone their skills.

All learners want and deserve to develop their skills as thoroughly as they can; for gifted kids, seeking their interests is a deeper passion that needs to be served. It isn't enough to say "oh they'll just be fine;" we must push for gifted education, more and more, because for our gifted population, getting the right kind of education isn't just a nice thing to do. It's a priority.

Michael Shaughnessy: If not what can be done ?

Matt Zakreski: I think that's a huge question, and I will try to give a meaningful summary. I think that serving any population starts with education. Since there is so much misinformation about gifted kids out there, if we start by getting meaningful, contemporary information about giftedness (specifically as a piece of broader neurodivergence) into the hands of parents, teachers, principals, and policymakers, then we are creating a meaningful foundation to make change. If the grown-ups in charge understand that giftedness isn't just what you do, it's who you are, then I think that real change will come.

Second, we continue the push for Universal Screening. I think that every kid needs to learn more about their learning style, strengths, and weaknesses. And we have the tools! When we cast a wider net for testing (because right now, it mostly goes for kids who are major behavior problems or for kids who have demanding parents), we give more kids (and their families) more information about how their brains work. And when families are empowered with that information, then it is easier to make appropriate changes to how they are being taught in public school.

Lastly, I want the broader education (and mental health) field to understand the giftedness, like all neurodivergence, is an all-day thing. Our interventions in these areas must be broader and more pervasive than the drips and drabs that we are currently trying. One hour every other week with a gifted specialist is something, but it's not enough. Gifted kids are gifted all the time. They deserve educational systems (in addition to pedagogy) that incorporates that information. We need more schools with acceleration, enrichment, mentorship, understanding of sensory needs, project-based learning, makers spaces, compacted curriculum, and integrated social-emotional learning techniques.

And if you're saying that it isn't fair that only gifted kids would get those resources, I'll let you in on a little secret: the best practices in gifted education are just the best practices in education, full stop. All kids deserve access to best practice**.**

Michael Shaughnessy: It seems that the conceptualization of "giftedness" shifts and changes over the years. Have you noticed this also?

Matt Zakreski: Definitely! I have seen a huge change in my own life, from being a gifted kid growing up in the 90s to where things are today. The biggest changes that I've seen are the integration of the brain and shifting to a strengths-based approach to learning. I think that understanding that giftedness is a piece of broader neurodivergence (literally a

gifted brain is a different brain), rather than just "being smart" is a huge shift. I truly believe that when gifted is a thing that you are, rather than a piece of how your brain works, it's easier to take a lot more things personally.

I think that a lot of gifted people see their failures and struggles as personal failures, because they lack the informational context of neurodivergence. When I was researching giftedness for my dissertation, I kept saying "I wish that I had known that!" over and over, just because we know so much more now about the gifted brain, neurodivergence, twice-exceptionality, pedagogy, etc. But since I can't go back in time and help me 30 years ago, I want to use that contemporary knowledge to help this generation of students.

The other shift that I've noticed is the move away from the "eminence" path towards letting kids live their own values. I remember growing up that everyone told me that I had to go to Harvard (or Princeton as a "safety school" hahah) and that I was going to "change the world." It was inspiring but also totally overwhelming! Eminence puts a lot of pressure on kids, because it implies that there is a "right" way to be gifted or neurodivergent. The fact remains that many of the "right" paths that exist are built by neurotypical people and are easier for neurotypical people to follow.

For example, I once worked with a young man who got an interview for a major scholarship to Harvard, and when he was meeting with the alumnus tasked with vetting him, it was a disaster. My client, who was very direct and not great at reading the room, was asked why he wanted to go to Harvard. And instead of giving the "right" answer, where he espoused that Harvard was his "lifelong dream" or something, he spoke his personal truth: He wants to make a lot of money as a businessman and Harvard is the best place to make those professional contacts. The alumnus got huffy and ended the interview; my client was shattered. After a while, though, I pointed out to him that he can make business connections anywhere, and if he went to a cheaper school, he would have less debt (he ended up getting a full ride to his local state University).

And now? He's got a very successful business and his field is unusual: aquariums. He loves them! And while he has a brain that probably could have won a Fields Medal at some point, he doesn't owe the world anything at that level. He is happy and successful running his fish business. Moving away from the eminence mode allowed him to chase his dreams in a way that felt authentic to him. If you let kids follow their interests, they may still eminence, but in their own way on their own terms, and that almost certainly leads to happier, more well-adjusted adults.

Michael Shaughnessy: Parenting the gifted what are the challenges that parents face in this day and age?

Matt Zakreski: So many. So, so, so many. Emotional regulation is probably at the top of the list for me. Gifted kids have big feelings, and they max out the scales on what we in psychology call "the big three:" frequency, intensity, and duration. To wit, gifted kids are more emotionally intense, more often, for longer periods of time. Helping our kids co-regulate through their big feelings is exhausting and demanding for any parent, but if the parent happens to be neurodivergent themselves (with similar or, even worse, competing quirks), then the challenge can feel impossible.

We've covered the educational challenges above, but it is worth noting that finding the right school and/or education models for your children can feel like a full-time job. I work with kids who are homeschooled, unschooled, in public school, in private school, hybrid progam, cyber school, college programs, and in educational collectives. The fact is that we are all trying to find a tribe for our gifted learners, and education is often the biggest bang for our buck.

Lastly, there's the social piece of raising gifted learners. Due to developmental asynchrony, gifted kids can be all over the place. My mentor, Dr. Jean Peterson, used to say that every gifted kid is five kids, due in no small part to the different developmental levels of neurodivergent kids. To focus on social skills for a moment, gifted kids often do not play well with others. Sure, they can be remarkably mature and precocious one moment, but then they're having a fifty-minute meltdown over the next episode of NOVA being unavailable to stream. These social challenges can make it remarkably difficult for parents to know who can serve their kids, let alone understand them, which can increase feelings of loneliness and helplessness. The good answer is that there are infinitely more communities for neurodivergent folk these days (online and in person), and you can connect your kiddos with as many as they can handle.

Michael Shaughnessy: Mentoring the gifted- who should be doing it and how important is it?

Matt Zakreski: Anyone can mentor a gifted person; they don't have to be gifted or neurodivergent to do so. To be effective mentor you need to be two things: passionate and authentic. Gifted kids crave authenticity and can learn from anyone who shows up with genuine passion. These traits are consistent with the Vygotsky's "Zones of Proximal Development" theory piece of the More Knowledgeable Other (MKO). Their skills and desire may outpace yours at some point, but that's OK. The best way to engage a gifted learner is to follow their passion (or passions), which means that there is likely only so far that you can take your student as a parent or a teacher. And there's nothing wrong with that! You simply cannot be an expert at everything. True mentorship is passing things along when your piece of the journey is over, like passing a baton in a relay race.

Mentoring is extremely important for gifted learners, and I think that it should be placed in a much higher importance than it is currently considered. Teachers are amazing and they do so much, but teaching does not only take place in the classroom. Mentors can step in and facilitate growth outside of the traditional classroom activities. Mentors can provider personal, individualized challenges and support, without the politics and complexities of working within the traditional education system. If you're going to work with a mentor, I would highly suggest this: know what you'd like to accomplish (your goal) and what you need from a mentor (i.e., specific instruction, networking, opportunity) to get there. A more targeted approach will make for the more efficient use of everyone's time.

It is also helpful to explicitly state how much you want to be pushed and held accountable, and in what way. Mentors can create personal relationships and really give that individualized attention, but they are fully optimized as a tool when they find your comfort zones and push you through them. My mentor in graduate school, Dr. Michael Cassano, once said to me, "You are good at a lot of things; you wouldn't have gotten into grad school if you weren't. My job is to make sure that you don't hide in your skills, that you continue to grow to be the best version of yourself you can."

Michael Shaughnessy: Difficult question -IQ testing- in the big scheme of things- how important is it?

Matt Zakreski: IQ testing is a means to an end. When we talk about giftedness as a construct, there are many ways to conceptualize it and define it. The problem is that we need some sort of unified definition or structure to provide a check point for giftedness to either exist or not exist. And since giftedness has traditionally been associated with intelligence, IQ scores were a natural place to insert that checkpoint. Now we know given the theory of multiple intelligences, that giftedness is far more than intelligence, however, we must start somewhere. So, if we are going to look at IQ as a marker of giftedness, then we need to be able to consider its impact from a verbal intelligence perspective, a nonverbal intelligence perspective and also skills that are harder to define like drawing, painting, singing, dancing, etc.

Now IQ is certainly a flawed measure. It tends to benefit educated people, it tends to bet benefit affluent people, and it definitely benefits people whose first language is English. The problem is that our schools are filled with kids who do not meet those criteria and are just as likely to be gifted themselves. If the test isn't designed to "see" those kids, we risk missing them completely.

A good therapist or a good psychologist will know those things and can consider that one writing up the test report. The problem is that most organizations don't have the skills training or knowledge to be able to parse out some of those intersectional factors. When I do a report, I always include an IQ test, a achievement test, and a test of nonverbal intelligence, non-verbal intelligence really does a nice job of cutting across language differences and learning styles. Because the ability to problem solve and make connections. That's a skill that exists outside of traditional measures of IQ of intelligence.

So, is IQ important? It serves a purpose. And I'm interested in IQ because of what it represents and the fact that it's a scaled measure so we can compare it to previous scores and other people. But I don't think that's where the conversation should stop, and assessments for giftedness must consider other measures and psycho-social factors.

Michael Shaughnessy: Social skills is it that gifted kids are lacking in social skills or it is that they have difficulty finding like-minded friends with similar interests?

Matt Zakreski: Gifted kids struggle with social relationships for many reasons. The first is developmental asynchrony. We could give an entire interview on this concept, but in the interest of brevity, I'll say that neurotypical kids develop in line with their expected age norms. So a 10 year old will be 10 socially, emotionally, academically, physically, etc.

A neurodivergent kid will often develop asynchronously. So that same 10 year old kid might have the intelligence of a 15 year old, the academic skills of a 14 year old, the emotional skills of a nine year old, and the social skills of a seven year old. There are many complicated reasons for why this phenomenon occurs. But the simplest answer is that when the brain is developing, there's only so much energy to go around. And as the cerebral cortex develops, some other things lag, mostly social and emotional skills.

This asynchrony impacts gifted kids in two ways the first is that while they are a certain chronological age, their intellectual age is often much greater than their peers. So gifted kids will seek out intellectual peers rather than chronological peers, which puts them in different social groups and activities that may be harder to find or navigate. For example, one of my clients is a very talented musician, and like a lot of talented musicians, he had outpaced the music instruction available to him in his current school. We successfully got him involved in the high school's marching band even though he's in middle school. And he enjoys spending time with these students and talking about music, and music theory, and performance. But when they start talking about high school drama, the prom, dating, and parties, he's completely left out. So, they're an intellectual appear in some ways, but not in other ways.

The second way that this asynchrony impacts gifted kids is their social skills often lag their other skills. And you'll see a kid who is poised and articulate and thoughtful in class become a silly, immature, weird person when trying to interact with friends. This weirdness creates anxiety, which of course exacerbates the behaviors in the first place. So gifted kids often get stuck in these sort of negative feedback loops, where they feel anxious about making friends which causes them to act weird, which pushes their friends away, which makes them more anxious, which makes them act weirder, which pushes more people away. It can be a really painful cycle to watch.

One of the ways we deal with this is by connecting gifted kids to other gifted peers. Now, just because gifted kids are all gifted, that doesn't mean that they're going to be friends, it may not even mean that they get along at all. But there is a phenomenon that occurs when you see kids who are all a synchronous realizing that they are all different together. And that platform can allow for deep and meaningful connections. So while gifted education is important for intellectual and academic development, I would argue that it is just an just as important for social and emotional development, because you're giving kids the option and the opportunity to connect with like-minded peers.

It is also worth noting that due to the way their brains work, and the fact that there just aren't that many gifted kids statistically speaking, it is important to help gifted kids find like-minded peers. And given the different developmental ages of gifted kids and their varied interests. It may mean that they have many different peer groups for many different activities on very on many different levels. I have kids who play chess against adults, and go to birthday parties with their homeroom class, and take social skills courses with kids who are a little bit younger, while taking online college courses. All of these interventions combine to scratch all of their various itches in all their various domains of functioning.

Now an intervention like this can be exhausting and challenging, logistically difficult, and expensive. So, we must out balance the different points of this and focus on what is possible and practical. But if you're a parent struggling for helping your gifted kid, make friends, the best practice is always to start with their interests. You're going to be much more successful in giving your kid meaningful social connection if you follow their interests, because in those interests they will find their places and then their people.

Michael Shaughnessy: The Internet -can it be used to nurture and support gifted kids- if so how?

Matt Zakreski: The Internet can be a tremendous tool for gifted kids. It can serve their education, social skills, and special interests. The best thing about the internet is that it is endless. There are constantly new platforms being developed, new organizations carving out their little corner and more information is available more readily to more people. than it ever has been in human history.

The internet can serve that intellectual black hole that gifted kids often present with. If your kid has read every single book in your local library about the Roman Empire, you might feel stuck as a parent. I guarantee you there are articles, resources, YouTube videos, etc. on the Roman Empire online that the kid has not seen before. If we point them in that direction, we feed their intellectual curiosity while also giving us an opportunity to talk about limits and boundaries.

Secondly, the internet has transformed into a place where many traditionally marginalized communities have staked out areas for themselves. Many gifted kids are drawn to computers in technology anyway. And in those spaces in through those tools, they have found areas of connection. I can't even begin to tell you how many online resources there are for gifted kids, gifted teachers, and the parents of gifted kids. People share resources, information, conferences, and tips and tricks. And this sharing of information not only lifts everybody up, but it makes us all feel less alone.

One of the other nice things about the internet when it comes to gifted kids is the prevalence of high-level academic instruction. Many gifted kids can't work in public schools. The way they learn is just too dissimilar then to how schools are developed, and that disconnect means that sometimes parents will have to move to get the kids the education they need. But if the family can't move, online school has become a viable option that it really wasn't for a long time.
Some schools are entirely online so the child will be enrolled just in the cyber school and sometimes gifted kids are homeschooled, and their education is supplemented through online resources. The upshot is that parents aren't alone in educating gifted kids. They can lean on online resources, cyber school and educational professionals who make their work accessible in the various virtual spaces. So more gifted kids are getting what they need from wherever they are and thus everyone benefits.

Michael Shaughnessy: The age old question- acceleration vs enrichment- any thoughts on which is superior?
Matt Zakreski: Can I pick both? If not, I am all about enrichment. There is so much redundancy built into the American education system that sometimes acceleration can end up being more of the same stuff, but in a different classroom. Acceleration also can be a thornier proposal within the school district; for some reason, people often get resistant and combative around ideas of acceleration, especially grade skipping. It obviously can and does work, but I tend to lean more on the side of enrichment.

Enrichment, as a practice, is all about making education come alive. After all, education really is about connecting to the material. And while there are great PowerPoints out there, and there are wonderful worksheets and really cool spelling tests, those aren't the lessons that we remember. Think back to your own education. You probably remember science fairs, and doing labs, and the egg drop, and History Day, and the time that you made your own ice cream, etc. Those sorts of activities are consistent with enrichment. They take educational principles and apply them to something tangible and meaningful and frankly, more interesting than any chapter textbook ever could be.

Enrichment is the best way to educate all kids but especially gifted kids. Why sit there and memorize every piece of information about a blue whale, when you could go see a blue whale at a museum, or build a scale model of a blue whale when compared to a scaled down version of a human, or talk to a marine biologist? There are so many more interesting ways to talk about education engage kids with information than traditional didactic lecture ever could be. And that's why I think you're seeing education move from the “sage on the stage” model to the “guide on the side” model. We can point kids through differentiation to the topics and methods of delivery that feel the best to them. Then we can challenge them to learn the information as they go and use that connection to facilitate deep and meaningful learning.

Michael Shaughnessy: Self care seems to be a pervasive theme how will this impact gifted ed?
Matt Zakreski: Self-care is an important thing, but the problem with it is that it seems so impossible even though it is so simple. In this day and age, we are all overwhelmed, overworked, exhausted and parents perilously close to burnout. If we don't take care of ourselves than we can't show up for the people and things that matter most to us, let alone ourselves. How can you possibly find time to take care of yourself if you're so busy and overworked and overwhelmed? Since it feels impossible, we push it off and push it away and never end up doing it. And as such, get more burned out and exhausted.

So, when it comes to self-care, I always tell my clients three things. The first off, the first is that you have to carve out time for self-care. If you don't carve out time for it, it's **not** going to happen. We push it until what I like to call "the magical land of later," as in we'll do it later, after all the other things are done. And it never happens because the work either never ends, or it finally does and by that point we're exhausted. So self-care has to be a priority.

The second thing I tell my clients is that self-care must be personal. It must feed your personal strengths and your personal interests. I had a client once talk to me about how he had to do yoga and how he didn't really like yoga but yoga was so important. After a while, I asked him why he had to do yoga if he didn't like it and he said, "Well, that's what calms people down, right? And I want to be calmer." And I told him that if you don't like yoga, then it's not going to be helpful for you. The key question is what sort of things calm you down. We hemmed and hawed for a while, but ultimately, he came up to playing music. So, I made him carve out a half hour a day to play his acoustic guitar on his back porch. And that was much more therapeutic for him than doing the "right" thing of doing yoga.

Lastly, self-care is all about being the right kind of selfish. You've probably heard someone say that you can't pour from an empty cup. And that's true. The problem is that there are always people asking to have a pour from your cup. And if you don't learn how to set boundaries and limits and learn how to say no to people, then the constant asking for your time and space becomes itself a detriment.

So, self-care is putting yourself first, which is a concept that is very challenging for a lot of people. It doesn't always feel great to put yourself first, but that's why I call it the right kind of selfish you must be selfish to be selfless. You have to take care of yourself to be able to take care of other people. Whether your self-care is watching cartoons or playing frisbee or going for a walk or guided meditation or cooking an omelet. Whatever those things are for you, you must make that sacred time because those activities are going to fuel your soul and recover you enough to keep doing the high level intellectually and emotionally draining work that we've all chosen to do.

After all, you're worth it. I promise.

Michael Shaughnessy: What have I neglected to ask about your work and involvement with gifted kids?

Matt Zakreski: You are gifted all the time. I think that we still tend to think about giftedness as it pertains to school and education. But if you have a gifted brain, you are always carrying that brain with you. So, you are gifted at soccer practice, during play rehearsal, at the dinner table, on a road trip, etc. You'll note that I didn't say that you're gifted at ***doing*** these things; rather, you have the idiosyncrasies of the gifted brain with you at those moments. Gifted people aren't good at everything. And their intensities can make for the perception that their weaknesses are even worse because of how they see the world. Using the information that we know about how the gifted brain works to inform and set expectations for the people in our lives goes a long way towards making many things easier, from work to school to dating to recreation. Knowledge, as they say, is power.

Michael Shaughnessy: Thanks

Autobiography of Todd Lubart

Matt Zakreski, PsyD is a high energy, creative clinical psychologist who utilizes an eclectic approach to meet the needs of his neurodiverse clients. He is proud to serve as a consultant, a professor, a speaker at national and international conferences, and a researcher on Giftedness. Dr. Zakreski is a member of Supporting the Emotional Needs of the Gifted and the National Association for Gifted Children, as well as Pennsylvania Association for Gifted Education and the New Jersey Association for Gifted Children. Dr. Zakreski is the co-founder and lead clinician at The Neurodiversity Collective (Web 1).

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References

Web 1. https://www.tesummit.org/tespeaker/matthew-zakreski/

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Research Article

Asperger's, giftedness and autism paradox: a case report[1]

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Abstract

The ongoing debate over the distinction between high-functioning autism, giftedness, and Asperger's syndrome is important to resolve because of the implications for understanding the etiology and prognosis associated with these conditions and diagnostic applications. But even decades later, the nosological status of AS is still unclear. In simple literature reviews on individuals with high-functioning ASD, the characteristics of these individuals were interpreted depending on both diagnoses, and were not explained by the data obtained as a result of empirical research. Moreover, Asperger's syndrome is currently used with high-functioning ASD. This poses greater problems for gifted individuals with Asperger's. This research, which was prepared to examine ten gifted and talented adult individuals diagnosed with Asperger's Syndrome and to determine the diagnosis process, its characteristics, and the reflections of these characteristics on their education, professional life and social life, is a case study. Semi-structured interview forms prepared in the research were used. Interview forms were prepared using the literature and were prepared from 15 open-ended questions that were parallel to each other. While preparing the questions, the opinions and consent of 3 experts in the field were obtained and the research questions were conveyed to the participants through online interviews. In some incomprehensible times, written responses were received. The answers given by the participants were deciphered and themes and codes were created. In findings, Gifted Asperger's individuals insisted on their routines, habits and obsessions during the interview. Although studies with children with Asperger's syndrome show that they are routine-attached individuals like high-functioning autistic children, it has been observed that Asperger's individuals share their interests and take pride in them from early infancy. In this context, individuals with gifted Asperger's differ from individuals with high-functioning autism. As a result of the study, this paradox was tried to be explained by discussing the similarities and differences between high-functioning autistic and gifted individuals according to the views of individuals with Asperger's.

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Introduction

First described in 1944, Asperger's syndrome (AS) was incorporated into ICD-10 and DSM-IV nearly 50 years after it was described by Hans Asperger, a Viennese pediatrician who deals with mental disorders in children. Considered a variant of autism for many years, AS is defined as a pervasive developmental disorder (PDD), characterized by obvious difficulties in socialization, a one-sided communication style, and rigid interest patterns that typically focus on

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memorizing real information. The temporary inclusion of Asperger's syndrome in ICD-10 and DSM-IV has brought this condition to the attention of nosological researchers. But even decades later, the nosological status of AS is still unclear. While the clarity of research on Asperger's syndrome is still questionable, an exponential increase in the number of individuals diagnosed with AS has led to a proliferation of parental support groups coalescing around this concept, increased research, and a steady growth in the educational literature. Part of this interest gives rise to a narrow view, sometimes deceptive, about highly intellectual Aspergerian individuals with eccentric attitudes and all-encompassing esoteric interests. While this may be true for some individuals, beyond the peculiar intersection of intellectual abilities and interesting orientations, it is also a fact that there are individuals with Asperger's who have major socialization deficiencies that cause significant difficulties for individuals and the family. Therefore, in Asperger's syndrome, the DSM-IV definition was used, which includes a certain number of substances, due to qualitative deficiencies in social interaction; limited repetitive and stereotypical behavior, interests and activities; an unequal development profile, evidenced by inconsistencies between or within language, social interaction, adaptive behavior, and/or cognitive skills; impairment in social interaction, which is manifested by delay, absence or atypical ability to relate to people or the environment; deterioration in oral and/or non-verbal language or social communication skills and limited repetitive and/or stereotyped behavior, interests or activities.

Asperger's and high-functioning autism (HFA) appear as interchangeable terms in the literature (Gray, 1998; Kunce & Mesibov, 1998; Sansosti, Powell-Smith, & Cowan, 2010). Within existing literature, researchers and psychiatrists proposed several similar definitions for highfunctioning autism. Researchers from Yale University defined high-functioning autism as individuals with autism whose full-scale IQ is greater than 70, without significant language and intellectual delays (Rubin & Lennon, 2004). Attwood (2003) reported the term highfunctioning autism was initially used to describe individuals who demonstrated typical symptoms of autism when they were young children, but as they grow older, they gradually showed greater degree of cognition, social and adaptive behavior skills with good long-term clinical outcomes compared to other children diagnosed with autism. Qualitative deterioration in social interaction; limited, stereotyped and repetitive patterns in behavior, interests and activities are among the similar characteristics of individuals with Asperger's and high-functioning autistic individuals (Mazzone, Ruta, & Reale, 2012). HFA individuals have higher IQ scores than individuals with classical autism and are individuals without cognitive and language disorders (Goldstein et al., 2008). In addition to having intense and deep knowledge about a complex subject, HFA individuals have excellent problem-solving skills (Yirmiya & Sigman, 1991). While their honesty and hard work capacity differ from classical autism (Tebartz van Elst et al., 2013), they create confusion with Asperger's. Because some studies (Gillberg & Billstedt, 2000; Sanders, 2009) claim that Asperger's and HFA are different from each other. It is reported that fine psychomotor skills of individuals with HFA are better than individuals with Asperger's. In addition, the IQ average of gifted individuals with Asperger's is in the same intelligence range as those of normal gifted individuals.

It seems seven features are emanated as pravelent to gifted individuals and individuals with Asperger. Modern definitions of giftedness are the result of an evolution of ideas. Each generation of gifted theories has built upon the one before it, thus integrating previous iterations and research while adding components reflecting the current state of research (Kaufman & Sternberg, 2008). An early and still common definition of giftedness was on top scores obtained in standardized IQ tests. Alfred Binet created the first IQ test in 1905 in order to predict success in school, not as a measure of innate intelligence or “raw” genetically based potential (Gardner, 1992). For example, verbal fluency or precociousness are common to both, and they seem to have splendid memories (Levy et al., 1988; Frith, 1991; Little and Clark, 2006; Silverman, 1993). Both can have a huge captivation with letters or numbers and become aware of their ability to memorize at early ages. Both may show a keen interest in a particular subject and have a great deal of factual knowledge about it (Gallagher, 1985; Klin et al., 1995). They can annoy their peers with their endless chats about their concerned areas. They can demand specific answers so long and detailed that they seem unable to stop. Hypersensitivity to sensory stimuli occurs in both groups of children. Parents of both high-functioning autistic and gifted AS children

have often reported that their children choose to wear certain types of materials, eat foods with a certain texture, and are withdrawn and afraid, especially at sounds they find exhausting.

Children with high functioning AS are defined as owning quite multifold abilities, just like gifted children. It has been stated that all children with Asperger's have "a special interest in a particular field that allows them to reach unusual degrees of performance" (Winter-Messiers, 2007). This is like the "passions" of the gifted children (Torrance, 1965; Betts & Kercher, 1999). While they may exhibit unusual abilities in certain fields, both gifted AS individuals and high functioning individuals can perform in the average range in some areas (Baum, Owen, & Dixon, 1991; Wing, 1991). When the cognitive development of both gifted and high functioning AS children is compared with their peers, it has been observed that these children show a much faster development than their peers (Hollingworth, 1942; Altman, 1983; Asperger & Frith 1991; Silverman, 1993).

In the field of "gifted intelligence", four related cases can be defined in which the term Asperger's is used (Subotnik et al., 2011): (1) high academic achievements; (2) individuals who score at least 2 Standard Deviation (SD) above average on intellectual tests (Full-Scale Intellectual Section 130 and above on the commonly used Wechsler Scales); (3) individuals who exhibit extraordinary talent in one or more areas of talent; and (4) individuals with socio-emotional characteristics, high intellectual ability but socialization deficiencies. These definitions of giftedness are based on different understandings of phenomenological reality and the different models of intelligence the term evokes. In the first case, giftedness is related to academic achievement. The second state reflects high-level mental abilities that are not a guarantee of academic success, while the third state refers to the development of natural abilities in any area of general intelligence due to regular training based on pluralistic intelligence models.

Individuals with gifted AS are defined as having a wide variety of abilities, just like gifted individuals. Asperger's clinical observation is that all individuals with this syndrome have "a unique relevance that allows them to reach certain stages of performance that are quite unusual in a particular area" (Asperger's, 1991). This interest is similar to the saying that talented individuals have "passions" (Torrance, 1965; Betts & Kercher, 1999). While exhibiting extraordinary abilities in selected fields, both gifted individuals and gifted individuals can perform on average in some fields (Baum, Owen and Dixon, 1991; Wing, 1991). Both high functioning individuals and talented AS-individuals are described as experiencing unequel upgrowth, especially when cognitive development is compared to social and emotional development at early ages (Hollingworth, 1942; Altman, 1983; Asperger's, 1991; Silverman, 1993).

Hypersensitivity to sensory stimuli often occurs in both groups of individuals (Hazen et al., 2014). Parents of individuals with both high-functioning autism and gifted AS often tell stories that these individuals prefer to put on specific kinds types of fabrics, consume foods with a specific texture, turn inward or escape in sounds they find frightening, or resolutely reject certain facts (Smith and Sharp, 2013).

Problem of Study

This brief analysis of the external validity of AS demonstrates the urgent need for additional research evaluating the effectiveness of various diagnostic modalities. This research agenda is required for a number of reasons: First, it's important to evaluate how comparable the study data that are now available and were obtained utilizing various diagnostic techniques are. Second, despite the rise in clinical and research interest in AS, the lack of a validated definition hinders the creation of standardized instruments that might improve diagnostic assignment reliability and enable cross-site collaborations that are crucial to both behavioral and biological research. Third, there are signs that the DSM-IV definition is not being followed in clinical practice; the term is being used interchangeably with HFA or, perhaps more frequently, PDD-NOS. This has caused a rift between DSM-IV and research and clinical practice, which has confused and alienated researchers, clinicians, and parents alike. Fourth, without addressing the validity of the AS diagnosis, the scientifically intriguing question of whether or not there are qualitative discontinuities among the PDDs or, alternatively, whether the PDDs should be considered along a dimensional continuum (and what this dimension should be) is left open (Klin, 2003).

Recent case reports of Asperger's syndrome have used the term fairly uniformly for individuals who are interested in relationships but are unable to maintain social interactions with sufficient success to facilitate relationships. Few studies have been done to find specific pathological associations with Asperger's syndrome. There is a growing body of research on children with autism (ASD), but little is known about individuals with Asperger's; even less is known about gifted individuals with AS. In simple literature reviews on individuals with high-functioning ASD, the characteristics of these individuals were interpreted depending on both diagnoses, and were not explained by the data obtained as a result of empirical research. Moreover, Asperger's syndrome is currently used with high-functioning ASD. This poses greater problems for gifted individuals with Asperger's. For example, there will be negative labeling when defined as high-functioning autistic. The aim of this study is to examine ten gifted and talented adult individuals diagnosed with Asperger's Syndrome and to determine the diagnosis process, its characteristics, and the reflections of these characteristics on their education, professional life and social life.

Method

Research Model

This study was developed by modeling the case study. Case study provides an understanding of a complex social situation (Yin, 2004) and is a frequently preferred pattern in applied fields such as education and psychology (Merriam, 2002). A case study is a study in which detailed information about a particular situation in daily life is collected, the situation is defined, and themes are put forward (Creswell, 2016; Merriam, 2002). Case studies according to Stake (2015); The content of the research can be classified in three different ways as internal, instrumental and integrated. If the researcher is particularly interested in a specific topic, he or she performs an internal case study. In this research, internal state study was adopted and focused on the behavioral characteristics of high-functioning adults with Asperger's.

Participants

Study group consists of ten adult individuals with gifted Asperger's who were diagnosed at an early age. Five of them are female and 5 are male. The age range of the group is between 29 and 37. 3 of the participants live in Turkiye and 7 of them live abroad. The codes were given to the participants in the study (see Table 1). This research, which was prepared to examine the diagnosis process of adults with gifted Asperger's, high-functioning characteristics and the reflections of these features on the education process, after-school life, human relations and mood, is a case study.

Table 1. Structures of participants and coding

Participant no	Living place	Gender	Age	Codes
1	Turkiye	Female	32	P1-F-32
2	Russia	Male	29	P2-M-29
3	Turkiye	Male	35	P3-F-35
4	Turkiye	Female	34	P4-F-34
5	Russia	Male	30	P5-M-30
6	Russia/Spain	Female	36	P6-F-36
7	Portugal	Male	35	P7-M-35
8	Russia	Female	35	P8-F-35
9	England	Female	36	P9-F-36
10	Russia	Male	33	P10-M-33

Data Collection Tool and Procedure

Semi-structured interview forms were used in the research. Interview forms were prepared using the literature and were prepared from 5 open-ended questions that were parallel to each other. While preparing the questions, the opinions and consent of 3 experts in the field were obtained and the research questions were conveyed to the participants through online interviews (See Appendix). In some incomprehensible times, written responses were received. The answers given

by the participants were deciphered and themes and codes were created. After obtaining consent for the themes and codes from the same 3 experts, the statements for the findings were put in quotation marks. Volunteering was taken as a basis while collecting the data.

Credibility and Dependability

Credibility and reliability in qualitative studies are just as important as validity and reliability in quantitative studies. In this study, the interview made by the participants are recorded to ensure credibility; Afterwards, it was informed that the interview data could be converted into a scientific publication and confirmation was obtained about voluntary participation. In addition, the researchers provided long-term interactions with the participants and it is still ongoing. Feedback on the findings of these interactions was given and reconfirmation was obtained. An opinion was obtained from a psychiatrist with expertise in the subject in Russia to determine whether there was a counterpart to the recent findings in ensuring credibility. On the other hand, triangulation, one of the most frequently used techniques, was used to ensure reliability. In triangulation, interviews, observations and related articles and books in the literature were examined and the results were compared. For the confirmability of the study, the audit trail was used. It is explained how the study proceeds on the way to supervision, how the information obtained raw in the study is reduced to themes and codes, and especially the participant discourses of the codes are presented within quotation marks. In the provision of external validity, the determination of the research method and design, the creation of the study group, the method used in analyzing the obtained data were presented in detail in the research and detailed descriptions were made with the direct statements of the participants. In order to ensure internal reliability, the analysis of the data was carried out by two researchers separately by using researcher triangulation (Merriam, 2015), themes, sub-themes and codes were determined independently, and then those with disagreement and consensus were compared and finalized.

Results

In the study, it was conducted to determine the diagnosis process of 10 adult individuals with high-functioning Asperger's disease, their characteristics, and the reflections of these characteristics on their education, professional life and social life, and at the end of the interviews; unequal developmental profile evidenced by inconsistencies in or between language, social interaction, adaptive behavior, and/or cognitive skills; impaired social interaction, manifested by a delay, absence, or atypical ability to relate to people or the environment; It is possible to see frequently repeated patterns such as impaired verbal and/or non-verbal language or social communication skills and limited repetitive and/or stereotyped behavior, interests or activities. The data obtained from the study; a) Positive experiences with having Asperger's, b) Negative experiences with having Asperger's c) Social relationships and emotion d) Sensory sensitivities (taste, smell, touch, hearing), e) Routines, constitute the main themes of the research. The answers given in the light of these themes and codes are presented in this section.

Findings related to the theme 'positive experiences with having Asperger's'

When asked to individuals with Asperger's, “What did being with Asperger's give you in life, what did you achieve more easily?” The answers given by the participants to the question mostly; special talent in a particular area, a strong memory and rationality. It is noteworthy that the participants used similar expressions within the framework of these codes.

Theme 1. Positive experiences with having asperger's

Table 1. Content analysis of the responses of the participants to the question "What did being with Asperger's give you in life, what did you achieve more easily?"

Theme	Codes	Frequencies
Positive experiences with having Asperger's	Special talent in a particular area	6
	A strong memory	5
	Rationality	3

Regarding the *rationality* expressed by the participants within the scope of positive characteristics, one participant used the following statements:

"Not feeling certain emotions as intense as everyone else says makes me more rational and calm. I can look at things rationally. I can make more logical decisions in this sense, which is a big plus for me (P1-F-32)"

"I'm very good with numbers. That's why I turned to this area (Stockbroker). Even when I was very young, I admired the numbers. I can do all kinds of operations with 4 or 5 digit numbers from my mind (P7-M-35)"

Research participants mentioned special abilities in connection with their syndrome. All 7 participants mentioned specific interests and skills in specific areas.

"I love painting. I even make a part of my living from the paintings I sell. I especially like to draw still life pictures. I've always had talent in this field since I was a kid. The older I grew up, the better I became. (P6-F-36)"

"I have a huge interest in bicycles and motorcycles. I can smash and collect these tools like a puzzle. When I was little, I used to go to my father's repair shop and watch him. I learned how to do it by watching him (P2-M-29)"

"Music is my life. I have been working in orchestras since my childhood. Music is both my love and my obsession. If it wasn't for the music, I would probably kill myself (P10-M-33)"

"I am very talented in computers. That's why I chose this job (Working as an IT staff at the University). I'm also very good at World Wars history. You can ask me anything you want about it (P5-M-30)"

"I've had a great interest in music since a young age. I play violin, guitar, cello and piano. I play other instruments, but I'm still a novice (P4-F-34)"

"... painting is a passion for me. People sometimes think that the pictures I make are photographs... (P8-F-35)"

Two of the participants talked about their memory abilities and emphasized that having Asperger's makes them learners much faster.

"I can learn much faster compared to others. My memory is very strong. I can remember what I read, what I heard, what I saw for a very long time and in a very vivid way. When I'm focused, nothing can distract me (P1-F-32)"

"...I think I am luckier than most people. I can easily remember what I want. I can learn fast. I can read and write for long hours without getting tired (P3-F-35)"

Theme 2. Negative experiences with having Asperger's

The data obtained from the study includes the negative experiences that the participants associated with the syndrome. By the related theme; psychological problems, obsessions and clumsiness are the most emphasized negative aspects of the participants.

Table 2. Content analysis of the responses of the participants to the question " What kind of psychological problems do you have?"

Theme	Codes	Frequencies
Negative experiences with having Asperger's	Psychological problems	10
	Obsessions	6
	Clumsiness	5

"I was treated for depression for a long time. I am obsessive compulsive. I am on medication (P1-F-32)"

"When I was in high school, I trained in a special education class for 5 hours a week. I have an anger management problem. There is a therapy group I join for this (P5-M-30)"

"Yes, unfortunately. I was treated for chronic depression for a long time (P10-M-33)"

"I have a severe lack of concentration. In my academic life, there were times when I had difficulties because of this. At that time, I received support and used medication (P6-F-366)"

"I have bipolar disorder. I am getting help for this (P3-F-35)"

"I have OCD. I am on medication (P7-M-35)"

All of the participants stated that they had *obsessions* during the interviews and these obsessions were both challenging and indispensable for them.

"My obsessions are pushing me hard. That's why I have to take medication or they get to a level where I can't cope (P4-F-34)"

"I love backpacks. I have a system that I have set up myself. I built it on the number Pi (π). I change my bags according to this system. The number on each digit represents a certain bag. I'm definitely not going outside of this system. I just wear multi-colored socks and wear them in a certain order. I do my best not to spoil the order. I don't like even numbers at all. That's why I prefer odd numbers in any ranking. If my sequence number at the bank or hospital is an even number, I try to change it or I get very uncomfortable (P1-F-32)"

"Keeping my environment under control is indispensable for me. This includes my room, where I work, even where I eat. I only eat my lunches at 2 cafes. It's close to where I work, but I take my dinners from there. I eat my food in a certain order. If this order is broken, I get very nervous. There are even times when I have anxiety attacks (P6-F-36)"

"I don't know if it's an obsession, but my orchids are the most obsession-like thing to me. The temperature of the room, vitamins, water, everything has a certain standard. I only grow a certain type of orchid. (a sub-species called Oncidium Orchid) (P9-F-36)"

"The tools I use have a certain layout. I hate the disruption of this order. I'm getting very restless. If someone comes along and breaks this system, I can't work efficiently that day (P2-M-29)"

"I have an obsession with cleanliness and order. Only I clean my house. I do not accept help from anyone in this matter, neither from an assistant nor from my fiancee... (P7-M-35)"

Clumsiness is seen in the study data as another negative that participants with Asperger's agree on.

"...I have many cracked bones in my body. Even a few broken ones. Ever since I remember myself, I've been falling all the time, hitting something (P2-M-29)"

"I have a serious lack of coordination. This causes me to fall all the time. So much that sometimes I feel like I have 4 arms. I'm so unstable. That's why I never wanted to learn to drive. I don't have a license. Because with this clumsiness and lack of coordination, I can be a serious danger to other people (P1-F-32)"

"I've always been clumsy as long as I know myself. Coordinating often challenges me (P9-F-36)"

"I love to cook. It's even a passion for me. It's bad to be clumsy when you have such a hobby. I always get a cut or a burn on my hands. I even burned my feet while making pasta (P4-F-34)"

"I am very clumsy. I was always like this. Even though I paint, my coordination ability is zero...(P8-F-35)"

Theme 3. Social relations and emotions

With the questions asked to the individuals with Asperger's during the interview, their social relations and emotional worlds were tried to be understood. In line with the findings obtained from the interview questions; empathy, interpersonal relationships, loneliness and personal space codes were reached.

Table 3. Content analysis of the responses of the participants to the question "How would you describe your relationships with people?"

Theme	Codes	Frequencies
Social relationships and emotion	Empathy	5
	Interpersonal relationships	10
	Loneliness	5
	Personal space	7

The expressions used by the participants in line with empathy are as follows:

"Empathy is almost impossible for me. It doesn't make sense to me to understand how others are feeling or to share that feeling with them. That's why I have problems in my relationships with people. But when I read emotions from somewhere, for example from a novel, it is much easier to understand. Sometimes I am accused of being heartless and very cold. But I don't mind it too much. Though I am often accused of being heartless, of being insensitive. In fact, my brother once said that I have another brain instead of my heart, that's why I'm so smart but insensitive (P1-F-32)"

"I thought everyone was like me until I grew up and realized what it was like to have Asperger's. I find it very difficult to internalize people's sadness, joy or pain with them. I think we (individuals with Asperger's) are even lucky in this sense. I'm sure my parents thought I was a psychopath or something because I was like that. But over time, they begin to understand this situation, as I do (P2-M-29)"

"...there is a video my family took when I was little. Children are playing in a park. I stand a little further from them. Then I suddenly move and take the teddy bear from one of the children's hands. The boy starts to cry when he can't take his bear from me. Then my mother comes to me and the video is cut. But I remember that day very well. The fact that the teddy bear was in the sands made me very uncomfortable. I guess that's exactly the case. It doesn't matter if the child is sad or crying. The important thing is that the toy does not get dirty. Know what I mean? (P6-F-36)"

The opinions obtained in connection with interpersonal relations are as follows:

"I don't have many relationships with people in terms of personal intimacy, but that's my choice. I've never had a 'best friend' since I was a kid. I find it very difficult to establish this kind of long-term relationship. I can't catch the social cues. If I don't learn something while listening to others, I get bored. I have a hard time making sense of allusions or the sarcastic use of words. This makes it very difficult for me to continue the conversation. There are times when I find very difficult to understand what my husband feels. But he understands me. However, I don't want children. I don't like children. A lot of time and effort wasted... (P1-F-32)"

"...I am quite comfortable on my own. I have a girlfriend. She can understand me. My relationship with her is enough for me. I definitely don't want children. My fiancee also respects my decision (P2-M-29)"

"I'm sorry, but I don't like people very much. I have a small circle (P9-F-36)"

I have a group of friends with whom I play video games, but I haven't met any of them in real life. Actually, this is the best kind of friendship in my opinion. Even people I thought were friends when I was in school treated me badly. Virtual friends are the best (P3-F-35)"

"...I can't host guests at home because of my cleaning situation, nor can I do it in other people's homes... I have a sterile, small world that I set up with my fiancee and my cats. That is enough... I am very happy this way. (P7-M-35)"

The findings regarding *loneliness* (being alone, isolation) are as follows:

> *"The calmness... I love being alone. Because most of the time I don't know how to behave when I'm with people. This makes me tired. I feel more energetic when alone. (P6)"*

> *"Not being in a crowded environment, being alone means peace. Silence, happiness... I feel much better and more productive when I am alone. If I don't have an important job, I don't want to go out or see people for days (P6-F-36)"*

> *"Actually, I hadn't thought about it in detail. But I think it's good to get away from people. I can't say that I complain about loneliness (P3-F-35)"*

Individuals with Asperger's who participated in the research stated that they are sensitive in terms of their *personal space* and their space should be respected. Regarding this:

> *"I think people are very unsympathetic about physical boundaries. In my opinion, no one should touch or hug without the permission of the other person... (P2-M-29)"*

> *"My physical space should definitely be respected. I don't like people getting too close to me, touching or hugging me. Physical demonstration of affection is unnecessary and not for me. When people get close enough to break my comfort zone, I'm counting Shakespeare's plays to calm myself down. I don't like guests etc. My house is my castle. Others are invaders... (P1-F-32)"*

> *"...this issue is very important to me. That's why I hate using public transport and walking on crowded streets. I'm starting to get angry. There were times when I had problems with my co-workers because of it, but they learned that I didn't like it anymore. They respect my personal space... (P5-M-30)"*

> *"...I don't like having other people in my house. This is more sincerity than necessary... (P7-M-35)"*

Theme 4. Sensory sensitivities (taste, smell, touch, hearing)

In the study, individuals with Asperger's were asked about whether they had any sensitivity in terms of basic senses. In this context, it has been observed that the participants have some special situations in areas such as tasting, smelling, hearing and touching, and some of them may be in a special skill dimension.

Table 4. Content analysis of the responses of the participants to the question " What do you think about sound, visual, smell or taste?"

Theme	Codes	Frequencies
Sensory sensitivities	Tasting	3
	Smelling	2
	Touching,	4
	Hearing	3

Participants used the following statements regarding their sensory sensitivity:

> *"When I was a kid, I hated foods with a certain texture. I wouldn't eat anything that felt lumpy in my mouth. My mother always complains about this. As I got older, I started to deal with this a little more, but I still don't like this kind of food. Apart from that, I think my sense of taste is very developed. That's why I cook so well. I have a talent for combining different flavors (P3-F-35)"*

> *"I have a sensitivity to most external stimuli. I don't like bright lights, loud noises and certain smells. Especially the sounds make me nervous. I use headphones when I'm outside (P5-M-30)"*

> *"I feel like I can see sounds. I can even taste it sometimes. That's what makes me such a talented musician. (P10-M-33)"*

"Raising voices scares me. My headphones are always with me. Also hate from the white colored lights... I can smell strange things. When I was little, this was very strange to my family. So when I told them that anger has a smell, they were quite surprised. Other than that, I can smell hot and cold air, electricity, certain diseases or laughter. And I'm almost always right about that. I guess I have a special sensitivity to this (P1-F-32)"

"My ears hear very well. I can distinguish even very small sounds. I think that's why I love music so much. Most of the time when I hear a song once or twice, I can play it. When sounds come to my ears, I feel as if they have shapes and I can see them (P4-F-34)"

"...I am very sensitive to smells. I cannot tolerate odors other than cleaning related odors. My home, my clothes, my surroundings should always smell the way I want. Or I feel sick (P7-M-35)"

Theme 5. Routines

As a result of the questions asked to the participants about their routines, it was seen that they had certain routines and they were strictly adhered to these routines.

Table 5. Content analysis of the responses of the participants to the question "What would you say about your routines?"

Theme	Codes	Frequencies
Routines	Daily routines	6
	Personal care routines	5
	Routines related to work life	4

Participants used the following statements regarding their routines:

"I stick to my routines. I don't like surprises in my daily work. The times I wake up, have breakfast, get in and out of work, and return home are fixed. I go to the cinema once every two weeks. 2 days a week to gym. This order is important to me (P2-M-29)"

"I think routines make actions perfect. Therefore, they are indispensable for me. I like to live my life according to a plan. Sometimes I even have a plan B and a C in case things don't work out. 'Let it flow' means chaos (P1-F-32)"

"I don't like going out of my routines. My routines protect me from setbacks and nasty surprises (P4-F-34)"

"Although I work from home, I have a strict schedule. The time when I wake up, have breakfast, start work, take a break for lunch and finish the work is certain. Unless I'm very sick or something, this doesn't change (P7-M-35)"

Discussion

According to the data obtained from the literature and clinical experience, individuals with superiority and Asperger's have common characteristics. For example, verbal fluency or precociousness are broad for them and they all may have perfect capacity (Levy, 1988; Frith, 1991; Clark, 1992; Silverman, 1993). Despite the limitations of the study, the data obtained from the participants support these findings. However, it is generally thought that the distinction between high-functioning autistic people with superior intellectual abilities are ambigious (Myles et al., 2004). Therefore, more studies are needed in this context.

There are studies showing admiration for letters or numbers in individuals with both high-functioning autism and gifted Asperger's, and both groups have a strong memorization memory from an early age. Both can show a keen concern in a particular topic and acquire a vast amount of literal information on that topic (Klin et al., 1995; Gallegher, 2004). They can annoy their peers with their endless talk about their interests. They can ask endless questions or give very long, detailed and specific answers to seemingly endless questions. However, as seen in the study, individuals with gifted

Asperger's syndrome have more unusual occupations (outside of the usual/out-of-the-ordinary habits) and interests compared to those with high-functioning autism. Kerbeshian et al. (1990) suggest that limited and marked interests or insensitivity in many areas are important in differentiating Asperger's syndrome (Kugler 1998).

Individuals with gifted AS are defined as individuals with a wide variety of abilities, such as gifted individuals. Hans Asperger's observation is that all individuals with this syndrome have a "special interest in a particular field that enables them to achieve quite extraordinary levels of performance" (Asperger and Frith, 1991). The extraordinary abilities and performances of the participants in the fields of painting, music, literature or informatics also support these findings. This interest is like the way gifted individuals are told to have "passions" (Torrance, 1965; Betts & Kercher, 1999).

While exhibiting extraordinary abilities in selected fields, both gifted individuals with Asperger's syndrome and gifted individuals may perform at an average level in other areas (Baum, Owen and Dixon, 1991; Wing, 1991). Both gifted individuals and individuals with Asperger's Syndrome are described as experiencing an irregular development, especially when cognitive development is compared with social and emotional development at a young age (Hollingworth, 1942; Altman, 1983; Asperger & Frith, 1991; Silverman, 1993). Especially from the point of view of emotional development, it is seen that individuals with gifted Asperger's have problems in social interaction and communication skills, understanding the perspective of others and showing loyalty to people compared to gifted and high-functioning autistic individuals. As participants in the study noted, individuals with Asperger's require coping with intense emotional states in social relationships (Ellis and Dumas, 2018). However, in this case, this process can turn into a very difficult situation for Aspergers due to its many features (Hillier et al., 2018). Compared to gifted and high-functioning autistic individuals, individuals with gifted Asperger's may have difficulty developing a romantic relationship and understanding the emotional dimension of the romantic relationship (Baron-Cohen et al., 2001; Byers et al., 2013).

Despite possessing an average to above-average Intellect, people with AS frequently struggle to empathize with others due to a lack of social cognition or theory of mind, according to Carothers and Taylor (2004), who also agree with Baron-Cohen et al (2003). While it has been discovered that people with AS have a strength in studying, researching, categorizing, or building systems, it has also been discovered that this capacity is frequently found to be adversely connected with empathizing (Myles et al, 2007).

On the other hand, there are studies showing that rates of depression are more common in both gifted individuals with Asperger's and high-functioning autism than in gifted individuals and other segments of society (Rumsey et al. 1985; Tantam 1988; Ghaziuddin et al., 2002; Larsen and Mouridsen, 1997; Kim et al., 2000). When considering depression in autism and Asperger's syndrome, there are diagnostic difficulties because the characteristics of these disorders such as social withdrawal, appetite and sleep disorders are also the main symptoms of depression. Verbal and nonverbal communication impairment in both Asperger's and individuals with high-functioning autism can mask the symptoms of depression. Symptoms associated with high-functioning autism and Asperger's syndrome, such as obsessions and self-harm, may increase during an episode of depression. Depression in some cases; It has been shown to be hidden by the symptoms of autism and Asperger's syndrome. A symptom of depression often reported in high-functioning autism and Asperger's syndrome is depressed mood, and depressed mood is identified as a symptom in nearly all case studies (Kim et al., 2000; Tsioursis et al., 2003). Both Asperger's and individuals with high-functioning autism may exhibit a developmental delay in certain components of the socio-emotional space. In both groups, difficulties in verbal comprehension can affect not only communication and social interaction, but also many areas of daily life.

Hypersensitivity to sensory stimuli is also common in individuals with both high-functioning autism and gifted Asperger's. Parents of individuals with both high-functioning autism and gifted AS often report their experiences of preferring to put on specific types of materials, consume foods with a specific fabric become withdrawn or run around sounds they find frightening, or resolutely reject certain facts. The results obtained in the study consistent with the findings obtained in the studies of Bettison, (1996); Tanguay et al., (1998) and Yates and Le Couteur, (2016).

Conclusion and Recommendations

It is claimed that individuals with gifted Asperger's are more persistent and rigid in their routines and habits, have a more developed imagination, show more motor stereotypes, and are constantly interested in strange, unusual objects and subjects compared to high-functioning autistic individuals and gifted individuals (Sussman, 1999). The participants insisted on their routines, habits and obsessions during the interview. Although studies with children with Asperger's syndrome show that they are routine-attached individuals like high-functioning autistic children, it has been observed that Asperger's individuals share their interests and take pride in them from early infancy (Kugler, 1998). In this context, individuals with gifted Asperger's differ from individuals with high-functioning autism (Ehlers et al., 1999; Ehlers and Gillberg, 1993).

The characteristics of gifted, high-functioning autistic and gifted individuals with gifted Asperger's and the characteristics stated in the literature are compatible with each other. The lack of empirical studies designed to compare these populations precludes comprehensive analysis, but a new line of research can be proposed. But empirical studies need to be increased. Because it is necessary to clarify who is normal gifted, who has Asperger's special talent or who has high-functioning autism. Some normally gifted individuals keep themselves away from social relations due to labeling. In this case, the confusion increases even more. On the other hand, the fact that children have been diagnosed with high-functioning autism instead of Asperger's diagnosis since 2013 exacerbates the paradox. It is thought that some of the characteristics conveyed by gifted adults with Asperger's disease interviewed in this study are not found in individuals with high functioning autism. Therefore, studies comparing the three groups are needed.

Studies with families of children, adolescents or young adults with high-functioning autism, giftedness and gifted Asperger's are very limited in the literature. This makes it impossible to observe the developmental stages of these individuals from an early age. In this context, it is seen that there is a need for studies with families, due diligence and appropriate training and development programs. For example, examining the similar and different characteristics of individuals with supernormal abilities and alexithymia and gifted individuals with Asperger's is a subject worth examining in new studies.

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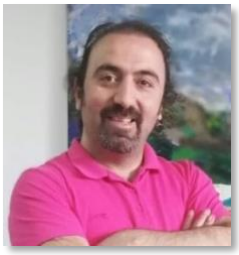

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Web site: https://avesis.cumhuriyet.edu.tr/hakansaricam

References

Altman, R. (1983). Social emotional development of gifted children and adolescents: A research model. *Roeper Review*, *6*(2), 65-68.

Attwood, T. (2003). Is there a difference between Asperger's Syndrome and high-functioning autism. Retrieved March 2, 2005, from http://www.tonyattwood.com.au/

Asperger, H., & Frith, U. T. (1991). 'Autistic psychopathy in childhood.

Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism-spectrum quotient (AQ): Evidence from asperger syndrome/high-functioning autism, malesand females, scientists and mathematicians. *Journal of autism and developmental disorders*, *31*(1), 5-17.

Baron-Cohen, S. (2003). The essential difference: Male and female brains and the truth about autism. Cambridge, MA: Basic Books. Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: An investigation of adults with Asperger syndrome or high-functioning autism, and normal sex differences. Journal of Autism and Developmental Disorders, 34, 163-175.

Baum, S., Owen, S. V., & Dixon, J. (1991). *To Be Gifted and Learning Disabled: From identification to practical intervention strategies*. Mansfield Center, CT: Creative Learning Press doi: doi.org/10.1007/978-1-4419-9116-4_1

Bettison, S. (1996). The long-term effects of auditory training on children with autism. *Journal of Autism and Developmental Disorders*, *26*(3), 361-374.

Betts, G. T.& Kercher, J. K. (1999). *Autonomous Learner Model: Optimizing Ability*. Alps Publishing.

Bowler, D. M. (1992). "Theory of Mind" in Asperger's Syndrome Dermot M. Bowler. *Journal of Child Psychology and Psychiatry*, *33*(5), 877-893.

Byers, E. S., Nichols, S., & Voyer, S. D. (2013). Challenging stereotypes: Sexual functioning of single adults with high functioning autism spectrum disorder. *Journal of autism and developmental disorders*, *43*(11), 2617-2627.

Carothers, D., & Taylor, R. (2004). Social cognitive processing in elementary school children with Asperger syndrome. Education and Training in Developmental Disabilities, 39, 177-187.

Clark, B. (1992). *Growing up Gifted, Developing the Potential of Children to Home and School* (4th ed.). London: Macmillan Publishing Company.

Crespi, B. J. (2016). Autism as a disorder of high intelligence. *Frontiers in neuroscience*, 300.

Creswell, J. W. (2016). Reflections on the MMIRA the future of mixed methods task force report. *Journal of Mixed Methods Research*, *10*(3), 215-219.

Ehlers, S., & Gillberg, C. (1993). The epidemiology of Asperger syndrome: A total population study. *Journal of child psychology and psychiatry*, *34*(8), 1327-1350.

Ehlers, S., Gillberg, C., & Wing, L. (1999). A screening questionnaire for Asperger syndrome and other high-functioning autism spectrum disorders in school age children. *Journal of autism and developmental disorders*, *29*(2), 129-141.

Ellis, W. E., & Dumas, T. M. (2018). Peers over parents? How peer relationships influence dating violence. In *Adolescent dating violence* (pp. 105-133). Academic Press.

Frith, U. (1991). *Asperger and His Syndrome*. Autism and Asperger syndrome, *14*, 1-36.

Frith, U., & Mira, M. (1992). Autism and Asperger syndrome. *Focus on Autistic Behavior*, *7*(3), 13-15.

Gallagher, J. J. (1985). *Teaching the gifted child*. Allyn & Bacon. https://doi.org/10.1177/001698628803200110

Gallagher, S. (2004). *Understanding interpersonal problems in autism: Interaction theory as an alternative to theory of mind*. *Philosophy, Psychiatry, & Psychology,* 11(3), 199-217.

Gardner, H. (1992). Assessment in context: The alternative to standardized testing. In B. R. Gifford & M. C. O'Conner (Eds.), Changing assessment: Alternative views of aptitude, achievement, and instruction (pp. 77–120). Boston: Kluwer.

Ghaziuddin, M., Ghaziuddin, N., & Greden, J. (2002). Depression in persons with autism: Implications for research and clinical care. *Journal of Autism and Developmental Disorders*, *32*(4), 299-306.

Gillberg, C., & Billstedt, E. (2000). Autism and Asperger syndrome: Coexistence with other clinical disorders. Acta *Psychiatrica Scandinavica, 102*(5), 321-330. doi: 10.1034/j.1600-0447.2000.102005321.x

Goldstein, G., Allen, D. N., Minshew, N. J., Williams, D. L., Volkmar, F., Klin, A., &Schultz, R. T. (2008). The structure of intelligence in children and adults with high functioning autism. *Neuropsychology, 22*(3), 301-312. doi: 10.1037/0894-4105.22.3.301.

Gray, C.A. (1998). Social stories and comic strip conversations with students with Asperger syndrome and high-functioning autism. In E. Schopler, G.B. Mesibov, & L. J. Kunce (Eds.), *Asperger syndrome or high-functioning autism* (pp. 167-198) New York: Plenum Press.

Hazen, E. P., Stornelli, J. L., O'Rourke, J. A., Koesterer, K., & McDougle, C. J. (2014). Sensory symptoms in autism spectrum disorders. *Harvard review of psychiatry*, *22*(2), 112-124.

Hillier, A., Goldstein, J., Murphy, D., Trietsch, R., Keeves, J., Mendes, E., & Queenan, A. (2018). Supporting university students with autism spectrum disorder. *Autism*, *22*(1), 20-28.

Hollingworth, L. S. (1942). *Gifted children above 180 IQ*. New York: World Book.

Kalbfleisch, M. L. (2012). Twice-exceptional students. Fundamentals of gifted education: *Considering multiple perspectives,* 358-368.

Kaufman, S. B., & Sternberg, R. J. (2008). Conceptions of giftedness. In S. I. Pfeiffer (Ed.), Handbook of giftedness in children (pp. 71–91). New York: Springer US

Kerbeshian, J., Burd, L., Randall, T., Martsolf, J., & Jalal, S. (1990). Autism, profound mental retardation and atypical bipolar disorder in a 33-year-old female with a deletion of 15q12. *Journal of Intellectual Disability Research*, *34*(2), 205-210.

Kim, J. A., Szatmari, P., Bryson, S. E., Streiner, D. L., & Wilson, F. J. (2000). The prevalence of anxiety and mood problems among children with autism and Asperger syndrome. *Autism*, *4*(2), 117-132.

Klin, A., Volkmar, F. R., Sparrow, S. S., Cicchetti, D. V., & Rourke, B. P. (1995). Validity and neuropsychological characterization of Asperger syndrome: Convergence with nonverbal learning disabilities syndrome. *Journal of Child Psychology and Psychiatry*, *36*(7), 1127-1140.

Klin, Ami. (2003). Asperger syndrome: An update. Revista brasileira de psiquiatria (São Paulo, Brazil : 1999). 25. 103-9. 10.1590/S1516-44462003000200011.

Kugler, B. (1998). The differentiation between autism and Asperger syndrome. *Autism*, *2*(1), 11-32.

Kunce, L., & Mesibov, G.B. (1998). Educational approaches to high-functioning autism and Asperger syndrome. In E. Schopler, G.B. Mesibov, & L. J. Kunceet (Eds.), *Asperger Syndrome or High-Functioning Autism* (pp. 227-261)? New York: Plenum Press.

Larsen, F. W., & Mouridsen, S. E. (1997). The outcome in children with childhood autism and Asperger syndrome originally diagnosed as psychotic. A 30-year follow-up study of subjects hospitalized as children. *European Child & Adolescent Psychiatry*, *6*(4), 181-190.

Levy, S., Zoltak, B., & Saelens, T. (1988). A comparison of obstetrical records of autistic and nonautistic referrals for psychoeducational evaluations. *Journal of Autism and Developmental Disorders*, *18*(4), 573-581.

Little, L., & Clark, R. R. (2006). Wonders and worries of parenting a child with Asperger syndrome & nonverbal learning disorder. *MCN: The American Journal of Maternal/Child Nursing*, *31*(1), 39-44.

Mazzone, L., Ruta, L., & Reale, L. (2012). Psychiatric comorbidities in asperger syndrome and high functioning autism: diagnostic challenges. *Annals of General Psychiatry, 11*(1), 16. doi: 10.1186/1744-859X-11-16.

Merchán-Naranjo, J., Mayoral, M., Rapado-Castro, M., Llorente, C., Boada, L., Arango, C., & Parellada, M. (2012). Estimation of the intelligence quotient using Wechsler Intelligence Scales in children and adolescents with Asperger syndrome. *Journal of Autism and Developmental Disorders*, *42*(1), 116-122.

Merriam, S. B. (2002). Introduction to qualitative research. *Qualitative Research in Practice: Examples for discussion and analysis*, *1*(1), 1-17.

Merriam, S. B. (2015). *Nitel araştırma: desen ve uygulama için bir rehber*. (3. Basımdan Çeviri). Turan, S. (Edt.) Ankara: Nobel Yayıncılık.

Myles, B. S., Dunn, W., Rinner, L., Hagiwara, T., Reese, M., Huggins, A., & Becker, S. (2004). Sensory issues in children with Asperger syndrome and autism. *Education and training in developmental disabilities*, 283-290.

Myles, Brenda & Lee, Hyo & Smith, Sheila & Tien, Kai-Chien & Chou, Y.-C & Swanson, Terri & Hudson, Jill. (2007). A large-scale study of the characteristics of Asperger syndrome. Education and Training in Developmental Disabilities. 42. 448-459.

Rubin, E., & Lennon, L. (2004). Challenges in social communication in Asperger syndrome and high-functioning autism. Topics in Language Disorder, 24(4), 271-285.

Rumsey, J. M., Rapoport, J. L., & Sceery, W. R. (1985). Autistic children as adults: Psychiatric, social, and behavioral outcomes. *Journal of the American Academy of Child Psychiatry*, *24*(4), 465-473.

Sanders, J. L. (2009). Qualitative or quantitative differences between Asperger's disorder and autism? Historical considerations. *Journal of Autism and Developmental Disorders, 39*(11), 1560–1567. doi: 10.1007/s10803-009-0798-0

Sansosti, F. J., Powell-Smith, K. A., & Cowan, R. J. (2010). High-functioning autism/Asperger syndrome in schools: *Assessment and Intervention. The Guilford Press.*

Silverman, L. K. (1993). *Counseling the gifted and talented*. Love Publishing Co., 1777 South Bellaire St., Denver, CO 80222.

Smith, R. S., & Sharp, J. (2013). Fascination and isolation: A grounded theory exploration of unusual sensory experiences in adults with Asperger syndrome. *Journal of autism and developmental disorders*, *43*(4), 891-910.

Stake, J. Y. (2015). Essays on quality evaluation and bidding behavior in public procurement auctions (*Doctoral dissertation, Örebro University*).

Subotnik, R. F., Olszewski-Kubilius, P., & Worrell, F. C. (2011). Rethinking giftedness and gifted education: A proposed direction forward based on psychological science. *Psychological science in the public interest*, *12*(1), 3-54. https://doi.org/10.1177/1529100611418056

Sussman, F. (1999). More than words. *Canada: Beacon Herald Press*

Tanguay, P. E., Robertson, J., & Derrick, A. (1998). A dimensional classification of autism spectrum disorder by social communication domains. *Journal of the American Academy of Child & Adolescent Psychiatry*, *37*(3), 271-277.

Tantam, D. (1988). Asperger's syndrome. *Journal of child psychology and psychiatry*, *29*(3), 245-255.

Tebartz van Elst, L., Pick, M., Biscaldi, M., Fangmeier, T., &Riedel, A. (2013). High-functioning autism spectrum disorder as a basic disorder in adult psychiatry and psychotherapy: Psychopathological presentation, clinical relevance and therapeutic concepts. *European Archives of Psychiatry and Clinical Neuroscience, 263*(S2), 189–196. doi: 10.1007/s00406-013-0459-3.

Torrance, E. P. (1965). Rewarding Creative Behavior; Experiments in Classroom Creativity.

Tsiouris, J.A., Cohen, I. L ., Patti, P.J. & Korosh, W. M . (2003) 'Treatment of Previously Undiagnosed Psychiatric Disorders in Persons with Developmental Disabilities Decreased or Eliminated Self-Injurious Behavior', *Journal of Clinical Psychiatry 64 (9):* 1081–90.

Wing, L. (1991). The relationship between Asperger's syndrome and Kanner's autism. In U. Frith (Ed.), *Autism and Asperger syndrome* (pp. 93–121). Cambridge University Press. https://doi.org/10.1017/CBO9780511526770.003

Winter-Messiers, M. A., Herr, C. M., Wood, C. E., Brooks, A. P., Gates, M. A. M., Houston, T. L., & Tingstad, K. I. (2007). How far can Brian ride the Daylight 4449 Express? A strength-based model of Asperger syndrome based on special interest areas. *Focus on Autism and Other Developmental Disabilities*, *22*(2), 67-79.

Yates, K., & Le Couteur, A. (2016). Diagnosing autism/autism spectrum disorders. *Paediatrics and Child Health*, *26*(12), 513-518.

Yin, R. K. (2004). *The Case Study Anthology*. Sage, 2004.

Yirmiya, N., & Sigman, M. (1991). High functioning individuals with autism: Diagnosis, empirical findings, and theoretical issues. *Clinical Psychology Review, 11*, 669–683.

Appendix 1. Semi-structured Interview Questions

Semi-structured Interview Questions

Q1. What did being with Asperger's give you in life, what did you achieve more easily?
Q3. What kind of psychological problems do you have?
Q4. How would you describe your relationships with people?
Q4. What do you think about sound, visual, smell or taste?
Q4. What would you say about your routines? (importance, commitment etc. how?)

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Research Article

The effect of STEM for gifted activities' mathematical problem-posing skills of gifted primary school students

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Abstract

STEM for gifted has become a rapidly developing field in gifted education. Many research findings on the use of STEM in the education of the gifted have increased the number of studies on how and in what way it will be applied. This study aimed to examine the effect of STEM for gifted activities on the problem-posing skills of gifted primary school students. The explanatory design of the mixed method was used in the study. The study included 16 gifted primary school students selected by convenient sampling. A problem-posing test and a semi-structured interview were used as data collection tools. The effect of STEM for gifted activities on problem-posing skills was determined by the Wilcoxon Signed Ranks test. Semi-structured interviews with gifted primary school students were analyzed with descriptive analysis. At the end of the study, it was concluded that STEM for gifted activities improved the problem-posing skills of gifted primary school students and their retention. Gifted primary school students expressed that they liked STEM for gifted activities; they liked the design phase the most, and it increased their interest in science, mathematics, and engineering. Gifted primary school students stated that problem-posing was moderately difficult because they did not do problem-posing activities at school, but their problem-posing skills improved thanks to STEM for gifted activities.

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Introduction

Educational activities are organized in schools for students who have cognitive developmental delays (learning, speaking, hearing, reading, writing, mathematics disorder), normally developing and gifted students. While students with this characteristic can receive education and training services in the same class, depending on their status, they can receive education and training services either in support education rooms in their schools or in special education institutions in accordance with their individual differences. Students with developmental delay; the hearing impaired participate in educational activities in institutions such as special education centers, and gifted students participate in education activities in SACs where ensures the development of their special capabilities Thanks to the differentiated and enriched education they experience, they acquire the skills of problem solving in daily life as well as acquiring high-level cognitive skills such as analysis, synthesis and evaluation as well. Apart from concrete thinking skills, studies about abstract thinking skills are also expected (Satmaz, Tortop & Deniz, 2018). Gifted students who come to SACs are individuals

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who perceive and learn complex concepts and ideas faster than their friends, and who are not content with learning more (Winebrenner, 2000). High-level thinking skills should be taken into account in order to discover the characteristics of gifted students and maximize their potential (Trna, 2014). Gifted students also show higher-order thinking skills such as problem solving and constructing (Yuan & Sriraman, 2011). In addition, the creativity characteristics of gifted students are associated with their mathematical problem-posing skills (Johnson, 2000; Sheffield, 2018).

Problem-posing is a learning model in which students set up the problem according to a certain situation and then solve the problem they have established. It is an inductive inquiry process that guides students' communication in the classroom and supports their critical thinking skills (Isik & Kar, 2012). In problem-posing, the student is expected to pose problems by combining metacognitive thinking skills with past life experiences, by giving instructions such as any table, figure, visual, operation, result and rule, real life problem, let's pose a problem (Ev-Cimen & Yildiz, 2017). Three different ways can be used for these problems expected from the student. The first of these is to pose a free problem that the student is asked to pose by using his/her creativity without limiting, the second is to pose a semi-structured problem that the student is asked to pose about the figure, table, story, picture or a problem appropriate to a given problem, and the third is to add to the problem given to the student, to change the given and conditions in the problem, to change the conditions in the problem. It is a structured problem-posing that is posed by fitting a subject or replacing the solution with the given ones (Kilic, 2011; Silver, 1994). In order for students to pose such problems, teachers are in the process of problem-posing; they should encourage their students to pose problems, do activities that will make mathematics fun and provide opportunities, give time to students to pose and solve problems, watch and listen to them during the problem-posing process, and only interfere with the mathematical operations of students who want help (Cheesemen, 2009). In this way, students; as their interest in mathematics increases, their fear of mathematics decreases. In addition, students' mathematics motivation increases, students can develop positive attitudes towards mathematics lessons, and even students' creativity characteristics improve (Altun, 2001; Lavy & Shriki, 2007; Silver, 1997; Yurtbakan & Aydogdu-Iskenderoglu, 2020).

In addition to the activities in the mathematics lesson, the activities in the sciences play an important role in the improvement of the creativity of gifted students. The practical implementation of science and mathematics sciences (Pang & Good, 2000), which are based on interconnected ways and share scientific processes such as problem solving and questioning, supports the improvement of students' science and mathematics skills (Tyler- Wood, 2000). STEM education, which is a differentiated and enriched education in which mathematics- science are applied together; It provides the opportunity for gifted students studying in SACs to express themselves and triggers the interests and abilities of students (Koshy, 2002; Omeroglu, 2004; Rinn, Plucker & Stocking, 2010; Tiryaki, Yaman & Cakiroglu, 2021).

STEM education which attracts the attention of countries both economically and politically; It aims to combine the fields of mathematics, engineering, science and technology to analyze education with a holistic approach by linking these disciplines (Broderick, 2018; Kuenzi, 2008; Smith & Karr-Kidwell, 2000). STEM education, which aims to support students' twenty first century skills, also enables students to realize how they transfer what they learn in the classroom environment to daily life, and to learn high-level thinking skills and meaningful learning. (Ministry of National Education of Turkey [MoNET], 2016; Yildirim & Altun, 2015). It also helps gifted students to better develop their skills such as looking at problems by using different disciplines together, thinking logically and critically, questioning, and being creative (Cepni, 2017; Roberts, 2012). In short, STEM education enables students to look at the problems they encounter in their lives with a critical perspective, to understand how tools and equipment work, to use technology effectively and to create original products by collaborating (Bybee, 2010; Hernandez, 2014).

In order for STEM education to be beneficial to students, some precautions must be taken. STEM practitioners, schools, administrators, and teachers should first start by considering their own needs and ideas (Savan-Gencer, Doğan, Bilen & Can, 2019). Practitioners should be educated and knowledgeable about STEM for gifted activities, willing and diligent (Aydeniz, 2017; Eroglu & Bektas, 2016; Toma & Greca, 2017). They should not be limited in material and time. In order for students to establish the connection between science, engineering, technology, mathematics disciplines, they

need to explain the ideas of each of these disciplines (Honey et al., 2014). They need to make students more productive by using measurement and evaluation tools more in the process and giving immediate feedback to students about assessments (Zengin, Kaya, & Pektas, 2021). In this context, in order for STEM education to be successful, students need to give opportunities to learn by doing, so that they can embody what they have learned, make production, that is, be successful in practice (Pehlivan & Uluyol, 2019).

Implementation of STEM for Gifted Activities

STEM for gifted requires students to use their knowledge and skills in science, technology, engineering, and mathematics disciplines to solve a social problem. In STEM for gifted, rather than making gifted students memorize information, students are expected to try to find solutions for the solution of the problem situation, to do research, to ask questions, and to produce original products while producing a solution. Gifted students are expected to solve the 21st century skills they have and the problems they encounter on a project basis. It is important to follow the steps below in STEM education (MoNET, 2020).

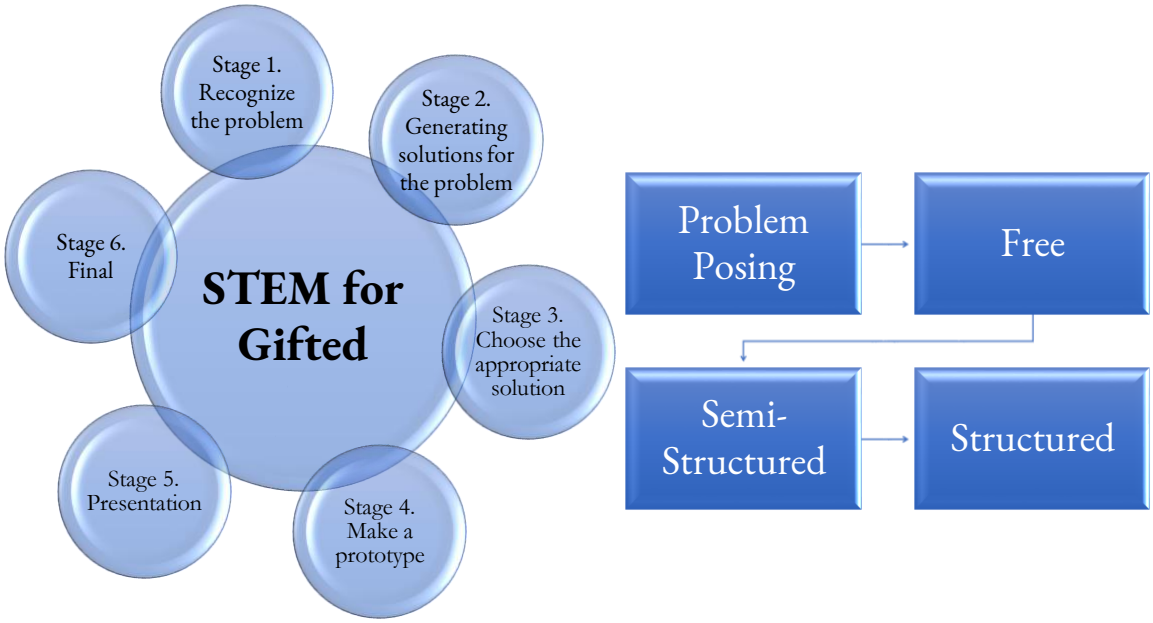

Figure 1. Problem-posing practice steps with STEM for gifted activities

Recognize the problem: The problem needs to be defined and analyzed in a cause-and-effect relationship (MoNET, 2020). It is tried to make gifted students feel the problem situations that we may encounter in daily life based on newspaper or television news and story books. For example, the students are reading the story of people who could not go to their fields on the other side because of the river in front of their house.

Generating solutions for the problem: Multiple possible solutions to the problem are suggested (MoNET, 2020). Gifted students are expected to come up with ideas on how to solve the problem by brainstorming after they are made to feel the problem situation in newspaper or television news or in story books. At this stage, the suitability of the solutions produced by the students is not discussed, and all the ideas are written on the board. For example, the ideas put forward by the students to solve the problem of crossing the river are written on the board.

Choose the appropriate solution: The appropriate idea is chosen among the ideas put forward by the students for the solution of the problem (MoNET, 2020). At this stage, solutions are discussed with the students in terms of criteria such as cost, safety, functionality, and not harming the environment, and a safe, functional, cost-effective, and environmentally friendly solution is chosen. For example, for the problem of crossing the river, cable cars, flying balloons, and bridge solutions are presented by the students. Bridge construction is chosen as a solution because it is safe, cost-effective, functional, environmentally friendly, and does not require any energy consumption.

Make a prototype: A product or prototype is developed and tested using the best solution (MoNET, 2020). At this stage, the necessary materials for the solution are given to the gifted students, and the students are expected to present

the product concretely by using their science, mathematics, engineering, and technology skills. Gifted students are divided into groups to provide an environment for collaborative work. For bridge construction, which is the most suitable solution for crossing the river, students are given a rope, straw, mouth stick, silicone gun, and silicone, and they are expected to produce a product as a group.

Presentation: Shares the product or prototype with other people and receives their comments and criticisms (MoNET, 2020). At this stage, the students present their prototype to the friend or friends they have chosen from the group in front of the class. The purpose of the presentation is to ensure that the good aspects of the prototype made by the students are taken as examples by other groups and to draw attention to the shortcomings seen by the students in other groups. For example, the gifted students argue that the bridge they built to solve the problem of crossing the river should be put in place to break the speed of the water in order not to damage the bridge due to the increase in the intensity of the water as a result of the melting of the snow and increasing rains in the spring months. In addition, it draws attention to the construction of a bow-shaped arch underneath the bridge in order to carry the weight on it.

Final: The product or prototype is evaluated, and ideas for improvement are developed (MoNET, 2020). At this stage, gifted students give their final shape to the prototype by considering each other's criticisms. For example; gifted primary school students give the bridge its final shape by placing springs that will allow it to flex under the bridge and feet that increase resistance to water violence in order to increase the load bearing capacity of the bridge.

STEM for gifted, after the STEM construction phase is completed, the problem-posing phase is started. In the problem-posing phase, first of all, the subject of mathematics related to the prototype we produce for the solution of the problems that we may encounter or encounter in our daily lives is discussed with the students. For example, it is concluded that the bridge prototype is related to the measurement learning domain (weight and length) of mathematics. Then the students are asked to pose a free problem related to the appropriate learning area. Free problem-posing, students are not limited and they are expected to pose problems that include the operations and numbers they want. Students are asked to present their problems on the board. Problem feature, unnecessary data usage and solvability are checked. Then, the semi-structured problem-posing phase is started. The students are given the data necessary for the problem, but the last sentence of the problem is not given. The reason for this is that the student determines the operations themselves using the given numbers. After the semi-structured problem situation is transformed into a problem by the gifted students, they are asked to make a presentation. Problem feature, unnecessary data usage and solvability are checked. Finally, the structured problem-posing phase is started. In structured problem-posing, students are given numbers and operations. Gifted students are expected to pose problems that can be solved, in which the given things are not used or added to the given ones. Problems posed by gifted students are evaluated according to criteria.

Effect of STEM education on gifted high school students' mathematical problem solving skills, their university preferences (Suarsana, Lestari & Mertasari, 2019; Vu et al., 2019), the effect of secondary school students on creativity and science attitudes, their attitudes towards coding, critical thinking, metacognitive awareness and It is seen that there aare studies examining the effect on problem solving skills, and only one study in the field of mathematics was conducted to examine the effect on problem-posing (Akben, 2020; Avci, Okusluk & Yildirim, 2021; Boran & Karakus, 2022; Erdogan & Gul, 2020; Ozcelik & Akgunduz, 2017; Tiryaki, Yaman & Cakiroglu, 2021). Although it has a large effect size on primary school students, which are mostly carried out with secondary school students, it is seen that STEM education (Becker & Park, 2011; Ecevit, Yıldız, & Balci, 2022) is done on the experiences of gifted primary school students in material development and project design (Kalkan & Eroglu, 2017; Karahan & Unal, 2019). In this sense, it is thought that examining the effect of STEM education on the problem-posing skills of gifted primary school students will fill the gap in the literature. In addition, the use of STEM activities (Kocak & Icmenoglu, 2012; Tiryaki, Yaman & Cakiroglu, 2021), which has an important role in developing creativity, which is one of the most sensitive components of giftedness, to develop problem-posing skills that require creativity (Davis & Rimm , 2004) provide students with a different perspective. important in terms of gain.

Problem of Study

The effect of STEM for gifted activities on the problem-posing skills of gifted primary school students will be examined in the research.

- Is there a statistically significant difference between the problem posing pre-test scores and post-test scores of gifted primary school students who receive STEM for gifted activities?
- Is there a statistically significant difference between the problem posing post-test scores of gifted primary school students receiving STEM for gifted activities students and their retention problem-posing test scores?
- What are the thoughts of gifted primary school 4th grade students about problem-posing with STEM activities for gifted students?

Method

Research Model

The explanatory design, which is one of the patterns of the mixed method, was adopted in the study. In the explanatory design, before the qualitative data is used to support the results, quantitative data are collected (Cresswell, 2008). Quantitative data collected in the post-pre test experimental design without control group were supported by qualitative data collected through a case study. For this reason, after the open-ended problem-posing test was applied to the gifted primary school students as a permanence-post and pre-test, interviews were conducted with the students about STEM for gifted activities and problem-posing with STEM for gifted activities.

Study Group

A total of sixteen primary school 4th grade students studying at a SAC in the Eastern Black Sea region in Turkey participated in the study by way of convenient sampling. The demographic information of the gifted primary school students is shown in Table 1.

Table 1. Structures of students and coding

No	Age	Gender	Favorite lesson	Enrolled program	Codes
1	10	Female	Science	Supportive Program	S1-F-10
2	10	Male	Mathematics	Supportive Program	S2-M-10
3	10	Male	Mathematics	Supportive Program	S3-M-10
4	10	Female	Science	Supportive Program	S4-F-10
5	10	Female	Turkish lesson	Supportive Program	S5-F-10
6	10	Male	Mathematics	Supportive Program	S6-M-10
7	10	Male	Science	Supportive Program	S7-M-10
8	10	Male	Mathematics	Supportive Program	S8-M-10
9	10	Female	Mathematics	Supportive Program	S9-F-10
1o	10	Male	Social studies	Supportive Program	S10-M-10
11	10	Male	Social studies	Supportive Program	S11-M-10
12	10	Female	Mathematics	Supportive Program	S12-F-10
13	10	Male	Turkish lesson	Supportive Program	S13-M-10
14	10	Female	Mathematics	Supportive Program	S14-F-10
15	10	Male	Science	Supportive Program	S15-M-10
16	10	Male	Mathematics	Supportive Program	S16-M-10

All of the students are 10 years old and are studying in the supportive education program of the SAC. Ten of the students are boys and 6 of them are girls. Eight of the students like mathematics the most, 4 like science lessons, 2 of them like social studies and Turkish lessons. The students are coded in a way that shows the participant number, gender and age (S1-F-10, S2-M-10, ..., S16-M-10).

Data Collection Tools

In the study, open-ended problem-posing test and semi-structured interview form were used.

Problem-Posing Test

The test, which includes 4 open-ended questions, was prepared for 2 structured, 1 free problem-posing and 1 semi-structured. Permission was obtained from the authors for the study, and 3 questions in the test (1 structured, 1 semi-structured, 1 free problem-posing) were used by taking the opinions of 3 experts in the field of mathematics education. While preparing the open-ended test, first of all, problem-posing tests developed in the literature to reveal the problem-posing skills of primary school students were examined. Then, 4 questions (2 structured, 1 semi-structured, and 1 free) were prepared to reveal the problem-posing skills of gifted students. The questions were presented to the opinions of three experts in the fields of one gifted and two primary school mathematics. After the approval of the experts, the problem-posing test was administered as a pilot to four gifted students. Student answers were scored separately by the researchers, and the consistency between the researchers was checked using the Kendall's W test. It was determined that the agreement was 100%.

Semi-Structured Interview

Prepared by the researcher; "Did you like STEM for gifted activities, and if so, which part did you like the most? Did you find STEM for gifted activities useful, and if so, what are the benefits? Is problem-posing difficult, if so why, what are your views on STEM for gifted activities and problem-posing?" questions were asked to the students. For the interview tool, 3 experts (primary school mathematics teaching) were consulted and the tool was finalized in line with expert opinions (see Appendix 1).

Before starting the study, STEM for gifted activities were examined from the literature and ten weeks STEM for gifted activities was planned by the researchers. While planning the activities for STEM for gifted activities, help was received from two academicians in the field of science who have academic studies on STEM for gifted activities and a science teacher who has 20 years of experience and conducts STEM for gifted activities workshops with gifted students. After completing the STEM for gifted activities, the activities were explained to two experts in the field of primary school mathematics education and 1 primary school teacher with 15 years of teaching experience who worked on problem-posing, and opinions were received about which subject of mathematics would be asked to pose problems by connecting the students. STEM for gifted activities activities planned in line with expert opinions are shown in Table 2.

Table 2. STEM for gifted activities associated with mathematics subjects

No	Activity title	Science	Math subject
1	Bird's nest (MoNET, 2020)	Life in living things	Natural numbers
2	Wind binoculars	Motion and force	Fractions
3	Parachute	Motion and force	Measuring time
4	Air powered car (MoNET, 2020)	Motion and force	Measuring length
5	Rocket making	Motion and force	Measuring length
6	Bridge construction	Motion and force	Weighing
7	Catapult (MoNET, 2020)	Motion and force	Weight-length
8	Air powered vacuum cleaner	Motion and force	Measuring area
9	Underwater vehicle	Motion and force	Measuring liquid
10	Thermometer	Heat	Graphic

The air-powered car activity in the book "Achievement-Centered STEM Activities" published by the General Directorate of Private Education Institutions of the MoNET in 2019 was applied to the students. In the first step of STEM for gifted activities, which is define and analyze the problem; Students are made aware of what kind of power the air we breathe every second can create when compressed, and where this power can be used in our lives. Afterwards, they are asked whether the thrust of the air can be used in transportation, whether a transportation vehicle can be made using the power of the air, and their opinions are taken about how the air can be compressed. In the second step, find possible solutions and choose the best; The students are asked what can be used to trap the air first and then expel it. In the third

step, make an example and test it; Students are divided into groups and each group is given 3 straws, 1 plastic bottle, 5 plastic bottle caps, skewers, balloons and tape, and the students are asked to design a car that works with balloons. In the fourth stage, share the product; each group chooses a spokesperson and explains their designs in detail to their friends. During the narration, he takes note of the criticisms of his friends, and the group who does not present their design takes note of the good idea in the group. In the last step, which is to evaluate the product and think better; After sharing, students are asked what they can do to improve their designs (MoNET, 2019). After completing the STEM for gifted activities steps, the students were asked which subject of mathematics we can associate the car with the air. Based on the length measurement answer received from the students, they were asked to pose and solve one free problem. Afterwards, the students were given the statement "The air powered car made by Zeynep goes 50 meters, the air powered car made by Egemen goes 40 meters..." and the students were asked to turn the statement into a problem and solve it. Finally People: Zeynep and Yaren, Numbers: 90, 30, 4; Operation: They were asked to pose and solve problems by giving addition and division data. After each problem-posing phase, the problems were evaluated by the students in terms of being logical, solvable, understandable, and designed in accordance with the STEM for gifted activity, and feedback was given to the students about their problems.

Figure 1. STEM for gifted activity example: Bird's nest, wind binoculars, parachute, rocket making, air powered car, bridge construction, catapult, air powered vacuum cleaner, underwater vehicle, thermometer

Before starting the application, the open-ended problem-posing test was administered to the students as a pre-test. Then, STEM for gifted activities were designed for 10 weeks (once a week) and problem-posing studies were carried out about the activity. The open-ended problem-posing test was applied as a post-test the week after the applications ended. The open-ended problem-posing test was applied for the last time as a permanence test 3 weeks after the post-test was administered. In the problem-posing test applied to the students, "3" points if the problems are set up correctly and completely solved (1+2), "2" points if the problem has been posed but the solving is half done (1+1), "1" point if only the problem has been posed, if the problem has not been posed or the numbers given Although it is used, if it is not a problem statement, a score of "0" is given (Yurtbakan & Aydogdu-Iskenderoglu, 2022). A total of 9 points can be obtained from the test; The variation between the data obtained from the permanence test- post test and pre test was analyzed with the Wilcoxon Signed Ranks test. The effect size of the statistically significant results was calculated.

Semi-structured interviews with the students were analyzed with descriptive analysis, the data obtained were shown in the table and after the interpretation of the table, the student views were conveyed as they were.

Results

In this section, descriptive analysis results obtained from gifted primary school students and Wilcoxon Signed Ranks Test results are included.

The Effect of STEM for Gifted Activities on Problem-Posing Skills

The open-ended problem-posing test, which was applied as a permanence and post-test after the implementation of STEM for gifted activities, was applied to gifted primary school students as a pre-test, The results of the applied tests are presented in tables together with the results of the interviews with the students.

Table 3. The scores of the students in the problem-posing pre-post-test, retention test

Students	Pretest			Posttest			Retention Test			PrS	PsS	RS
	1	2	3	1	2	3	1	2	3			
S1	3.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	6.00	9.00	9.00
S2	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00
S3	3.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	6.00	9.00	9.00
S4	3.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	6.00	9.00	9.00
S5	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00
S6	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	,00	9.00	9.00	6.00
S7	3.00	3.00	,00	3.00	3.00	,00	3.00	3.00	,00	6.00	6.00	6.00
S8	1.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	9.00	9.00
S9	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00
S10	3.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	6.00	9.00	9.00
S11	1.00	3.00	,00	1.00	3.00	,00	3.00	3.00	3.00	4.00	4.00	9.00
S12	3.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	6.00	9.00	9.00
S13	1.00	3.00	,00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	9.00	9.00
S14	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00
S15	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00
S16	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	9.00	9.00	9.00

PrS: Pre-test total scores **PsS**: Posttest total scores **RS**: Retention test total scores

In the question requiring semi-structured problem-posing, it was determined that 13 of the gifted students in the pre-test, 15 in the post-test, and all of them in the permanence test were able to both pose and solve the problem they posed. In the second question of the test (free problem-posing), it was observed that all of the gifted students were able to pose a problem successfully both in the retention, post-test and pre-test and were able to solve the problem correctly. In the third question of the test (structured problem-posing), it was revealed that 7 gifted primary school students were able to pose and solve problems in the pre-test and 14 students in the permanence and post-test. In this sense, it can be thought that more than half of the gifted students have difficulties in setting up structured problems, but they overcome this difficulty with the help of STEM for gifted activities .

Table 4. Problem-posing pre-post test Wilcoxon Signed Rank Test

	Post-pre	n	Mean r.	Sum of R.	z	partial η^2	p
Problem-posing	**Neg.**	0	,00	,00			
	Pos.	7	4.00	28.00	-2,460	0.62	.01
	Equ.	9					

It has been determined that STEM for gifted activities have a positive effect on the problem-posing skills of gifted students ($p<.05$).

Table 5. Problem-posing post-test-retention test Wilcoxon Signed Rank Test

	Post-pre	n	Mean r.	Sum of R.	z	p
Problem-posing	**Neg.**	1	1.00	1.00		
	Pos.	1	2.00	2.00	-.447	.66
	Equ.	14				

It has been determined that the positive effect of STEM for gifted activities on the problem-posing skills of gifted students is permanent ($p>.05$).

Views of Gifted Students on STEM for Gifted Activities and Problem-Posing

In this section, the views of gifted students about liking STEM for gifted activities and the part they like most, about the usefulness of STEM for gifted activities , about the difficulty and reason of problem-posing, and about posing problems with STEM for gifted activities are given

Table 6. The students' enjoying of STEM for gifted activities and their favorite stage

Enjoyment	Most enjoyable stage	Students	f
Yes I enjoyed(except for S5-F-10)	Finding suitable solution	S2, S8, S14	3
Yes a little enjoyed (S5-F-10)	Design	S5, S6, S7, S9, S16	5

A total of 7 gifted primary school students stated that they enjoyed STEM for gifted activities . More than half of the gifted primary school students stated that they enjoyed the design part of the activities the most. These are the students' opinions with the code S5-F-10 "*I enjoyed it a little bit. I had fun there. I enjoy the design stage. I enjoyed designing more events." expressed as.* In Table 7 below, students' views on whether STEM for gifted activities are beneficial or not are given.

Table 7. Gifted students' views about usefulness of STEM for gifted activities

Usefulness	Benefits	Students	f
Yes they are useful (all)	My math skills have improved.	S7, S8	2
	My interest in science has increased.	S2, S5, S6, S8, S16	5
	My interest in mathematics has increased.	S2, S5, S6, S8, S16	5
	My interest in technology has increased.	S8, S16	2
	My interest in engineering has increased.	S2, S7, S8, S9, S16	5
	My thinking skills have improved.	S2, S14	2

All gifted primary school students stated that they found STEM for gifted activities useful (see Table 7.). The students were asked, "*How did STEM for gifted activities benefit you*?" The students said that their interest in science, mathematics and engineering increased the most. S8-M-10 of the students expressed their thoughts on the subject as follows:

> "*I was more interested in science and mathematics. It says divide the top in half. We can calculate by eye, so it increased my math skills. Looking at the science, it increased my interest. I started to like science more. Technology and engineering increased my interest in them (S8-M-10).*
>
> *In addition to this, S14-F-10 expressed his thoughts on the benefit situation as "Yes, I can make up my mind because it improves our minds in the lessons."* stated in the format. Table 8 below shows the students' views on problem-posing with STEM for gifted activities.

Table 8. Opinions on problem-posing with STEM for gifted activities

	Students	f
Difficulty in problem-posing		
Easy	S6, S16	2
Middle	S5, S8, S9, S14,	4
Hard	S2,	1
Indecisive	S7	1
Cause of difficulty in problem solving		
We didn't do it at school.	Except for S8	7
Because I can install it easier than anyone.	S8	1
Problem-posing with STEM for gifted activities		
Improved my problem-posing skills.	All	8
Made math class easier.	S14	1
It improved my thinking skills.	S14	1
Increased my interest in math.	S14	1
My creativity has improved.	S2	1

Half of the gifted primary school students stated that they stated problem-posing as difficult, almost all of the students stated that there was no problem-posing practice at school, and that STEM for gifted activities improved their problem-posing skills. Opinions of the student coded S16-M-10 on the subject *"No, it was very nice to do with STEM for gifted activities. In this way, I can set up a better problem in the past, I couldn't at all because I didn't try. We weren't doing*

it at school, I came across it in only one homework, and that's just one", while the students with the coded S14-F-10 expressed their opinions as *"I think it is of medium difficulty. Thanks to STEM for gifted activities, it improved my brain on problem solving. It facilitated the mathematics lesson, my thinking skills improved, my interest in mathematics increased."* expressed as. The student with the code S6-M-10 said that it is not difficult, *"No, it is not difficult. At first, I couldn't pose a problem, but now I can make a problem with it"*, S2-M-10 coded student thought "*It is difficult for some to pose a problem. I could never have established it, I had no interest. We didn't do it at school. It just got easier with STEM for gifted activities. At school, I can sometimes do it faster than my friends when asked. I can pose various problems in a different way"* expressed as.

Conclusion and Discussion

In the study carried out to determine the effectiveness of STEM for gifted activities in the problem-posing skills of gifted primary school students; It has been determined that STEM for gifted activities not only improve the problem-posing skills of gifted students, but also ensure their permanence. Gifted primary school students stated that they enjoyed STEM for gifted activities, they enjoyed mostly at the design stage, and it increased their interest in science, mathematics and engineering. Gifted primary school students stated that problem-posing was moderately difficult because they did not do problem-posing activities at school, but their problem-posing skills improved thanks to STEM for gifted activities.

STEM education positively affects mathematics achievement and mathematics attitude (Yildirim & Altun, 2015). In the study, it was revealed that STEM for gifted activities improved the problem-posing skills of gifted primary school students and continued their permanence. The fact that STEM for gifted activities require calculations at the stage of testing the functionality of problem-solving-oriented products designed by students using science topics may have given students a different perspective. Because gifted students can think differently than their normally developing friends and their creative features are more developed. In Erdogan and Gul's (2020) study, gifted secondary school students were able to pose semi-structured problems of any difficulty; In the studies of Carkci, (2016) and Deringol (2019), it was concluded that the students with normal development could not solve the problems with the desired competence. In this sense, the fact that gifted students have the ability to think creatively, which is necessary for problem-posing (Daher & Anabousy, 2018; Mingus & Grassl, 1999), may be the reason why they are better at problem-posing skills than avarage student.

In the study, gifted primary school students stated that they liked STEM for gifted activities and that they enjoyed the design phase the most. In many studies, it has been concluded that students find STEM education fun and enjoy the practical activities rather than the theoretical part (Kalkan & Eroglu, 2017; Ozcelik & Akgunduz, 2018; Tiryaki, Yaman & Cakiroglu, 2021). In this study, gifted primary school students enjoyed STEM for gifted activities and they stated that they increased their interest in science, mathematics and engineering. The opinions of gifted students as enjoyed about STEM for gited activities may enable us to evaluate that it has high social validity. In another study, it was concluded that gifted students gain abilities such as cooperation, creativity, communication and critical thinking in addition to their mathematics and science achievements (Ozcelik & Akgunduz, 2017). In STEM for gifted activities, students are expected to notice the problem in a given situation, and to design after producing solutions for the problem they have noticed. In other words, the transformation of information into design rather than theory, and then into a product, increases the motivation of students (Ozcelik & Akgunduz, 2018). Students' motivation to do STEM for gifted activities by using different disciplines such as science, mathematics, engineering and technology may have increased their motivation. However, the reason why the students did not state that they increased their interest in the technology discipline may be that they did not use any software or coding via computer while designing the products. So students do not feel the importance of technology may be that they are not aware of the fact that tools such as pencils and paper are technological products.

Gifted primary school students stated that problem-posing was moderately difficult because they did not do problem-posing activities at school. Isik and Kar (2012) also concluded that students with normal development do not do enough problem-posing activities in their schools. However, gifted students in the study stated that their problem-posing abilities improved thanks to STEM for gifted activities. In this sense, the fact that the problem-posing skills of the gifted students

who carry out their educational activities in the same class with the students with normal development do not develop may be due to the lack of sufficient problem-posing activities in schools. STEM for gifted activities are student-centered and that will trigger the student's different thinking skills are carried out and time is allocated for activities such as problem-posing, it can be ensured that gifted students reach the desired goal. Otherwise, as Cetinkaya and Soybas (2017) concluded, students may not be able to pose neither original nor creative problems..

Recommendations

In order to increase technology interests with gifted students, it may be necessary to implement software and coding applications while performing STEM for gifted activities .

- Different thinking skills of students can be improved by conducting studies in which different disciplines such as STEM for gifted activities take place together in schools where gifted students continue their education activities outside of SACs.
- In order not to leave the improvement of problem-posing skills of gifted students to SACs, students' problem-posing skills can be developed by making use of student-centered methods such as STEM for gifted activities in their own schools.
- The study can also be carried out with gifted secondary school students.
- The effect of STEM for gifted activities on the problem solving skills of gifted primary school students can be investigated.

Limitations of Study

Conducting this study with sixteen gifted students is a limitation and educational term. In addition, only 10 STEM for gifted activities were performed in the study.

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References

Akben, N. (2020). Effects of the problem-posing approach on students' problem solving skills and metacognitive awareness in science education. *Research in Science Education*, *50*(3), 1143-1165.

Altun, M. (2001). *Matematik öğretimi (mathematics teaching)*. Bursa: Erkam Matbaası.

Avci, E., Okusluk, F., & Yildirim, B. (2021). The effect of STEM-based robotic coding activities on gifted students' attitudes towards coding. *Journal of Educational Theory and Practice Research, 7*(2), 228-235.

Aydeniz, M. (2017). *Eğitim sistemimiz ve 21. yüzyıl hayalimiz 2045 hedeflerine ilerlerken, Türkiye için STEM odaklı ekonomik bir yol haritası/ our education system and our 21st century dream advancing to 2045 goals a stem-oriented economic roadmap for Turkey*. University of Tennessee, Knoxville.

Bakioglu, A., & Levent, A. F. (2013). Suggestions for gifted education in Turkey. *Journal of Gifted Education Research, 1*, 31-44

Becker, K., & Park, K. (2011). Effects of integrative approaches among science, technology, engineering, and mathematics (STEM) subjects on students' learning: A preliminary meta-analysis. *Journal of STEM Education: Innovations & Research, 12*(5-6), 23-37.

Boran, M., & Karakus, F. (2022). The mediator role of critical thinking disposition in the relationship between perceived problem-solving skills and metacognitive awareness of gifted and talented students. *Participatory Educational Research, 9*(1), 61-72.

Broderick, N. (2018). *The future "Vision" for science education: a critical analysis of the STEM education policy in an Irish context*. Paper presented at 8th Science and Mathematics Education Conference (SMEC). Dublin, Ireland.

Bybee, R. W. (2010). What is STEM education? *Science, 329*(5995), 996-996.

Cheeseman, J. (2009). Young children are natural inquirers: Posing and solving mathematical problems. *Waikato Journal of Education, 24*(2), 11-22. https://doi.org/10.15663/wje.v%vi%i.664

Creswell, J. W. (2008). *Educational research planning, conducting and evaluating quantitative and qualitative research*. International Pearson Merril Prentice Hall

Carkci, I. (2016). *İlkokul 4. sınıf öğrencilerinin farklı problem kurma durumlarına yönelik ortaya koydukları problemlerin incelenmesi (Investigation of the problems encountered by 4th grade primary students in different problem posing situations).* Master thesis. Gazi University, Ankara.

Cepni, P.D. (2017). *Kuramdan uygulamaya STEM+E eğitimi (STEM+E education from theory to practice)*. Ankara: Pegem Akademi.

Cetinkaya, A., & Soybas, D. (2017). İlköğretim 8. sınıf öğrencilerinin problem kurma becerilerinin incelenmesi. *Journal of Theoretical Educational Science, 11*(1), 169-200.

Daher, W., & Anabousy, A. (2018). Creativity of pre-service teachers in problem posing. *EURASIA Journal of Mathematics, Science and Technology Education, 14*(7), 2929-2945

Davis, G. A., & Rimm, S. B. (2004). *Education of the gifted and talented*. Boston, MA: Pearson Education Press.

Deringol, Y. (2019). İlkokul dördüncü sınıf öğrencilerinin problem kurma ve çözme becerileri ile akademik benlik durumları*(*Problem forming and solving skills and academic self-status of fourth grade students*). Mediterranean Journal of Educational Research, 13*(29), 172-187. doi: 10.29329/mjer.2019.210.10

Ecevit, T., Yildiz, M., & Balci, N. (2022). Türkiye'deki STEM eğitimi çalışmalarının içerik analizi (Content analysis of stem education studies in Turkey). *Bolu Abant Izzet Baysal University Journal of Faculty of Education, 22*(1), 263-286.

Erdogan, F., & Gul, N. (2020). An investigation of mathematical problem posing skills of gifted students. *Pegem Eğitim ve Öğretim Dergisi, 10*(3), 655-696. http://dx.doi.org/10.14527/pegegog.2020.022

Eroglu, S., & Bektas, O. (2016). STEM eğitimi almış fen bilimleri öğretmenlerinin stem temelli ders etkinlikleri hakkındaki görüşleri (Ideas of science teachers took STEM education about STEM based Activities). *Journal of Qualitative Research in Education, 4*(3), 43-67.

Ev-Cimen, E., & Yildiz, S. (2017). An investigation of problem posing activities in secondary school mathematics textbooks. *Turkish Journal of Computer and Mathematics Education, 8*(3), 378-407.

Hernandez, J. F. (2014). *The implement of an elementary STEM learning team and the effect on teacher self-efficacy: An action research study*. Doctoral thesis. Capella University, Minnesota.

Honey, M., Pearson, G., & Schweingruber, H. (2014). *STEM integration in K-12 education: Status, prospects, and an agenda for research*. Washington, DC: National Academies Press.

Isik, C., & Kar, T. (2012). Matematik dersinde problem kurmaya yönelik öğretmen görüşleri üzerine nitel bir çalışma (A qualitative study on teacher views of problem posing in mathematics lesson). *Milli Eğitim, 194*, 199-215.

Johnson, D. T. (2000). *Teaching mathematics to gifted students in a mixed-ability classroom*. Reston, VA: ERIC Clearinghouse on Disabilities and Gifted Education.

Kalkan, C. & Eroglu, S. (2017). Destek eğitim odalarında üstün/özel yetenekli öğrenciler için stem materyallerine dayalı örnek etkinliklerin tasarlanması (Outstanding/specialty in support training rooms stem for gifted students sample activities based on their materials designing). *Journal of Gifted Education and Creativity, 4*(2), 36-46.

Karahan, E., & Unal, A. (2019). Gifted students designing eco-friendly STEM projects. *Eğitimde Nitel Araştırmalar Dergisi, 7*(4), 1553-1570.

Kocak, R., & Icmenoglu, E. (2012). Üstün yetenekli öğrencilerin duygusal zekâ ve yaratıcılık düzeylerinin yaşam doyumlarını yordayıcı rolü (Emotional intelligence and creativity as predictors of life satisfaction among gifted students). *Turkish Journal of Psychological Counseling and Guidance*, *4*(37), 73-85.

Koshy, V. (2002). *Teaching gifted children 4-7: A guide for teachers*. London: David Fulton Publishers Ltd.

Kuenzi, J. (2008). *Science, technology, engineering, and mathematics (STEM) education: background, federal policy, and legislative action*. Crs Report for Congress.

Lavy, I., & Shriki, A. (2007). *Problem posing as a means for developing mathematical knowledge of prospective teachers*. Paper presented at the meeting of 31st Conference of the International Group for the Psychology of Mathematics Education, Seoul.

MoNET, (2016). (*STEM eğitimi raporu (STEM education report)*. Ankara: Yenilik ve Eğitim Teknolojileri Genel Müdürlüğü.

MoNET, (2019). *Kazanım merkezli STEM uygulamaları (Outcome-based stem applications).* https://ookgm.meb.gov.tr/meb_iys_dosyalar/2019_01/29164143_STEM_KitapYk.pdf

Mingus, T., & Grassl, R., 1999.What constitutes a nurturing environment for the growth of mathematically gifted students? *School Sciences and Mathematics, 99*(6), 286-293.

Omeroglu, E. (2004). *Üstün yetenekli çocukların eğitim ihtiyaçlarının karşılanmasında yaratıcı dramanın yeri (The place of creative drama in meeting the educational needs of gifted children).* Üstün Yetenekli Çocuklar Seçilmiş Makaleler Kitabı. Çocuk Vakfı Yayınları.

Ozcelik, A., & Akgunduz, D. (2018). Üstün/özel yetenekli öğrencilerle yapılan okul dışı stem eğitiminin değerlendirilmesi *(Evaluation of gifted/talented students' out-of-school STEM education). Trakya University Journal of Education Faculty, 8(*2), 334-351.

Pang, J., & Good, R. (2000). A review of the integration of science and mathematics: Implications for further research. *School Science and Mathematics*, *100*(2), 73-82.

Pehlivan, K., & Uluyol, C. (2019). STEM ve eğitimde uygulama örneklerinin incelenmesi (Investigation of STEM and educational STEM examples*). The Journal of Turkish Social Research, 23*(3), 848-861.

Rinn, A. N., Plucker, J. A., & Stocking, V.B. (2010). Fostering Gifted Students'affective development: a look at the impact of academic self-concept. *Teaching Exceptional Children Plus, 6*(4), 1-13.

Satmaz, I., Tortop, H.S., & Temiz, E. (2018). Investigation of the metaphorical perceptions of the gifted students related to the concept of science and art center (SAC). *Higher Education Studies, 8*(3), 34-48.

Savran-Gencer, A., Dogan, H., Bilen, K., & Can, B. (2019). Bütünleşik STEM eğitimi modelleri (Integrated STEM education models). *PAU Journal of Education, 45*(45), 38-55.

Sheffield, L.J. (2018). Commentary paper: A reflection on mathematical creativity and giftedness. In F. M. Singer (Ed), *Mathematical creativity and mathematical giftedness* (pp. 405-428). Cham, Switzerland: Springer International Publishing.

Silver, E., & Cai, J. (1996). An analysis of aritmatic problem posing by middle school students. *Journal for Research in Mathematis Education,* 27/5, 19-27.

Smith, J., & Karr-Kidwell, P., (2000). The interdisciplinary curriculum: A literary review and a manual for administrators and teachers. http://files.eric.ed.gov/fulltext/ED443172.pdf

Suarsana, I. M., Lestari, I. A. P. D., & Mertasari, N. M. S. (2019). The effect of online problem posing on students' problem-solving abilitiy in mathematics not capital letter. *International Journal of Instruction*, 12(1), 809-820.

Tiryaki, A., Yaman, Y., & Cakiroglu, O. (2021). özel yeteneklilerde STEM uygulamaları: Tutum ve yaratıcılık üzerine nitel bir çalışma *(STEM applications in gifted education: A qualitative study on attitude and creativity). Journal of Kazım Karabekir Education Faculty, 43*, 1-24.

Toma, R.B., & Greca, I.M. (2018). The effect of integrative STEM instruction on elementary students' attitudes toward science. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(4), 1383-1395.

Trna, J. (2014). IBSE and gifted students. *Science Education International, 25*(1), 19-28.

Tyler-Wood T.L., Mortenson M., Putney D., & Cass M.A. (2000). An effective mathematics and science curriculum option for secondary gifted education. *Roeper Review, 22*, 266–270

Vu, P., Harshbarger, D., Crow, S., & Henderson, S. (2019). Why STEM? Factors that influence gifted students' choice of college majors. *International Journal of Technology in Education and Science, 3*(2), 63-71.

Winebrenner, S. (2000). Gifted Students need an education, too. *Educational Leadership, 58*(1), 52-56.

Yildirim, B., & Altun, Y. (2015). STEM eğitim ve mühendislik uygulamalarının fen bilgisi laboratuvar dersindeki etkilerinin incelenmesi *(*Investigating the effect of STEM education and engineering applications on science laboratory lectures*). El-Cezerî Journal of Science and Engineering, 2*(2),28-40.

Yuan, X., & Sriraman, B. (2011). An exploratory study of relationships between students' creativity and mathematical problem posing abilities. In B. Sriraman & K. Lee (Eds). *The elements of creativity and giftedness in mathematics* (pp. 5–28). Rotterdam, the Netherlands: Sense.

Yurtbakan, E., & Aydogdu-Iskenderoglu, T. (2020). İlkokul 4. sınıf öğrencilerinin matematik motivasyonlarında ve problem kurma becerilerinde etkileşimli okumanın etkisi *(*The effect of dialogic reading on primary school 4th grade students' mathematics motivation and problem posing skills*). Journal of Erzincan University Faculty of Education, 22*(2), 348-370

Yurtbakan, E., & Aydogdu-Iskenderoglu, T. (2022). Dördüncü sınıf öğrencilerinin organizasyon becerisi ve okuduğunu anlama becerisinin matematiksel problem çözme ve kurma becerilerine etkisi (The effect of organization and reading comprehension skills of primary school fourth grade students on mathematical problem solving and posing skills). *MANAS Journal of Social Studies, 11(3),* 958-972.

Zengin, N., Kaya, G., & Pektas, M. (2020). STEM Temelli araştırmalarda kullanılan ölçme ve değerlendirme yöntemlerinin incelenmesi *(*Investigation of measurement and assessment methods used in stem-based research*). Gazi University Journal Gazi of Education Faculty), 40*(2), 329-355.

Appendix 1. Semi-structured Interview Questions

Semi-structured Interview Questions

Q1. Did you like STEM for gifted activities, and if so, which part did you like the most?
Q2. Did you find STEM for gifted activities useful, and if so, what are the benefits?
Q3. Is problem posing difficult, if so why, what are your views on STEM for gifted activities and problem posing?

Appendix 2. STEM for Gifted activity example

Activity title: Parachute
Theme: Motion and force- Measuring time
Materials: pet cup, rope, pompom, garbage bag, crayons
Implementation of Activity
Stage 1. Recognize the problem:
Students are asked the following questions: "How do birds reproduce, what are the endangered birds, what can be done to keep the birds extinct, how to protect the eggs of endangered birds, what kind of a safe place to store their eggs if the birds lay their eggs in their nest on a very high tree and do not return to their nests for a long time? How do you get it down from the tree?"
Stage 2. Generating solutions for the problem
Students are asked to come up with solutions for safely removing bird eggs from the tree.
Stage 3. Choose the appropriate solution
Students are guided to choose the appropriate solution from the solutions they produce.
Stage 4. Make a prototype
Students are divided into groups so that they can work collaboratively. A prototype of the parachute solution they propose is designed to remove bird eggs from waste materials from the tree.
Stage 5. Presentation
The groups take turns presenting their prototypes. They criticize the prototype (pointing out its shortcomings, reflecting its good aspects on their own projects).
Srage 6. Final
They put pom-poms on the prototypes they produce, drop them from high, and observe the descent situation safely.
Problem Posing

- Students are asked to pose a free problem about the parachute used to save bird eggs. The problems posed by the students are discussed (according to the status of having problem characteristics, being solvable, being logical).
- Eda wants to protect the eggs laid by the birds in the nests in the trees. Therefore, he decided to make a parachute to carry the eggs to safety. The parachute made by Eda can safely carry up to 6 eggs. Birds have laid 48 eggs in the bird's nest...
  Make the above statement a semi-structured problem and solve it.
  The problems posed by the students are discussed (according to the status of having problem characteristics, being solvable, being logical).

Objects	**Numbers**	**Math operations**
Parachute	240	X
Bird eggs	20	/
Tree	4	

Pose a problem with the above and solve it.
The problems posed by the students are discussed (according to the status of having problem characteristics, being solvable, being logical).

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Research Article

Investigating the critical thinking skills and autonomous learning of gifted students

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Abstract

This paper examines the characteristics of gifted students in the context of autonomous learning and critical thinking skills. It explores the historical background of gifted education in Turkey and highlights the importance of identifying and nurturing gifted learners for societal development. The study focuses on understanding how gifted students achieve success in autonomous learning and the potential impact of critical thinking skills on their autonomous learning. A quantitative research design was employed, and data were collected using validated scales measuring critical thinking disposition and autonomous learning. A total of 397 gifted learners from Art and Science Centres in Turkey participated in the study. The data were analysed using T-test, Pearson correlation and simple linear regression analysis. The findings reveal significant relationships between the age and gender of gifted students and their critical thinking skills and autonomous learning. Additionally, a positive relationship was observed between autonomous learning and critical thinking skills. The results also suggest that critical thinking skills have a predictive effect on autonomous learning. These findings contribute to the existing literature on gifted education and provide insights into the educational practices and support needed for gifted students. The study underscores the importance of individualised curriculum and differentiated teaching methods to cater to the unique learning needs and abilities of gifted students. By fostering autonomous learning and developing critical thinking skills, educators can enhance the educational experiences and outcomes of gifted students, promoting their personal growth and societal contributions. Additionally, findings reveal a strong positive relationship between Autonomous learning and the critical thinking of high-potential learners. Regression analysis showed that critical thinking is a good predictor for autonomous learning. Any change in critical thinking affects autonomous learning of highly able learners. There is no effect of gender on the said variables.

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Introduction

Gifted and talented individuals have made significant contributions to the realms of science and art world, making ground-breaking discoveries, and playing a significant role in the development of societies. Through unique and exceptional abilities, gifted individuals have actively supported cultural and intellectual progress by generating innovative solutions to encountered challenges, thereby taking a vital part in fostering an innovative transformation within their respective societies (Kontas and Yagci, 2016; Rimm et al., 2018; Renzulli and Reis, 2021).

In many countries, although not universally applicable, the belief that gifted individuals cannot fulfil their potential without intervention has led to the implementation of various approaches, programs, and organizations to support

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gifted education. This notion underscores the significance of tailored programs, applications, and specialised organisations to maximise the development of gifted individuals (Boettger and Reid, 2015). In Turkey, too, several schools and organisations have been established to identify and nurture gifted children, facilitating the exploration of their talents and supporting their self-actualisation (Kaya, 2013). Fine Arts High Schools that has been operating since 1989 to educate gifted students in areas such as art and music (Altinkurt, 2015), science high schools, which started in the early 1960s with the opening of Ankara Science High School to educate gifted students in mathematics and science and continues to exist today (Bal, 2020) and the `Turk Egitim Vakfi (Turkish Education Foundation) Inanc Turkes` Private High School, which was established by Inanc Foundation in 1993 to provide education to gifted students with limited financial means (www.tevitol.k12.tr, 2023) are cited as examples of these institutions. Additionally, in various cities across Turkey, Science and Art centres known as BILSEM were established in 1992 to cater to the educational needs of gifted students at different academic levels (Balca et al., 2023). These initiatives aim to make gifted children visible, discover their abilities, and assist them in realising their full potential.

Characteristics of Gifted Students

According to Renzulli (2016), gifted students exhibit exceptional intelligence, remarkable innovation, superior cognitive abilities, and strong drive and determination. Despite exceptional abilities, intelligence, and creativity, gifted individuals require guidance and support in order to discover and develop their talents (Fernández et al., 2017). As well as these characteristics, gifted students have a greater tendency to be motivated by internalising events around them compared to non-gifted individuals, and these inner attitudes of gifted individuals play a critical role in promoting autonomous learning (Gottfried, Fleming, and Gottfried, 2001). In studies related to gifted individuals, awareness is raised by focusing on various concepts, their characteristics, and individual differences, while addressing the learning needs of gifted students. Regarding the exploration of these areas, contemporary research delves into captivating topics such as "peer relationships" as examined by Cross (2021), and the investigation of `social problem-solving skills` in gifted students conducted by Senol, Koca, and Erbasan (2023). As Deci and Ryan (2000) points out that autonomy is a fundamental aspect of the psychological needs of gifted children and that these students possess the ability to self-develop in a range of environments and with diverse materials. Moreover, the significance of fostering critical thinking skills among students, including gifted ones, is highlighted by Parks (2009 and Struck and Little, 2011). Furthermore, Lawless and Brown, (2015) states that this ability is essential for the students to acquire life-long skills that allow them to tackle obstacles in their daily lives outside of school. Hence, this study underscores the significance of autonomy and critical thinking skills, which are considered a requirement for development and well-being, cannot be detached from gifted individuals due to the fact that these two concepts are intrinsically intertwined with gifted students' inherent tendencies, and addressing them is imperative. Thus, they are expected to enhance their skills and individual growth if they are guided in developing of autonomy and critical thinking skills.

Autonomous Learning in Gifted Students

Benson, (2007) posits that students, in a learner-centred approach to education, exhibit autonomous learning behaviours by recognising their personal responsibility for their education and their role as active participants in the learning process. This educational environment fosters the development of students' sense of identity and role through their active engagement in social learning. Educators, thus, can facilitate the creation of a self-directed learning atmosphere by assigning responsibilities to students, thereby raising their awareness of their roles and encouraging them to embrace challenges in their assignments. (Harmer,2001). The examination of autonomy should encompass three interrelated dimensions: behavioural, emotional, and cognitive. Behavioural aspect involves an individual's capability for self-control and self-administration, demonstrated by their skill in arranging themselves based on their own set standards, while the emotional dimension concerns the role of parents as perceived sources of control over the individual, and their potential impact on restricting the sphere of autonomy for their children. (Zimmer-Gembeck and Collins, 2003; Parra and Oliva, 2009). The cognitive approach refers to an individual's decision-making and inference

abilities, which are considered crucial components of cognitive autonomy. This perspective has been echoed by numerous researchers in the field, including Steinberg and Morris (2001), Bednar and Fisher (2003) and Beckert (2005).

Critical Thinking Skills of Gifted Students

The implementation of critical thinking education should be integrated into the curriculum for students of all aptitudes (Augustine, 2011). Sayler (2009) proposes that cultivating specialized critical thinking skills is deemed a necessity for gifted students, as their needs and abilities differ from their peers. The diversity in the intellectual development of gifted students should be considered when evaluating their critical thinking abilities (Kettler, 2014). To enhance their critical thinking performance, teachers should provide these students with challenging tasks that can stimulate their capacities and allow for more efficient learning (Winebrenner, 2001). Despite being a natural talent for gifted individuals, their critical thinking skills can still be cultivated through instruction (Kaufman and Sternberg, 2008; Alghamdi and Hassan, 2016). The teaching methods used by educators to promote critical thinking in gifted students can differ due to their varying cognitive development (Kanevsky and Geake, 2004). These diverse instructional approaches can also promote autonomous learning styles among gifted children (Alnesyan, 2012; Ghazivakili, et al., 2014). According to Fahim and Behdani (2011) and Nosratinia and Zaker (2013), autonomous learning and critical thinking are interrelated skills and teaching gifted students critical thinking skills enhances their skills in autonomous and collaborative learning, due to their inquisitive and analytical approach. Thus, critical thinking can foster autonomous learning, which is a prevalent learning style among gifted students. Dilekli (2017), similarly, concurs with this viewpoint in his study, finding a correlation between critical thinking skills, which are considered higher order thinking skills, and learning styles.

Gifted Students and Curriculum

Differentiated curriculum and activities benefit gifted students by helping them recognise their potential and improving their critical thinking abilities and autonomous learning (Roberts and Inman, 2009; Robinson, Shore, and Enersen, 2007; Van Tassel-Baska, 2013; Kettler, 2014). It is also significant to understand that although gifted individuals have high IQ and exceptional abilities, they can still have diverse learning experiences, socio-economic, and cultural backgrounds. Thus, when creating educational programs for the students to have critical thinking ability and autonomous learning, it is necessary to consider individual cognitive differences and the factors mentioned, leading to a personalised curriculum. (Ford, Grantham, and Whiting, 2008; Dixon, et al., 2004). When considering educational programs, it becomes evident that the programs serve as a fundamental platform for empowering students to discover and cultivate their unique abilities, providing them with opportunities for growth and achievement of their potential (Clark, 2009). When examining the principles of the education program implemented at BILSEMs, it can be observed that it adopts an approach that strengthens and supports the skills of gifted students, including critical thinking skills and autonomy (The Ministry of National Education, 2007). In addition, Kazu and Senol (2012) argue that the educational programs implemented in BILSEMs help students become aware of their individual abilities. They also suggest that these programs provide opportunities for students to engage in exploratory and questioning activities through project work, allowing them to express themselves and encouraging them to generate new ideas. However, there are numerous challenges in evaluating the effectiveness of education programs targeting gifted students and accessing relevant outcomes. The primary reasons for these challenges include the lack of a consensus on education standards, assessment conducted with unclear objectives, inadequate qualified evaluation principles, insufficient measurement tools, a shortage of experts, and budget constraints (Avci, 2015). In this respect, although educational programs aim to support individuals' cognitive skills, including autonomous learning and critical thinking skills, it is essential to consider students' individual differences and needs.

Problem of Study

This research aims to determine the characteristics of gifted students based on relevant literature and on learning and thinking styles, and to have a contribution to the literature where there are limited studies found. Moreover, the research aims to provide a better understanding of gifted students' education in Turkey. Findings aim to further knowledge

regarding how gifted students achieve success in learning autonomously, and whether critical thinking skills have an effect on their autonomous learning. The sub-questions of the study are as follows:

- Does age play a significant role in determining the critical thinking skills of gifted students?
- Does the age of gifted students have a significant impact on their capacity for autonomous learning?
- Is there a notable correlation between the gender of gifted students and their critical thinking skills?
- Is there a significant relationship between the gender of gifted students and their ability to engage in autonomous learning?
- How do autonomous learning and critical thinking skills interact with one another?
- To what extent can critical thinking skills predict the ability of gifted students to engage in autonomous learning?

Method

Research Model

In this research, quantitative research methods were used to generate numerical data, which can provide a comprehensive understanding of phenomena (McLeord, 2008). It involves reduction, control, and precision in order to obtain specific data that can be generalised to the population from a randomly selected sample. Additionally, it emphasizes measurement, logistics, and deduction (Creswell 2009; Johnson and Christensen, 2019). Quantitative methods are characterised by higher validity and reliability compared to qualitative methods and involve formulating hypotheses prior to data collection for testing purposes. Moreover, the researchers' biases have minimal influence on the data. By employing techniques such as surveys, it becomes feasible to recruit a large number of participants and gather reliable data within a short timeframe (Christensen and Johnson, 2016). In this study, the quantitative method have been adopted, specifically employing surveys, to collect extensive data from gifted students and obtain a comprehensive understanding of the phenomena using numerical analysis (Creswell, 2009). Given the objective of examining the autonomous learning and critical learning skills of gifted students and their relationship, the quantitative research method was deemed appropriate. The primary objective of selecting the quantitative research method in this study is to comprehend the autonomous learning skills and critical learning skills of the gifted learners in Turkey and assess the extent to which critical learning skills predict autonomous learning skills.

Participants

For the recent quantitative research study, participant recruitment plays a crucial role in gathering the necessary for analysis and drawing meaningful conclusions. To ensure a robust and diverse participant pool, the target population was clearly defined that would best represent the research objective. This involves identifying specific demographic characteristics, such as age, gender, education level, that are relevant to the study. Online platforms and scales were utilized to reach out to and engage specific groups and communities that matched the defined characteristics of the target population. Art and Science Centres were contacted to request their assistance in participant recruitment. By leveraging their networks and channels, a more focused and knowledgeable participant pool was accessed. In total, 397 participants were successfully reached out to and recruited from across Turkey, both online and physically. Among the participants, 55% were female (n = 219) and 45% were male (n = 178). These participants were identified as gifted students aged between 7 and 18, who received education in Art and Science Centres during the 2017-2018 academic year. Importantly, it should be noted that the selected sample represents the entire population, as data was collected directly from the entire population. The demographic features of the participants are listed in table 1:

Table 1. Demographic features of the participants.

		N	%
Sex	Female	219	55.2
	Male	178	44.8
Age			
	Before adolescence	257	64.7
	Adolescence	140	35.3
Class			
	Primary Sc.	155	39
	Secondary Sc.	242	61
Total		**397**	**100.0**

The participants' gender distribution consisted of 219 (55.2%) females and 178 (44.8%) males. Regarding the class distribution, 155 (39%) students were enrolled in primary school, while 242 (61%) were receiving education at the secondary school level in Turkey. In terms of age demographics, participants were divided into two groups: those before adolescence and those in adolescence, with the commonly accepted age of 12 years old as the dividing line. There were 257 participants (64.7%) in the before adolescence group, while 140 participants (35.3%) were classified as adolescents.

Data Collection Instruments

The following two data collection scales were utilized: Critical Thinking Disposition Scale, originally developed by Sosu (2013) and Autonomous Learning Scale, originally developed by Macaskill and Taylor (2010)

Critical Thinking Disposition Scale

This scale was originally developed by Sosu (2013) to determine the critical thinking disposition of high-potential learners. It consists of 11 items that are rated from 1 to 5 which represent strongly disagree (1); disagree (2); neither agree nor disagree (3); agree (4), and strongly agree (5). The scale was adapted to Turkish by Arslan and Yurdakul (2015) after a validity and reliability study. For this purpose, factor analysis was adopted, and factor loading was varied between .68 and .75. That means the Turkish-adapted version of the critical thinking disposition scale can be used to determine the critical thinking of high-potential learners in Turkey.

Autonomous Learning Scale

This scale was originally developed by Macaskill and Taylor (2010) with the aim of investigating autonomous learning of gifted students. It consists of 12 items that are rated from strongly disagree (1); disagree (2); neither agree nor disagree (3); agree (4), and strongly agree (5). The students can assess their autonomous learning abilities by answering the scale's questions. The scale was designed with 12 items to avoid overwhelming participants with a large number of questions. This approach is believed to enhance the validity and reliability of the scale by focusing on a single target for assessment (Macaskill and Taylor, 2010). The scale was adapted to Turkish by Arslan and Yurdakul (2015) following a validity and reliability study, which determined that it can be effectively used in assessing the autonomous learning of gifted students in Turkey.

Data Collection Procedure

The data collection process in this study was conducted with the aim of achieving the research goals and addressing the research questions. Initially, participants were selected using an appropriate sampling technique, and validated scales were adapted and administered in both online and printed formats. Subsequently, the online survey, comprising the two scales, was distributed to all participants, while the physical version of the scales was handed out face-to-face to participants who received education at the Art and Science Centre in Turkey during the 2016-2017 academic year. The responses were collected, and for paper-based surveys, data were manually entered into the SPSS analysis program, while for online surveys, data were transferred from Excel software.

Results

To examine the correlation between variables and predict the independent variable's impact on the dependent variable, statistical analysis techniques such as T-test, Pearson correlation, and simple linear regression analysis were utilized. These analyses were conducted using IBM SPSS Statistics software version 26. Before proceeding with the analysis, the normality of the data distribution was assessed. To assess normality, skewness and kurtosis tests were employed. Based on the results, it was found that the Critical Thinking variable had a skewness of -1.153 and a kurtosis of 1.980, while the Autonomous Learning variable had a skewness of -0.890 and a kurtosis of 0.821. These findings indicated that the data was within an acceptable range of normal distribution, in line with the guidelines provided by George and Mallery (2012, p. 113). "*A kurtosis value between ±1.0 is considered excellent for most psychometric purposes, but a value between ±2.0 is in many cases also acceptable, depending on the particular application*." The analysis results are presented in tables below.

A total of 397 participants were included in this study. The aim was to compare the mean scores of critical thinking and autonomous learning skills between two groups, namely females and males. To analyse the data, an independent group t-test was performed, which allowed for a comparison of the means between the two groups. The results of the t-test are presented below.

Table 2. Independent group t-test results for comparing means of females and males according to autonomous learning.

	Group	N	X	ss	Sh_x	t	df	p
Autonomous learning	female	219	4.00	.699	.047	-2.630	384.553	.009*
	Male	178	4.18	.669	.050			

p<.05

Assuming unequal variances, the results of the independent group t-test are as follows: The t-value is -2.630. The degrees of freedom (df) for the t-test are 384.553. The associated p-value for the two-tailed test is 0.009. The mean difference, standard error difference, and confidence interval remain the same as mentioned earlier. These findings indicate a statistically significant difference between the means of the two groups. The negative mean difference suggests that the "female" group has a lower mean score compared to the "male" group. Specifically, it suggests that males exhibit higher autonomous learning skills compared to females.

Table 3. Independent group t-test results for comparing means of females and males according to critical thinking

	Group	N	$\overline{X}$	ss	Sh_x	t	df	p
Critical Thinking	Female	219	4.10	.674	.046	-1.626	377.266	.105
	Male	178	4.21	.679	.051			

p>.05

The equal variances are not assumed, the results are as follows: The t-value is -1.626. The degrees of freedom (df) for the t-test is 377.266. The associated p-value for the two-tailed test is 0.105. The mean difference, standard error difference, and confidence interval remain the same as above. In this case, the p-value (0.105) indicates that there is no statistically significant difference between the means of the two groups. Therefore, based on the available information, there is no strong evidence to suggest a difference in means between the groups for the variable "critical thinking". Means that there is no difference between Males and Females in terms of critical thinking skills.

Table 4. Independent group t-test results for comparing means of primary and secondary school according to autonomous learning.

	Group	N	$\overline{X}$	ss	Sh_x	t	df	p
Autonomous Learning	Primary Sc.	155	4.27	.575	.046	4.404	395	.0001*
	Secondary Sc.	242	3.96	.732	.047			

p<.05

T-test is used to assess whether the variances of the two groups are significantly different. t-value: 4.404 (assuming equal variances); Degrees of freedom (df): 395; p-value: 0.0001. The equal variances are assumed, the t-test results

indicate that there is a significant difference between the means of the two groups. In this case, the p-value of 0.0001 suggests that there is a significant difference in variances between the two groups. Means that primary school students have higher autonomous learning skills compare to secondary school according to t-test.

Table 5. Independent group t-test results for comparing means of school level according to critical thinking

	Group	N	$\bar{X}$	ss	Sh_x	t	df	p
Critical Thinking	Primary Sc.	155	4.26	.697	.056	1.935	394	.054
	Secondary Sc.	242	4.10	.661	.043			

p>.05

Independent samples t-test was conducted to compare the means of two groups. t-value: 1.935 (assuming equal variances); degrees of freedom (df): 394, and p-value: 0.054. Under the assumption of equal variances, the t-test results indicate that the difference between the means of the two groups is not statistically significant. Therefore, it could be said that there is no significant difference between primary and secondary school students in terms of critical thinking skills.

Table 6. Independent group t-test results for comparing means of age according to autonomous learning.

	Group	N	$\bar{X}$	ss	Sh_x	t	df	p
Autonomous Learning	Bef. Adoles.	257	4.18	.641	.040	4.048	395	.0001*
	Adolescence	140	3.89	.741	.063			

p<.05

T-test is used to assess whether the variances of the two groups are significantly different. T-test for Equality of Means: t-value: 4.048 (assuming equal variances); degrees of freedom (df): 395; p-value: 0.0001. Under the assumption of equal variances, the t-test results indicate a significant difference between the means of the two groups. Means that before adolescent students have higher autonomous learning skills compare to adolescent students according to t-test.

Table 7. Independent group t-test results for comparing means of age according to critical learning.

	Group	N	$\bar{X}$	ss	Sh_x	t	df	p
Critical Thinking	Bef. Adoles.	257	4.21	.685	.043	2.185	296.935	.030
	Adolescence	140	4.05	.655	.055			

p>.05

T-test is used to assess whether the variances of the two groups are significantly different. If equal variances are not assumed: t-value: 2.185; degrees of freedom (df): 296.935; p-value: 0.030. Under the assumption of equal variances not assumed, the t-test results indicate a significant difference between the means of the two groups. Based on the provided information, there is evidence to support a significant difference in means of before adolescent students in terms of critical thinking skills. However, it is important to note that the p-values are close to the significance level, indicating that the results may be borderline significant.

Pearson correlation was utilised to determine the relationship between autonomous learning, critical thinking, gender, class, and age. The analysis results are shown below.

Table 8. Correlations between Autonomous Learning, Critical Thinking Skills, Gender, Class, and Age of gifted students

	M	S.D.	N	AL	CTS	Gender	Class	Age
AL	4.08	0.691	397	1				
CTS	4.15	0.677	396	.718**	1			
Gender		0.498	397	.131**	0.082	1		
Class		1.807	397	-.216**	-0.089	0.023	1	
Age		1.908	397	-.190**	-0.078	0.066	.956**	1

CTS: Critical Thinking Skills **AL:** Autonomous learning **Correlation is significant at the 0.01 level (2-tailed)

Table 8 states that a Pearson correlation coefficient was computed to assess the linear relationship among Autonomous Learning, Critical Thinking Skills, Gender, Class, and Age of gifted students. There is a strongly positive significant relationship between autonomous learning and critical thinking skills of the gifted learners, r (397) = .718, p <.01. That means, when Autonomous Learning of the gifted students increases, their Critical Thinking skills do too. The reverse is true for the direction to the negative level. There is also a positive relationship between Autonomous Learning and Gender, despite the relationship being weak r (397) = .131, it is significant according to p < .01 value. As a relationship was found between Autonomous Learning and Gender, it is interesting that there was not a significant relationship between critical learning and gender of gifted learners. It is noted that there is a positive but very weak relationship between critical thinking and gender of gifted learners according to r (397) = .082 value. Likewise, a similar relationship was found for the relationship between gender and year (397) = .023, p >.01, and between Gender and Age, r (397) = .066, p >.01. This means there is a very weak positive relationship between gender and class, and between gender and age, but this relationship is not significant for both groups. There is a strong, significant positive relationship between Class and Age, r (397) = .956, p <.01. This analysis supports the division into year group stages from preschool to high school according to age that is used by many education systems.

It was also found that there is a weak negative relationship between autonomous learning and class r (397) = -.216, p>.01, and autonomous learning and age r (397) = -.190, p>.01, but this relationship is not significant. It could mean that gifted students lose their autonomous learning when they grow up and reach the upper class. Another finding is that there is a weak negative relationship between critical thinking skills and class r (397) = -.089, p>.01, and a weak negative relationship between critical learning and age r (397) = -.078, p>.01. This means that critical thinking of gifted learners correlated negatively with age and class, but this correlation is not significant according to the p-value.

The analysis was conducted on data derived from 397 participants. In order to understand the extent to which critical thinking predicts autonomous learning, the simple linear regression analysis was conducted. The results are presented in table 2 shown below.

Table 9. Regression analysis to investigate the degree to which critical learning predicts autonomous learning of high-potential students.

Variable		B	SH_B	β	t	p
	(Constant)	1.036	0.151		6.875	0.000
	Critical Thinking	0.733	0.036	0.718	20.475	0.000
	R=.718; R^2 =.516					
	$F_{1, 394}$ = 419.214; p<.05					

a. Dependent Variable: Autonomous learning

Table 9 shows results from a simple linear regression which was calculated to predict Autonomous Learning based on the Critical Thinking of high-potential students. A significant regression equation was found F (1, 394) = 419.214, p < .5), with an R^2 of .516. Participants predicted unit is equal to 1.036 + 0.733 (Critical Thinking) when Autonomous Learning is measured in learning abilities. Autonomous Learning increased by .733 for each learning abilities unit of Critical Thinking. Hence, based on the regression analysis, it can be concluded that critical thinking serves as a strong predictor for autonomous learning.

Findings and Discussion

This study was carried out to determine whether there is a relationship between autonomous learning and the critical thinking skills of gifted learners and to find out whether the critical thinking skill of high-potential learners predicts their autonomous learning and if their demographic features affect those skills. For this purpose, t-test, Pearson correlation and simple linear regression analyses were applied.

According to t-test results; Males has higher autonomous learning skills compare to Females while there is no significant difference in terms of critical thinking skills of both groups. Moreover, gifted students who attended primary

school have higher autonomous learning skills compare to those in secondary schools. Similarly, when the age is considered, before adolescent students have higher autonomous learning skills compare to adolescent students according to t-test. Therefore, it can be argued that age may have an impact on autonomous skills. In terms of critical thinking skills, no significant difference was found between primary and secondary gifted students. However, there was evidence to support a significant difference in mean scores of critical thinking skills among students before adolescence. These findings prompt to reconsider the role of schools in fostering autonomous learning. It raises the question of whether schools contribute to enhancing or limiting autonomous learning skills. Based on the t-test results, it is possible to suggest that an increased level of schooling may limit the autonomous learning of gifted students. Traditional educational methods often fail to provide adequate support for enhancing the autonomous learning skills of gifted students.

It is found that there is a substantially positive significant relationship between Autonomous learning and critical thinking skills of high-potential learners, and critical thinking skills can predict autonomous learning of high-potential learners reliably. This implies that an increase in critical thinking skills among high-potential learners is associated with an increase in their autonomous learning. Similarly, a decrease in critical thinking skills is linked to a decrease in autonomous learning. These findings align with previous studies conducted by Nosratinia and Zaker (2013) and Fahim and Behdani (2011), which reported a significant positive relationship between the two variables. These studies further demonstrated that critical thinking skills can serve as predictors of autonomous learning among high-potential learners.

According to the findings of research carried out by Dilekli (2017), gifted students have higher critical thinking scores than their non-gifted peers. The research of 225 gifted students aged 9 to 15 years old concludes that there is a positive correlation between learning styles and the critical thinking ability of gifted children. Furthermore, the study of Kettler (2014), which has compared measures of critical thinking qualifications in gifted and non-gifted students shows similar results as that of Dilekli (2017). Accordingly, critical thinking is a distinctive characteristic for gifted students and is more advanced in gifted students. As understood from the results mentioned above, critical thinking, which is a higher-level thinking skill, exists in gifted individuals, and this positively affects their learning styles. Moreover, according to Willingham (2007), educational activities and practices used in both teaching and learning develop critical thinking in individuals.

There was also a weak positive relationship between Autonomous Learning and Gender. Although the relationship is weak $r(397) = .131$, it is significant according to $p < .01$ value. Although a relationship was found between Autonomous Learning and Gender, it is interesting that a significant relationship between Critical thinking and Gender of the gifted learners was not found within the significance of $p > .01$ value. This means that gender correlated weakly with autonomous learning but not with critical thinking skills. A study by Shirazi et al, (2019), found a similar result - a weak positive relationship between gender and autonomous learning.

On the other hand, a study by Rudd et. al. (2000) did not find a relationship between learning styles and critical thinking skills. The reason why this finding is different may derive from participants involved, related educational content, or a different culture. In other words, whether the group participating in the study is gifted or not can affect the results of the research. From this point of view, it can be inferred that both gifted and non-gifted participants can be involved in studies to understand the relationship between these skills more clearly. The most interesting result of this study is that there is a significant negative relationship between autonomous learning and class, and autonomous learning and age. This could mean that gifted students lose their autonomous learning when they grow up and pass to the upper class. Therefore, the education system may be a barrier for gifted students who possess autonomous learning and critical thinking skills.

There is no significant relationship between age and gender, while there is a significant strong positive relationship between Age and Class. In Turkey, the education stages are structured based on the age of the students, starting from year 1 at the age of six and progressing up to the upper class (year 12) as they grow older. In light of the findings, it can

be concluded that designing an educational system that takes into account students' age has significant advantages for both students and their learning outcome.

Limitation of Study

This study exclusively collected data from gifted students enrolled in BILSEMs during the 2016-2017 academic year in Turkey, indicating that the findings are confined to this specific dataset. As a result, it is not possible to generalize the findings to other groups of students. The outcomes of this study are specific to the quantitative data collected. However, it is worth noting that qualitative data could complement and provide further support to the results obtained in this research.

Suggestions

Based on the results, it is recommended that schools consider revising their curriculum to better cater to the individual needs of gifted students and foster their autonomous learning and critical thinking skills. This would involve creating an educational environment that encourages and supports other skills as well as autonomous learning and critical thinking. By doing so, schools can maximize the potential of gifted students and provide them with the necessary tools and opportunities to thrive academically and personally.

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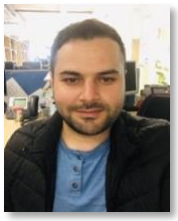

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References

Alghamdi, A.K.H., &Hassan, N.A.S. (2016). The effectiveness of the Mawhiba program for the development of critical thinking skills among gifted female students at the secondary levels. *Journal of Education, Society and Behavioural Science,* pp.1-13.

Alnesyan, A. (2012). *Teaching and Learning Thinking Skills in the Kingdom of Saudi Arabia: Case Studies from Seven Primary Schools*. Unpublished Doctoral Thesis, University of Exeter, Graduate School of Education. https://ore.exeter.ac.uk/repository/bitstream/handle/10036/3693/AlnesyanA.pdf?sequence=1&isAllowed=y.

and school adjustment. *Journal of Gifted Education and Creativity, 10*(1), 33-43.

Arslan, S., & Yurdakul, C. (2015). Özerk Öğrenme Ölçeği'nin Türkçeye Uyarlanması ve Geçerlilik Çalışması (Adaptation and Validity Study of the Self-Directed Learning Scale in Turkish). Journal of International Social Research, 8(39), 565-569.

Augustine, N. R. (2011). Educating the gifted. *Psychological Science in The Public Interest, 12*(1), 1-2.

Avcı, G. (2015). *Üstün yetenekliler eğitim programları değerlendirmeleri öğrenci formunun (ÜYEP-DÖF) revize edilmesi ve psikometrik özelliklerinin araştırılması* (Revision of the education programs for talented students evaluations student form (epts-esf) and its psychometric properties, Master`s degree dissertation, Anadolu University, Turkey).

Bal, R. (2020). Türkiye'de ilk fen lisesinin açiliş süreci, bilimsel gelişmeler ve değerlendirmeler. (Scientific developments in the opening process of turkey's first science high school and evaluations) *Kesit Akademi Dergisi*, *6*(25), 481-496.

Balca, S., Bozkuş, B., Yapağcı, E., Alparslan, E., & Durak, M. A. (2023). Bilsem'lerin kuruluşu ve Necate Baykoç'un hayatı.(The establishment of BILSEM centers and the life of Necate Baykoç). *İbrahim Mert Öztürk, HIST 200-2 (2022-2023 Fall); 7*.

Beckert, T. (2005). *Fostering autonomy in adolescents: A model of cognitive autonomy and self-evaluation*. American Association of Behavioral and Social Sciences. Las Vegas, Nevada.

Bednar, D. E., & Fisher, T. D. (2003). Peer referencing in adolescent decision making as a function of perceived parenting style. *Adolescence, 38*(152).

Benson, P. (2007). *Autonomy and its role in learning. International handbook of English language teaching*. Springer US.

Boettger, E. R. H., & Reid, E. (2015). Gifted education in various countries of Europe. *Slavonic Pedagogical Studies Journal*, *4*(2), 158-171.

Clark, B. (2009). *The Integrative Education Model*. In J. S. Renzulli, E. J. Gubbins, K. S. McMillen, R. D. Eckert and C. A. Little (Eds.), Systems and models for developing programs for the gifted and talented (2nd ed.). Mansfield Center, CT: Creative Learning Press.

Creswell, J. W. (2009). Mapping the field of mixed methods research. *Journal of Mixed Methods Research*, *3*(2), 95-108.

Cross, J. R. (2021). *Gifted children and peer relationships*. In M. Neihart, The Social and Emotional Development of Gifted Children (pp. 41-54). Routledge.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11,* 227-268.

Dilekli, Y. (2017). The relationships between critical thinking skills and learning styles of gifted students. *European Journal of Education Studies*, 3(4), 69-96.

Dixon, F.A., Prater, K.A., Vine, H.M., Wark, J.M., Williams, T., Hanchon, T., & Shobe, C. (2004). Teaching to their thinking: A strategy to meet the critical thinking needs of gifted students. *Journal for the Education of the Gifted, 28*(1), 56-76.

Fahim, M., & Sheikhy B., R. (2011). Critical thinking ability and autonomy of Iranian EFL learners. *American Journal of Scientific Research*, 29, 59-72.

Fernández, E., García, T., Arias-Gundín, O., Vázquez, A., & Rodriguez, C. (2017). Identifying gifted children: Congruence among different IQ measures. *Frontiers in Psychology, 8*(1239), 1-10. https://doi.org/10.3389/fpsyg.2017.01239

Ford, D.Y., Grantham, T.C., & Whiting, G.W. (2008). Culturally and linguistically diverse students in gifted education: Recruitment and retention issues. *Exceptional Children, 74*(3), 289-306.

George, D., & Mallery, P. (2012). *SPSS Statistics 21: Step by Step*. Boston: Allynand Bacon.

Ghazivakili, Z., Norouzi Nia, R. O. O. H. A. N. G. I. Z., Panahi, F., Karimi, M., Gholsorkhi, H., & Ahmadi, Z. (2014). The role of critical thinking skills and learning styles of university students in their academic performance. *Journal of Advances in Medical Education Professionalism*, *2*(3), 95-102.

Gottfried, A.E., Fleming, J., & Gottfried A. W. (2001). *Continuity of academic intrinsic motivation from childhood through late adolescence.*

Harmer, J. (2001). *The practice of english language teaching*. UK: Longman

Johnson, R. B., & Christensen, L. (2019). *Educational research: Quantitative, qualitative, and mixed approaches*. Sage publications.

Kanevsky, L., & Geake, J. (2004). Inside the zone of proximal development: Validating a multifactor model of learning potential with gifted students and their peers. *Journal for the Education of the Gifted, 28*(2), 182-217.

Kaufman, S.B. and Sternberg, R.J. (2008). *Conceptions of giftedness*. In: Pfeiffen SI, editor. Handbook of giftedness in children: Psychoeducational theory, research, and best practices. New York: Springer.;71-91.

Kaya, N. (2013). Üstün yetenekli öğrencilerin eğitimi ve BİLSEM'ler. (Education for gifted students and BİLSEM (Science and Art Centers). *Erzincan Üniversitesi Eğitim Fakültesi Dergisi*, *15*(1), 115-122.

Kazu, İ.Y., & Şenol, C. (2012).) Üstün Yetenekliler Eğitim Programlarına İlişkin Öğretmen Görüşleri (BİLSEM Örneği). (Views of Teachers about Gifted Curriculum- Case of BİLSEM.*) e-Uluslararası Eğitim Araştırmaları Dergisi*, *3*(2), 13-35.

Kettler, T. (2014). Critical thinking skills among elementary school students: Comparing identified gifted and general education student performance. *Gifted Child Quarterly, 58*(2), 127–136.

Kontaş, H., & Yağcı, E. (2016). BİLSEM öğretmenlerinin program geliştirme ihtiyaçlarına ilişkin geliştirilen programın etkililiği. (The effectiveness of the in-service training program developed on the basis of the needs of the teachers of science and art centers in the area of curriculum development). *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 16*(3), 902-923

Lawless, K. A., & Brown, S. W. (2015). Developing scientific literacy skills through interdisciplinary, technology-based global simulations: Global Ed 2. *The Curriculum Journal, 26*(2), 268-289.

Macaskill, A., & Taylor, E. (2010). The development of a brief measure of learner autonomy in university students. *Studies in Higher Education*, *35*(3), 351-359.

Ministry of National Education of Turkey (MoNET), (2007). *Milli eğitim bakanlığı bilim ve sanat merkezleri yönetmeliği. (Ministry of national education science and art centers regulations).*

Nosratinia, M., & Zaker, A. (2013). Autonomous learning and critical thinking: Inspecting the association among EFL learners. In *First National Conference on Teaching English, Literature, and Translation, Shiraz University, Shiraz, Iran. Retrieved from http://www.civilica. com/Paper-TELT01-TELT01_226. HTML*.

Parks, S. (2009). *Teaching analytical and critical thinking skills in gifted education*. In F. A.

Parra, A., &Oliva, A. (2009). Longitudinal research on the development of emotional autonomy during adolescence. The Spanish Journal of Psychology, 12(1), 66 - 75.

Renzulli, J. S. (2016). *The three-ring conception of giftedness: A developmental model for promoting creative productivity.* In S. M. Reis (Ed.), Reflections on gifted education: Critical works by Joseph S. Renzulli and colleagues (pp. 55–90). Prufrock Press.

Renzulli, J. S., & Reis, S. M. (2021). The three-ring conception of giftedness: A change in direction from being gifted to the development of gifted behaviors. *Conceptions of giftedness and talent*, 335-355.

Rimm, S. B., Siegle, D., & Davis, G. A. (2018). *Education of the gifted and talented* (pp. 233-236). Boston, MA: Pearson.

Roberts, J. L., & Inman, T. F. (2009). *Strategies for differentiating instruction: Best practices for the classroom* (2nd ed.). Waco, TX: Prufrock Press.

Roberts, R.D., Beh, H.C., & Stankov, L. (1988). Hick`s law, competing-task performance, and intelligence. Intelligence,12, 111-130.

Robinson, A., Shore, B. M., & Enersen, D. L. (2007). *Best practices in gifted education: An evidence-based guide*. Waco, TX: Prufrock Press.

Rudd, R., Baker, M., & Hoover, T. (2000). Undergraduate agriculture student learning styles and critical thinking abilities: Is there a relationship? *Journal of Agricultural Education*, *41*(3), 2-12.

Sayler, M.F. (2009). *Gifted and Thriving: A deeper understanding of the meaning of GT*. In: Shavinina LV, editor. International handbook on giftedness. Netherlands: Springer.;215-230.

Senol, F. B., Koca, S., & Erbasan, O. (2023). Gifted children's social problem-solving skills, social competence

Shirazi, F., & Heidari, S. (2019). The relationship between critical thinking skills and learning styles and academic achievement of nursing students. *Journal of Nursing Research*, *27*(4), e38.

Sosu, E. M. (2013). The development and psychometric validation of a Critical Thinking Disposition Scale. *Thinking Skills and Creativity*, *9*, 107-119.

Steinberg, L., & Morris, A. S. (2001). Adolescent development. *Annual Review Psychology, 52*, 83-110.

Struck, J. M. & Little, C. A. (2011). *Integrating higher order process skills and content*. In J. VanTassel-Baska & C. A. Little (Eds.), Content-based curriculum for high ability learners (2nd ed., pp. 71-100). Waco, TX: Prufrock Press.

TEVITOL https://tevitol.k12.tr. (2023). The institutional framework. Received from the website https://tevitol.k12.tr/kurumsal-tarihce on May 20, 2023

VanTassel-Baska, J. (Ed.). (2013*). Using the common core state standards for English language arts with gifted and advanced learners*. Waco, TX: Prufrock Press.

Willingham, D. T. (2007). Critical thinking: Why it is so hard to teach? *American federation of teachers summers 2007, p. 8-19*.

Winebrenner, S. (2001). *Teaching gifted kids in the regular classroom: Strategies and techniques every teacher can use to meet the academic needs of the gifted and talented*. Revised, Expanded. Minneapolis, MN: Free Spirit Publishing.

Zimmer-Gembeck, M. J., and Collins, W. A. (2003). *Autonomy development during adolescence*. In G. R. Adams & M. Berzonsky (Eds.), Blackwell handbook of adolescence (pp. 175 - 204). Oxford: Blackwell Publishers.

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