Research Article

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Risks in Identifying Gifted Students in Mathematics: Case Studies

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Abstract: The article discusses the risks involved in identifying gifted students in mathematics in the school environment. Although the theory of gifted students is widespread and available today, school practice shows many cases of gifted students who have not been identified in the school environment. The reasons for this are various. The article will present the theory related to this topic. The research was conducted as two case studies using qualitative research methods. Semi-structured interviews with parents and pupils were used, and the pupils were observed for a long time by the researcher. In the first case, it was a mathematically gifted pupil with dyslexia, and in the second case, it was a mathematically gifted pupil with an extremely high IQ. The result of the study was to find out in which moments the school did not provide support to the pupil in the two cases mentioned and what kind of help the pupil would appreciate at school. Both pupils were involved in a 1-year intervention in which the intention was to cultivate their mathematical thinking and expressions with the help of appropriately chosen tasks. The stated findings are important for practice and discussion about the training of future mathematics teachers, for which consistent professional training focusing, among other things, also on the education of gifted students is essential. Both case studies are part of long-term research dealing with the identification of gifted students.

Keywords: gifted pupils, identification of giftedness, profiles of gifted pupils, gifted pupils with dyslexia, mathematically gifted pupils with extremely high IQ

1 Introduction

When we think about giftedness, we must ask ourselves what this term means to us. The common myth that a gifted student is “the smart one” leads to the idea that identifying a gifted student in school is easy. We then consider a pupil who performs excellently, enjoys mathematics, learns quickly, and has practically no difficulties. Experts point out that students who are smart at school are not necessarily those who will succeed in the field in the future. Renzulli (1978) distinguishes between scholastic giftedness and creative-productive giftedness. He points out that the gift that is evaluated at school (school gift) often does not correspond to the individual’s success in life and whether he/she will develop his/her school skills in life as well (creative-productive gift). Therefore, if we perceive giftedness in this broader context, it will not be easy to detect gifted pupils directly in the school environment. In addition, there are different types of gifted pupils, some groups of which are disadvantaged in the school environment, and these students are not easy to identify. In the article, we will, therefore, reflect on the definition of giftedness and present six profiles of gifted students that were formulated by Betts and Neihart (1988). In the framework of two case studies, we illustrate the real difficulty of identifying gifted students from at-risk groups in the school environment.

2 Theoretical Framework

Intellectual talent has historically been viewed in a variety of ways, and we can say that even today we find different views on the definition of this term. Giftedness, e.g., has been defined as general intelligence (Terman, 1925), high ability in a specific academic area (Stanley, 1976), and an interaction between above-average ability, task commitment, and creativity (Renzulli, 1978). We also encounter an inconsistent approach to gifts, such as the potential to perform excellently in a certain area or already demonstrated performance (Hříbková, 2009). Many researchers have asked the question of what characterizes intellectual giftedness and how to recognize it already at younger
school age and not confuse it with, e.g., increased acceleration. According to many studies, gifted people have deeper and more connected knowledge, solve problems quickly, know how to categorize well, and are flexible in choosing strategies (Threlfall & Hargreaves, 2008). The gifted can quickly learn, receive, and process new information, tend to be interested in abstract questions, and are inquisitive; most have a good memory and a broad knowledge base (Portešová et al., 2014). Aspects that also distinguish pupils who are mathematically gifted are, e.g., atypical problem solving, interest in solving mathematical problems tasks, preference for abstraction, success in finding patterns and relationships, ability to concentrate, and ability to generalize (Singer, Sheffield, Freiman, & Brandl, 2016). A pupil who exhibits the above characteristics shows his/her gift. We then talk about manifested gifts. It is characterized by students who achieve exceptional performance compared to their peers. But even a student who is not gifted can achieve extraordinary performances. Hříbková (2009) states that the teacher considers the pupil who achieves exceptional performance to be gifted in a certain subject compared to his peers, whether he is gifted or not. At the same time, there are many gifted pupils who do not exhibit these characteristics. To understand this discrepancy, we need to focus on different types of gifted learners. Betts and Neihart (1988) introduced six profiles of gifted learners:

- Successful pupils who are popular with teachers and admired by classmates and parents; they have excellent results in school and are often singled out by teachers; these students, however, can get bored easily at school.
- Autonomous learners who are admired for their abilities are seen as successful; they have good self-confidence and high internal motivation; and they tend to have good grades.
- Underperforming pupils who seem quiet and shy and appear unproblematic are perceived as average achievers; they are not sure of themselves, have low self-esteem, and are not identified at school.
- At-risk pupils who are perceived as disobedient are not accepted by adults or peers; they are always in opposition and are angry at everything; there is a mismatch between intelligence and school performance; they excel in extracurricular activities and are not identified at school.
- Challenging pupils who tend to have problems with discipline come across as irritating; they quickly get bored at school, are impatient, are often in opposition, have low self-esteem, and are not identified at school. We refer to the previous three groups collectively as underperforming gifted students.
- Twice-exceptional pupils (gifted pupils accompanied by challenges in one or more areas such as learning disability or another disorder). This group includes gifted students with a learning disability, most often dyslexia, gifted students with Asperger’s syndrome – an autism spectrum disorder, gifted students with attention deficit disorder or hyperactivity (ADHD), etc., who are often perceived as strange and stupid; other students avoid them; they cannot respond to the teacher’s demands, are frustrated, have low self-esteem, do not understand the causes of their difficulties, and need a lot of support.

In the school environment, giftedness is usually recognized in students from the profiles of successful or autonomous pupils. Betts and Neihart (1988) claim that perhaps 90% of identified pupils in school programs are of the profile of successful pupils. Children from other profiles are risky, and identification is often not possible. The reason is usually a discrepancy between the perception of talent and its manifestations and the child’s actual manifestations.

Another at-risk group of gifted students is not listed among the six profiles, namely gifted pupils with extremely high IQ. These pupils, due to their behavior as well as teachers’ misunderstanding of the depth of their knowledge also tend to be unidentified.

When it comes to identifying gifted students at school, some authors point to the teacher’s perception of a gifted student. Baum and Reis (2004) or Portešová (2011), e.g., point out that primary school teachers often associate talent with mastered trivia, i.e., with fluent reading, flawless writing, and quick calculation. A student who fails trivia is not perceived as gifted. At the same time, various mathematically gifted scientists had problems with mastering trivia at school (Budínová, 2018). Furthermore, giftedness is often associated with early reading (Portešová, 2011), which at least gifted pupils with dyslexia do not fulfill.

In addition to the issue of identifying gifted students, there is also the issue of their development in mathematics classes. The teaching of these pupils should be based on the greater depth, complexity, and width of the study materials offered (Dimitriadis, 2012). From Bloom’s Taxonomy (1956), it is about providing opportunities for analysis, synthesis, and evaluation (Dimitriadis, 2012). Such an approach enables gifted pupils to be educated at a higher cognitive level.

Within the framework of two case studies, we will deal with the cases of pupils from the group of pupils with double exceptionality, namely mathematically gifted pupils with dyslexia and gifted pupils with extremely high IQ. So, we will now give more information about these groups.
2.1 A Gifted Student with Dyslexia

Students who display characteristics of the twice-exceptional profile (from the profiles of Betts & Neihart, 1988) are students who have two exceptionalities – giftedness and one or more disabilities (Ronksley-Pavia & Neumann, 2020). Students with this profile can have reduced resilience (impacting on behavioral engagement), limited coping strategies and learning strategies (inhibiting cognitive engagement), and impeded persistence (hindering both behavioral and cognitive engagement) (Ronksley-Pavia & Neumann, 2020).

Twice-exceptional students are divided into three groups: (1) identified gifted students as low-achieving students; (2) gifted students with specific learning disabilities (SLD) and diagnosed with SLD; and (3) students whose SLDs and talents mask each other (Yenioğlu, Melekoğlu, & Yılmaz Yenioğlu, 2022).

Dyslexia is usually specified as difficulties in the area of reading. As stated by Portešová et al. (2014), reading is not the only difficulty for students with dyslexia. Others are, e.g., deficits in the phonological processing of information, a deficit in the ability to quickly recall concepts from long-term memory, working speed, memorization, or insufficient graphomotor speed. In gifted students with dyslexia, various paradoxes arise between cognitive abilities and their difficulties. Therefore, these pupils are often referred to as paradoxical pupils and students (Tannenbaum & Baldwin, 1983). Gifted students with dyslexia tend to have difficulty with timed testing. They can achieve only partial success compared to if they had the opportunity to write the test in nonstressful conditions without a time limit. For that reason, they are very difficult to identify by testing. And, not only with testing that determines IQ or giftedness but also with practically every common test. They may achieve worse grades and may be perceived as weak rather than gifted. One compensatory mechanism that can help students with dyslexia is extended time. The second is to focus on the places where the student has difficulties and teach him to work with these mistakes.

2.2 A Gifted Student with an Extremely High IQ

One of the risk groups of gifted students is students with an extremely high IQ, usually greater than 150 (Hříbková, 2009). These pupils have very different individual profiles of different abilities. They have difficulties with peers and often find themselves socially isolated. Letta Hollingworth, who carried out a case study of 12 pupils with an IQ above 180 (Hollingworth, 1975), saw the reason in the fact that these children had interests, knowledge, and verbal expression corresponding to an adult rather than a child. This was a disadvantage for them because they did not have common interests with their peers. However, they did not feel comfortable even among the teachers, and sometimes they were considered “weirdos” and liars. Hollingworth reports that students with an IQ of 180 were taught by teachers with an IQ of 120, which was reflected in the way they communicated with the students. Hollingworth pointed out that gifted pupils with extremely high IQs waste a lot of time in school, e.g., as a result of not being given sufficiently challenging tasks: “In the ordinary elementary school situation children of 140 IQ waste half of their time. Those above 170 IQ waste practically all of their time” (Hollingworth, 1975, p. 299).

These are some of the reasons why educating gifted students with extremely high IQs is difficult and why these students may see school as a waste of time.

Ronksley-Pavia and Neumann (2020) present ideas on how to support autonomously gifted students in education (the profile according to Betts & Neihart, 1988). This profile perhaps corresponds most to students with an extremely high IQ who, like autonomous students, are able to set their priorities and adapt to the demands of the school, so we will now be inspired by these suggestions. These include, e.g., the following suggestions: giving pupils additional extended help if needed; offering inspirational study resources in their area of interest; strengthening motivation for independent study; and providing feedback in doing so.

The following study focuses on the description of two mathematically gifted students who were not identified as gifted in the school environment. It attempts to capture their academic development in the first years of education, certain moments that can be a sign for teachers that a given student is gifted, and the difficulties that students encounter in school. The parents’ view of their child’s mathematical education is captured. Furthermore, the child’s suggestions for a change in their education, which would enable them to develop better academically at the school level, are presented.

For this purpose, the following research questions were asked:

1. What characteristics in the field of education did the pupil show in preschool and younger school age?
2. What obstacles and difficulties in the area of education of gifted pupils did the student encounter at school?
3. How do their parents assess the student’s school education?
4. How does the student imagine his optimal mathematical education?
In both cases, a 1-year intervention was carried out, which focused on the initial deficiencies in the students' mathematical procedures. A procedure based on the assignment of nonstandard tasks was proposed, which the students solved independently and then presented their solutions to the researcher. The aim of this intervention was to cultivate their mathematical thinking and expressions.

3 Methodology

3.1 Participants

The first participant is a mathematically gifted student with dyslexia. He has been monitored since the fourth grade, and when his parents solved problems with his behavior and performance at school, they became more interested in his dyslexia and the possibilities of mathematical development. Today he is a pupil of the seventh year of elementary school. His mathematical abilities were determined by the test TIM3–5, which is a standardized test designed to identify the mathematical talent of third and fifth graders (Cígler, Jabůrek, Straka, & Portešová, 2017), according to which the student is at the hundredth percentile. His IQ was determined to be higher than 130.

The second participant is a mathematically gifted student with an extremely high IQ. He has been monitored since the seventh grade when his parents were looking for a tutor who would be able to adequately develop his mathematical abilities, as this did not happen at school. Today, he is a student in the second year of a 4-year high school. His mathematical abilities were determined by standardized tests in a pedagogical–psychological counseling center. His IQ was determined to be higher than 140 (there are no tests in the Czech Republic that would determine an IQ higher than 140).

3.2 Aim of the Study

The aim of the research was to describe the students’ situation, the moments that led their parents to intervene in education outside of school, the characteristics of the gift that the students showed, and the possibilities of cultivating their mathematical thinking. The research has two levels: (1) the level of pupils' difficulties or adverse circumstances that led to the fact that the pupils' talents were not identified and the pupils did not develop at the school level; and (2) a long-term view of the pupils, which will make it possible to determine whether and at what point they started to be pupils perceived in school as gifted.

3.3 Data Collection

Semi-structured interviews with parents and participants were used as the data collection technique in this study.

Parents were asked questions such as “How was the development of your son's math abilities and skills in preschool?” “Was the son independently interested in mathematical concepts in the early years of education? And which ones?” and “Has something hindered the development of your son's talents at school? And what?” The participant was then asked about the “ideal teacher” and the “ideal math lesson.”

Interviews were recorded and transcribed.

3.4 Data Analysis

The content analysis technique was used to analyze the data obtained in the study. No software was used for data analysis. Records were searched for predetermined sub-categories. These are presented in tables.

4 Case Study 1: Mathematically Gifted Student with Dyslexia

We will now present the identified subcategories of the first participant, a mathematically gifted student with dyslexia. The goal was to focus on relevant data that may be important for teachers of gifted students, who can more easily identify them according to certain characteristics and can focus on their optimal development (Table 1).

Pupil’s answers:

Ideal teacher: Nice, not obsessed with anyone. It is important for him that the teacher is able to explain the subject matter well. He assigns him tasks like other classmates, and when he does well, some more difficult ones, numerically and logically. But it must not be tasks that he just enjoys; he literally says, “It must not entertain me more than it educates me.”

Ideal math lesson: The teacher explains the subject matter, then the students solve the tasks independently; they can consult with the teacher. Now, they have math lessons in two-hour blocks, which doesn't suit him – he gets exhausted during the first hour, and in the last half hour,
he can no longer concentrate. He would like shorter lessons. He likes to work with teaching aids – he gets an idea of new concepts or practices the subject matter.

### 4.1 Context of the Situation

This case concerns a pupil with dyslexia. For the purposes of this case study, we will refer to him by the fictitious name Ron. The fact that Ron has an aptitude for mathematics was already suspected by his parents at preschool age. He was particularly interested in construction kits; he built very complex spatial structures, which required a high degree of spatial imagination. He was interested in numbers and liked solving word problems. However, after he started school, his parents started to deal more with problems with his social and emotional skills, which were greatly reduced. When they used to go to school for the third year to solve various problems with his behavior, the situation seemed hopeless, and they paid for a private psychologist. She reassured them that the son was socially and emotionally at the level of a child three years younger, but that the situation would improve on its own during puberty.

In addition, during the first two years of education, Ron’s dyslexia began to show strongly. The development of mathematical talent could not take place at school because the teachers spent most of the time solving problems with his behavior or problems associated with dyslexia. However, his parents continued to perceive his increased interest in mathematics as well as his high abilities in this subject. He quickly acquired new knowledge and had very flexible thinking with the ability to generalize. Arithmetic was no problem for him; he quickly learned to add, subtract, multiply, and divide. He liked to solve nonstandard problems, and his solutions were often imaginative. In Figure 1, we can see his original solution to the following problem: *If you add two numbers, you get 58. One of the numbers is 5 more than the other. What are the numbers?* He solved this task in his second year. He used a controlled experiment strategy. His answer is “26 and a half and 31 and a half = 58.”

Because of dyslexic difficulties, the parents decided to visit the pedagogic-psychological counseling center in the fifth grade. The assessment stated: “Reading at a slow pace with increased error rate (dyslexia), written expression is marked by increased error rate on the basis of weakened phonological awareness; graphomotor clumsiness. Reasoning skills are at a very good level. The ability to perceive spatial relationships, logical reasoning and mathematical judgment is advanced. Verbal skills are average. The work pace is slower. Frequent positive feedback helps him to stay focused.” An individual education plan was drawn up for Ron, with the

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**Table 1: View on the development of mathematically gifted pupils with dyslexia**

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Subdimension</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool period</td>
<td>Interest in numbers</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Interest in geometric building blocks (like Lego)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other significant interests</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>An early reader</td>
<td>No</td>
</tr>
<tr>
<td>The first 3 years of elementary school</td>
<td>Interest in numbers continues</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Interest in geometric building blocks continues</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other significant interests: Sport, Chess</td>
<td>Yes</td>
</tr>
<tr>
<td>Social–emotional state – first grade</td>
<td>Existence of a circle of friends (in school)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ability to make friends</td>
<td>With problems</td>
</tr>
<tr>
<td></td>
<td>Being able to express oneself</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Learned helplessness</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Displaying problem behavior when unable to express oneself</td>
<td>Yes</td>
</tr>
<tr>
<td>Social–emotional state – second grade</td>
<td>Existence of a circle of friends (in school)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Ability to make friends</td>
<td>Yes</td>
</tr>
<tr>
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<td>Being able to express oneself</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Learned helplessness</td>
<td>No</td>
</tr>
<tr>
<td>Gift development in school</td>
<td>Assigning more of the same tasks</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Assignment of more cognitively demanding tasks</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Difficulties leading to non-identification of the pupil’s talent</td>
<td>Dyslexia and learned helplessness</td>
</tr>
<tr>
<td>Manifestations of mathematical thinking</td>
<td>Missing metacognition</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Prevailing initial solver strategy</td>
<td>A controlled experiment</td>
</tr>
<tr>
<td></td>
<td>Problems with concentration</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Numerical errors</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>
emphasis placed on strengthening the teaching of the Czech language and also on enriching the mathematics curriculum. This helped him, and he began to do better in school.

4.2 Measures Leading to the Stabilization of Dyslexia Problems and the Development of Giftedness

The diagnosis of dyslexia was crucial for Ron. Many of his problems stemmed from frustration at not being able to complete schoolwork as successfully as his classmates. Once the problem was named, Ron could concentrate on compensating for dyslexic difficulties and developing his mathematical aptitude.

A mathematical intervention was carried out for him in the fifth grade. His initial strategy that he used before starting the intervention was a controlled experiment. Metacognition was manifested in some cases (e.g., evaluating the meaningfulness of the result), but he was not able to manage his strategies. In the course of the one-year intervention, he managed to eliminate these deficiencies, began to consciously use solution procedures, and was aware of individual steps. He expanded the spectrum of solving strategies and began to use arithmetic and sometimes algebraic strategies more.

From the sixth grade, he began to study mathematics outside of school in the mathematics club. He is in seventh grade today. His dream is to become a computer programmer, and he has begun to adapt his actions to this: he thoroughly learns the English language because he knows that he will need it; together with his parents, he decided on a vocational high school focused on programming because he would have problems with academic subjects in high school; strives to have good knowledge and results in mathematics; attends a programming class. Now, in the seventh grade, we can say that his dyslexic problems persist. He switched to freehand writing, which allowed him to write faster and focus more on the rules of spelling. Even so, he often makes mistakes. He is guided by teachers and parents to look for and correct mistakes himself.

In mathematics, he continues to be distinguished by novel and original solution ideas. He understands new knowledge and connections very quickly and is able to explain mathematics to others. But most importantly, he learned to work with his difficulty and found a goal to work toward. The psychologist parents visited in the third grade was right. In adolescence, he socially caught up with his classmates. However, his situation at school and in the classroom improved significantly immediately after the diagnosis of dyslexia and mathematical giftedness.

At school, however, he was never perceived as mathematically gifted, and the teacher described him as an average student.

5 Case Study 2: Pupil with Extreme High IQ

In Table 2, we can see a view on development of mathematically gifted pupil with extremely high IQ.

Pupil's answers:

Ideal teacher: A good mathematician who is willing to assign the student intellectually demanding tasks in the form of projects that he will discuss with the student, will give him feedback and gradually lead him to correct the project. The teacher should focus on the student’s strengths and not on their weaknesses.

Ideal math lesson: Math lessons, as he experiences them at school, might not be at all. He does not learn anything new from them. A meaningful lesson should be longer so that the student has time to delve into the problem and solve it to the end.
5.1 Context of the Situation

David started going to kindergarten at the age of 4. The parents were dealing with problems associated with his behavior – e.g., he took apart a model of a human skull, including all the teeth, which he hid in various places around the class and asked the teachers to find the individual parts and assemble the skull. He showed an unusual interest in numbers and had other interests that absorbed him, such as knowledge of dinosaurs.

David started first grade when he was almost 7 years old. He showed difficulties in the social area and a reduced ability to adapt to a new environment more than his mathematical talent. During the first grade, the mother was invited by the class teacher who told her that David is strange, does not fit in with the team, disrupts the lessons, and tries to teach the other children from examples to which they do not know the answers. The teacher was asking the parents to do something about him because if a school inspection comes to her class, it will be hard to explain. The mother perceived a difference in her view of her son, who showed an unusual interest in mathematics as well as unusual knowledge, and the view of the school, where David was seen as more problematic and, therefore, had David tested by Mensa. The test showed highly above-average intellectual abilities. The parents were advised to transfer David to another elementary school, where he can work better with gifted students. The transfer condition was confirmation of mathematical talent by pedagogical–psychological counseling. The investigation showed extraordinary abilities in mathematics, logic, and spatial imagination.

He was average in other subjects and had difficulty in the ability to understand the spoken word and in writing. His weak point was his social skills. During the second grade, he came to the conclusion that “you can also calculate the square of a number by adding the same number to the square of a number once more and then one larger number and you get the square of the number 1 larger” (e.g., $5^2 + 5 + 6 = 36$ which is $6^2$).

There was no acceleration in the gifted school because disciplinary problems were constantly being solved. David was not happy at school, and he was even hospitalized with mental problems. The parents, therefore, decided to change school yet again. Because he was in the fifth grade, they sent him to the entrance exams for a multiyear gymnasium and waited until the end of the school year to change school.

### Table 2: View on the development of mathematically gifted pupils with extremely high IQ

<table>
<thead>
<tr>
<th>Main theme</th>
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</tr>
<tr>
<td></td>
<td>Other significant interests: Dinosaurs</td>
<td>Yes</td>
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<tr>
<td></td>
<td>An early reader</td>
<td>Yes</td>
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<td>The first 3 years of elementary school</td>
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</tr>
<tr>
<td></td>
<td>Interest in geometric building blocks continues</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other significant interests: Chess, Timetables</td>
<td>Yes</td>
</tr>
<tr>
<td>Social–emotional state – first grade</td>
<td>Existence of a circle of friends (in school)</td>
<td>No</td>
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<tr>
<td></td>
<td>Ability to make friends</td>
<td>With problems</td>
</tr>
<tr>
<td></td>
<td>Being able to express oneself</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Learned helplessness</td>
<td>Yes</td>
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<td>Displaying problem behavior when unable to express oneself</td>
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<td>Social–emotional state – second grade</td>
<td>Existence of a circle of friends</td>
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<td>Behavioral manifestations, Learned helplessness</td>
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</table>
In the sixth grade, he transferred to a multiyear gymnasium. Even here he did not get the desired education he imagined. He was included in the group of average students, even in mathematics, and he did not have any supplementary studies as part of the teaching.

From the seventh grade, he started attending my individual math lessons.

David’s mathematical abilities were demonstrated at a younger age in a pedagogical-psychological counseling center and later, from the seventh grade, were described on the basis of his performance during individual tutoring.

His extraordinary mathematical abilities were obvious – he was able to calculate from memory even complex calculations with fractions or decimal numbers and determined powers and square roots from memory. He solved problems easily and was proficient in generalization and geometry. He had an extraordinary memory, thanks to which he remembered everything the first time.

At the same time, however, the uneven development of mathematical abilities was evident: he could not write down the solution procedure intelligibly, experimented chaotically, and did not use solving strategies or metacognition. In structural geometry, his knowledge and skills were not even at the level of a seventh grader.

There were noticeable gaps in the social area – he usually did not make eye contact, answered sternly, and of all topics, he was only interested in mathematics.

5.2 Actions to Improve David’s Situation at School

David was dissatisfied with the fact that, even at the multiyear gymnasium, teaching mathematics did not enrich him. He was looking for new stimuli, and most of all, he would like to start studying straight university mathematics. But I saw that first, we would have to eliminate the gaps in his ignorance of solving strategies, nonuse of metacognition, and ability to write down the solution procedure.

Initially, David mostly used an undirected experiment to solve problems. This was mainly due to his ability to calculate even difficult examples from memory. I immediately warned him that I would not accept the results unless I understood how he arrived at them. He immediately responded to my request and began to think about how he had actually proceeded. However, this led him to more sophisticated procedures – arithmetic or algebraic. When he had to start thinking about the procedure, he realized that there are more elegant ways of solving things than simply guessing the result.

During the seventh grade, he also learned to write down the solution process clearly. He had his own ways of thinking, and sometimes I had to do a lot of thinking to understand his process. Let us show this phenomenon in the example of David’s solution to one of the tasks: *We took some number, multiplied it by its two-thirds, and subtracted a third of that sum from that sum. We got 10. What was the original number?* David’s solution can be seen in Figure 2.

David recorded some of his essential thoughts, but the notes are atypical, and so one must infer the information that is missing. He proceeded arithmetically with the method from the end. He started by saying that 10 is two-thirds of a number. However, he was unable to write it down (e.g., the algebraic notation $10 = \frac{2}{3}x$ or a verbal description is offered), and he captured his idea at least as the mathematically false "$10 = \frac{2}{3}\$". So, he looked for a number that is three halves of 10, converted the three halves to the decimal number 1.5 and calculated $10 \times 1.5 = 15$. He then reasoned that increasing a certain number by $\frac{2}{3}$ is the same as multiplying it by $\frac{5}{3}$. This is where the last calculation comes from when he multiplied the number 15 by $\frac{3}{5}$ or the number 0.6. So, the number we are looking for is 9. At first, David did not do the true-falls tests at all, and gradually I managed to get him to at least perform them by heart.

![Figure 2](image-url)

*Figure 2: Sample of the solution: “We took some number, multiplied it by its two-thirds, and subtracted a third of that sum from that sum. We got 10. What was the original number?” David’s answer: “The original number was 9.”*
The fact that David did not perform true-falls tests was related to not using metacognition. This was reflected in cases where he had an error in the result but presented the result as correct. David was not used to checking his procedures and results. If he submitted a wrong result, I had him go back through the solution and find the error, then justify the newly chosen solution and finally perform the true-falls test. In this way, he began to realize that not all of his solutions were correct and that it was necessary to check and also justify the procedures.

During Grade 8, David improved in his use of strategies as well as in his use of metacognition. While in the first months of our interventions, he most often resorted to undirected experimentation, and during the eighth grade, he successfully used arithmetic strategies and gradually began to prefer the algebraic strategy. The tasks that I had to give him in order to fulfill his potential gradually exceeded the level of difficulty of the elementary school curriculum.

During seventh and eighth grade, we covered high school math, but even that was getting too easy for him. In the eighth and ninth grades, we discussed differential and integral calculus. He mastered the subject matter with deep insight and understanding.

Despite his undoubted mathematical ability, he was never considered mathematically gifted throughout elementary school. The teacher let him work together with the other students on the regular curriculum, and he was not interested in preparing stimulating materials for him or discussing them. David was wasting his time in math class. To the teachers, David seemed more like “a weird,” and he often showed it to David and his parents. The change only came when he entered grammar school when the teacher changed. The new teacher immediately recognized his talent and started offering him various activities in the form of assignments, math competitions, correspondence seminars, etc.

As for David’s social situation, he felt isolated in his early years of education. Over time, he was able to find friends with whom he shared hobbies such as ping pong and cycling. However, his interests continued to be fundamentally different from those of ordinary children. For example, he stopped playing computer games because he realized how much time they were taking away from his studies.

6 Findings

The characteristics of two mathematically gifted students and their difficulties at school were obtained from interviews with parents and the research participants themselves. From Tables 1 and 2, we can note that the students have some characteristics in common (interest in numbers and geometric constructions or the weak ability to surround themselves with friends), but they differ from each other in many ways. We see differences in early reading, other interests, ability to concentrate, initial problem-solving strategies, and obstacles that led to nonidentification of pupils. However, both students had in common that both they and their parents were frustrated with the development of their mathematical education at school, and because they did not find support at school, they had to try to help their children on their own.

In both cases, the parents pointed to learned helplessness when the student neither understand his difficulties nor why he was not understood by those around him, which resulted in undesirable behavior and the escalation of problems.

In both cases, help was found outside the school. Parents perceive this as a failure of the school and teachers, who did not recognize the needs of the students or their talents and refused to attend to them.

From the interviews with the parents, it emerged that the learned helplessness was removed for both pupils sometime between the first and second grades of elementary school. Pupils became more aware of their difficulties, which they did not know how to deal with before. Learned helplessness in both led to undesirable behaviors such as disruption or attracting attention, and thus became one of the main reasons for nonidentification. When the pupils understood their weak and strong points, they could start working on them in a targeted manner.

The studied pupils do not agree on the idea of an ideal teacher and an ideal mathematics class. While the first pupil is particularly concerned that the teacher should be fair and educate him analogously to other classmates, with the exception of the fact that he would receive additional enriching tasks, the second pupil imagines his education more in a university-based way, based on projects where the teacher is an expert, with which one can speak eruditely. The first student imagines the lessons to be shorter because of his weakened ability to concentrate. The second student, on the other hand, would like them to be longer so that he can delve deeper into the problem.

In both cases, there was a 1-year intervention in which the author of that article looked for ways to suppress some of the students’ deficiencies, such as missing metacognition or inefficient use of problem-solving strategies, and how to develop their mathematical thinking. The intervention was conducted by assigning nonstandard tasks, which the students solved independently and then described their solutions to the researcher. If they made a mistake, they were guided to correct it. In this way, they gradually learned to
7 Conclusion and Discussion

The study aimed at the description of two mathematically gifted students who were not identified as gifted in the school environment. It focused on the academic and social–emotional development of pupils, their interests, early manifestations of mathematical abilities, and difficulties that made it impossible to identify talent at school.

The first pupil was a mathematically gifted pupil with dyslexia. In his preschool and younger school years, he was interested in numbers and geometric building blocks and liked to solve mathematical problems. He was not an early reader and had trouble reading and writing. The mentioned problems can lead to the fact that the teacher does not perceive the pupil as gifted (Baum & Reis, 2004; Portešová, 2011).

His difficulties consisted of learned helplessness and dyslexia. The result was complicated behavior. Because of his behavior, he was not considered gifted. A positive change occurred after the diagnosis of dyslexia, more precisely, right after parents, teachers, and the student himself began to find out how to manage dyslexia. This apparently solved some of his problems, when he perceived his difference from other children, but did not know how to deal with it. Unfortunately, the school did not offer help to the student, but his parents had to provide it. The diagnosis of dyslexia helped him a lot, but he was never perceived as gifted during elementary school. The pupil achieved average to below-average results in regular tests, but he never succeeded in any math competition. Once he was given unlimited time on the math aptitude test, his scores were at the hundredth percentile. In this regard, there is another danger of dyslexia – gifted pupils with dyslexia are not detected by testing because they constantly fail it. Tannenbaum and Baldwin (1983) also draw attention to the fact that time-limited testing is problematic for pupils with dyslexia.

This student belongs to the category of students whose manifestations of dyslexia prevail over manifestations of giftedness (Yenigölu et al., 2022).

Parents would welcome their son’s education if teachers were able to identify both his dyslexia and his talents. Having secured a diagnosis of dyslexia themselves, they appreciated the school’s efforts to help their struggling son. However, they did not see any improvement in giftedness in the first grade. The student was not given more cognitively demanding tasks, which help gifted students to develop better (Dimitriadis, 2012). This gradually started to happen in the second grade of elementary school.

According to this student, ideal education consists of assigning tasks that will develop him. He wishes the lessons to be shorter (1 hour in length) because he has problems with concentration.

The second pupil was a pupil with an extremely high IQ. In his pre-school and younger school years, he was interested in numbers and geometric building blocks and liked to solve mathematical problems. He was an early reader. From the beginning of his education, he had problems with his high intelligence, as described by Hollingworth (1975), when he felt misunderstood by those around him. In kindergarten and in the first 5 years of education, he encountered misunderstanding, especially from the teachers. They perceived him as a disruptive and maladaptive pupil who disrupted the lessons. His mathematical abilities in some areas were so far beyond the capabilities of the teachers that he suffered from not learning anything new in mathematics classes throughout his primary education. It would be useful to create harmony in the school between hierarchical development, which is specified in the school curriculum, and horizontal or segmented development, as defined by Bernstein (Hordern, 2017), which is more spontaneous and can be uneven during tutoring.

His difficulties in not identifying his talents stemmed from learned helplessness. In the first grade, he did not understand why people did not understand him and judged him as a disruptive individual. He was not identified as gifted throughout elementary school. Throughout elementary school, he was several years ahead of his classmates in terms of knowledge, where by knowledge, we mean the set of facts, information, and skills acquired during education (Oxford Languages). In the second grade, he studied powers; in the seventh and eighth grades, he passed high school analytical geometry, functions, and equations; in the eighth grade, he learned differential calculus; and in the ninth grade, he learned integral calculus. In elementary school, he mastered the university curriculum with a deep understanding.

The parents of this pupil were very exhausted by the fact that none of the teachers could identify their son’s talents and that he did not develop in any way at school. The mother said: “Everywhere it is proclaimed that a gifted student has the right to an adequate education, but today I am convinced that this is just a theory.”

The student would like to be given tasks at school that would optimally develop him cognitively. The teacher
should then be an expert with whom you can talk about solutions. The hours should be longer so that you can dive more into the problem. Some earlier studies (e.g., Dimitriadis, 2012) point out that although the education of gifted students based on the assignment of more cognitively demanding tasks is generally considered desirable, practice often shows completely different approaches.

The results gained by the study are limited because they were obtained from only two case studies. Despite this, they present an important message from parents and students about what professional mistakes teachers make in teaching and what consequences this has for the student. The demands on the teacher, who is supposed to educate a mathematically gifted pupil, based on his specialist knowledge in the field and in pedagogy, are obvious.

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