Gramotnost, pregramotnost a vzdělávání

Odborný recenzovaný časopis zaměřený na problematiku čtenářské, matematické, informační a přírodovědecké gramotnosti a pregramotnosti

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Univerzita Karlova, Pedagogická fakulta
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Dear Readers,

We are happy to present to you the first issue of the fifth year of the journal which specializes in the field of literacy and education in their broadest terms. You are used to the fact that the issue written in English is usually the last. This year we are also publishing a double issue, which deals with physical literacy. For this reason, the numbers have been exchanged. The call for an English issue was open to all authors on any topic related to educational literacy. There are four articles for readers in this first issue (three research studies and one case study).

The first two research studies focus on reading and mathematical literacy. The first article describes a way to identify early readers at the very start of their compulsory school attendance by using a time-saving group activity. The second one focuses on mathematical literacy. This research study describes how students with autism spectrum disorder (ASD) approach mathematical problems, how they process them cognitively, and what the specifics of the way they solve them are. The third research study informs readers of the results of a qualitative analysis that was a complementary part of a quantitative investigation mapping the conditions of the implementation of inclusive education after the introduction of inclusive changes in the Czech Republic in 2016 from the perspective of special educators in schools and school managers. The last paper – a case study – deals with the issue of evaluating the level of comprehension by a child of texts read aloud in nursery school and the related development of the relationship to reading.

We will now introduce the contributions in more detail. The first article, Identifying Early Readers at the Start of their Compulsory Education (Lenka Zemanová and Radka Wildová), deals with the theoretical background to determine the conditions in schools, to map proposals for changes in the system, and to provide space for free expression of opinions revealing more about the attitudes being examined in terms of inclusive education. Elementary school pupils have different abilities in reading and reading comprehension and primary school teachers need to adapt to the pupils‘ reading and comprehension reading in the first

grade. All pupils need suitable conditions for their effective development and further motivation. This text provides a general overview of the reading skills that first-grade pupils can demonstrate at the beginning of the learning process. A positive aspect of this paper is that it also includes a methodological summary which could be used in practice.

The second text, Mathematical Problem Solving of Students with Autism Spectrum Disorders (Hana Sotáková), is focused on the processing of mathematical problems in pupils with autism spectrum disorders. The author primarily focuses on whether it is possible to find differences in the way these pupils approach the problems as compared to students with no known disabilities and whether we can find ASD-related differences in their problem-solving procedures. The results showed that the processing of mathematical problems by pupils with ASD is affected by both the degree of their disability and the level of their language and social skills.

The third research study, The Implementation of Inclusive Education after the 2016 Legislative Changes from Schools' Perspectives (Jana Mrázková), describes the implementation of inclusive education after legislative changes in 2016 from the point of view of schools and acquaints readers with the results of a survey mapping the conditions of this implementation from the point of view of special pedagogues in schools and school principals. The results emphasise the need to ensure the effectiveness of inclusive education with appropriate funding and staffing. Another important factor is the internal conditions of the school and the limits imposed by the handicaps of their students.

The fourth and final paper, Assessment of the Development of a Child's Comprehension of Texts Read Aloud (Eva Koželuhová), deals with evaluating the level of comprehension by a child of texts read aloud in nursery school and the related development of the relationship to reading. The author finds out that nursery schools have great potential to develop suitable conditions for the development of reading literacy and to support the development of text comprehension. The results provide an overview of several phases of comprehension, and their characteristics were used in the creation of a simple evaluation tool suitable for preschool teachers to assess the level of understanding and relationship to reading in children.

It is obvious that all four papers of this English issue are highly exploratory and bring new findings and experiences with an overlap with practice. We believe that this English issue will find its readers, both from the professional sphere and from practice, just like the previous issues.

Thank you for your patience with the

publication of this issue, which, like everything else, was not left unaffected by the pandemic, and we look forward to seeing you in the next issue, which will focus on physical literacy.

Anna Kucharská
and Monika Kadrnožková

Identifying Early Readers at the Start of Their Compulsory Education

Lenka Zemanová, Radka Wildová

Abstract: This contribution describes a way to identify early readers at the very start of their compulsory school attendance by using a time-saving group activity. Early readers are first-year primary school pupils who have learnt to read and understand what they read at least at the level of words or short sentences when they start school.

The different levels of reading skills at the beginning of the first year of primary school put a great strain on teachers. It is necessary to provide all children with suitable stimuli to develop their initial reading literacy and support their motivation to read. To reach this goal, it is necessary to have an overview of the pupils' current knowledge and skills. This text offers a way to get a general overview of each pupil's reading skills within one lesson. The procedure was developed for children who are learning to read in Czech, so it is also explained on this premise. However, we believe that the principle by which reading skills are determined is applicable to other languages as well. Therefore, we primarily present here a general methodological procedure which can be adapted to different languages as needed. After the initial examination, further activities should follow according to the individual teacher's choice, which will refine the knowledge acquired and enable the planning of subsequent learning activities.

Key words: early reading, identification of early readers, reading comprehension, the start of school attendance, initial reading literacy development, group activity

Introduction

Primary school is often associated with the idea of the basic things that it is necessary to learn at school, i.e. what is traditionally known as "the three Rs" (**r**eading, w**r**iting, and a**r**ithmetic). One of the key skills is reading, nowadays perceived in a broader context as reading literacy, which is defined in various ways. Historically, it was understood primarily as a tool for communication in writing. In this text, we will proceed from the PISA[1] definition. Even this definition

[1] The OECD's Programme for International Student Assessment.

has undergone certain changes and specifications. The newest is the definition from 2016 (for a research survey in 2018): *Reading literacy is understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential and to participate in society* (OECD, 2016, p. 11).

We live in a rapidly changing world, in which both the quantity and variety of written materials are increasing and where people are expected to use these materials in new and complex ways. It is now generally accepted that our understanding of reading literacy is evolving along with changes in society. The goal of education has continued to shift its emphasis from the collection and memorisation of information to the inclusion of a broader concept of knowledge. That is why reading literacy includes a wide range of cognitive competencies, from basic decoding to knowledge of words, grammar and larger textual structures, and metacognitive competencies. Metacognitive competencies are activated by the reader's thinking about, monitoring, and adjusting their reading activity for a particular goal (OECD, 2016).

The education system must also respond to these changing circumstances. The start of compulsory education is a key period during which a child acquires the basics of reading literacy. At the same time, it is necessary to take into consideration the fact that classes are not homogeneous. There are often children with different levels of knowledge and skills in different fields and subjects. Children with a different native language, children with special educational needs, and even gifted children come to school. Teachers must first get to know their class and then select the methods and types of work that will be suitable for each pupil so that everyone can develop according to their needs and abilities.

Some children come to school already possessing certain reading skills; some only "know the letters", i.e. they are in the phase of decoding text, but others read and understand words, sentences, or even whole texts. It is these children that we will pay attention to in this contribution.

The first assumption on which the research is based is the connection between giftedness and early reading, which has been pointed out by many authors (Beverly & Sulzby, 1989; Gross, 1999, 2006; Laznibatová, 2007). The second is that children who have learnt to read at an early age (three to five years, or six years – before starting school) will be interested in using reading as a tool for further learning and obtaining information from areas that interest them. Another assumption refers to the family environment of early readers and is based on the findings of international research (Cobb, 2014; Matějček, 1987; Shaughnessy, 1994), which state that

family environment has a fundamental influence on the development of early reading in children and that the vast majority of early readers come from families where reading is considered important and the parents read to their children, look at picture books with them from an early age, provide them with a stimulating environment (games, toys, books), talk to them about what they have read, etc.

Theoretical basis

Children are considered early readers when they learn to read before starting school. Some of them remain at the level of decoding text,[2] but then they quickly make progress as soon as they start school and read under the guidance of a teacher or even on their own. There are a number of children who start school and understand what they read. Some of them even read entire books. However, there are very few children such as this, about 1–2% (Cobb, 2014).[3]

A child is considered gifted when they have a high intellectual potential which is accompanied by other characteristics: a high level of logical thinking and attention span, excellent memory, above-average level of original and creative thinking, etc. A gifted child at the start of school attendance usually shows an increased interest in reading and writing, has above-average number concepts and the need to learn new things, is very inquisitive, and learns quickly (Laznibatová, 2007). Early reading is therefore one of the characteristics of children who are considered gifted or exceptionally gifted.

State of research on this topic

Questions concerning early reading have been elaborated in a number of foreign academic articles. Research in this area has been conducted over the last fifty years, mainly at various American universities. One of the first to draw attention to the topic of early reading was Dolores Durkin. She conducted research in the 1960s in California and New York City (Durkin, 1966 as cited in Cobb, 2014). It turned out that out of the group of 9,500 children in the first stage of primary school who were examined, 2% were children who could read at the start of their school attendance. The benefit of this study is that it drew

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[2] Here we leave aside the notion of hyperlexia, where children read fluently without understanding the text. If reading is associated with comprehension and other expressions of intellectual talent, the term hyperlexia is not usually used, although one may sometimes encounter it (Matějček, 1987).

[3] Cobb refers to Durkin's research from the 1960s: Durkin, D. (1966) *Children Who Read Early: Two Longitudinal Studies.* New York: Teachers College Press.

attention to the reading skills of some preschool-aged children.

Durkin was then followed by other authors who purposefully focused on early reading as a separate phenomenon. How does a young child learn to read? Is it possible to teach him/her? How do many children learn to read on their own? What do these children have in common? To this day, much research is searching for the answers to these and other questions (Cobb, 2014; Gross, 1999, 2006; Jones & Reutzel, 2015; Leahy & Fitzpatrick, 2017; Olson, Evans & Keckler, 2006; Shaughnessy, 1994). They agree that family environment has a major influence on early reading. This means a stimulating environment, enough books suitable for the corresponding age of the children, parents who support their children in viewing and later reading books as well as reading to them themselves, and siblings and grandparents that are key elements which influence the children's interest in reading and development of early reading.

Cobb (2014) cites research from Philadelphia (Neuman & Celano, 2006[4]) in which children from poor neighbourhoods were of interest. In preschool facilities, as many as 11% of the children read, even though their family environment was not very stimulating, no one led them to read, and nor was there a leading example for their positive relationship towards books. These children probably gained their early reading skills as a result of the stimulating environment in a collective facility while interacting with peers and adults, and thanks to the availability of appropriate motivating materials and books. It turns out that a crucial factor for the development of early reading is a linguistically stimulating environment and sufficient interaction with adults or other children. At the same time, it is a necessary requirement for the child to reach a certain maturity (Leahy & Fitzpatrick, 2017).

According to Lynn A. Olson (Olson et al., 2006, pp. 206–207), there is no universal definition of an early reader. However, she lists several characteristics according to which a child can be considered one. The primary one is the ability to decode words. The second characteristic is the comprehension of written text. T Many of the studies referred to by Olson et al. (2006)[5] define early reading as the ability of a preschool child to decode text without being formally

[4] Neuman, S., & Celano, D. (2006). The Knowledge Gap: Implications of Leveling the Playing Field for Low-Income and Middle-Income Children. *Reading. Research Quarterly, 41*(2), 176–201.

[5] Plessas, G. P., & Oakes, C. R. (1964). Prereading experiences of selected early readers. *Reading Teacher, 17*, 241–245.
Stroebel, S., & Evans, J. (1988). Neuropsychological and environmental characteristics of early readers. *Journal of School Psychology, 26*, 243–252.

taught to read and then understanding the text to the extent that is common for second-year primary school pupils. The third trait of early readers is the informal and unintentional reading instructions that early readers received from their parents, siblings, or preschool teachers. These children learnt to read not because they were deliberately taught by someone, but because they were able to ask the right questions and get answers to them. The activity was therefore based on children who were interested in getting acquainted with letters and written text and gradually learnt to read. Their ability to read and understand what they read is thus not the result of the intentional influence of adults or older siblings, but the interest of the child itself.

Olson et al. (2006) states that the information was obtained from interviews with parents, but none of the studies she refers to researched the children's opinions and views on how they learnt to read. Similarly, Cobb (2014) points out that in order to better understand the phenomenon of early reading, it is necessary to ask the early readers themselves, i.e. preschool children, or children at the start of their school attendance, not only their parents and teachers. According to Cobb (2012, 2014, 2016, 2017), children are credible participants in research, because if they learnt to read at an early age, it is very likely that they will also be able to reliably reflect on this ability. That is why Cobb herself conducted interviews with children and thus managed to significantly broaden her view on early reading.

Cobb's conclusions (2014) show that at the start of their school attendance, a total of 2% of children could read simple words and 1% of children could read words in a sentence. Of these early readers, 11% were children who learnt to read at age three, 39% at age four, and 43% at age five. Olson (2006) also gives a figure of 1% as the number of early readers. This data shows that early reading is a truly rare phenomenon, but it requires expert attention so that these children receive the necessary support at school and can develop according to their abilities.

Early reading research

The topic of early reading is almost nonexistent in Czech academic literature. In the second half of the 20th century, in addition to his research on dyslexia, Matějček (1987) and later Seidlová Málková (2017) dealt with this topic. In contrast, there is plenty of research in foreign, especially English-language literature. However, most of these studies deal with reading in English. To a lesser

Thomas, B. (1984). Early toy preferences of four-year-old readers and nonreaders. *Child Development, 55*, 424–430.

extent, research on other languages (Finnish, Greek)[6] is also available, as cited by Seidlová Málková (2017). We therefore proceed from the general definition of the term *early reading* and do not distinguish between individual languages and their differences for the purposes of this study.

In a Czech environment, Matějček (1987) worked on the topic of early reading, which he encountered while researching dyslexia and various reading difficulties. He worked with hyperlectic children, in whom the ability to decode text without understanding it was associated with autism spectrum disorders or reduced intellect, and with children for whom he uses the term *second form of hyperlexia – exceptionally early readers* (Matějček, 1987, p. 86). According to him, in this case, early reading is associated with the extremely rapid intellectual development of the child. In the context of individual abilities, reading is not perceived as something exceptional, as in many respects the child acts like older children and achieves similar results to them. Matějček collected data on approximately seventy children who learnt to read on their own before the age of four.

Virtually the only research that has recently dealt directly with early reading in a Czech environment is the research on the literacy profile of Czech early readers which was based on the longitudinal research study *Enhancing Literacy Development in European Languages – ELDEL* and discussed in detail by Seidlová Málková (2017). Over the course of three years, it followed nine early readers from preschool by way of tasks focused on preliteracy, early reading, and writing letters and words. The children completed these tasks in their last year of preschool and then in the first and second years of primary school. The control sample was nine children of the same age, but they were not early readers. The conclusions show that early readers achieve better results in most of the skills that were tested, i.e. reading and writing of letters and words, knowledge of letters, and phonemic awareness. The selection of respondents was based on an already-existing data set from a longitudinal research study on the development of reading literacy. Test questions from this research were also used, which proved to be a certain limitation – it was not possible to use questions and tasks other than these. E.g. reading comprehension questions were included in the second year of primary school and therefore it was not

[6] Silven, M., Poskinparta, E., & Niemi, P. (2004). The Odds of Becoming a Precocious Reader of Finnish. *Journal of Educational Psychology, 96*, 152–164.
Tafa, E., & Manolitis, G. (2008). A Longitudinal Literacy Profile of Greek Precocious Readers. *Reading Research Quarterly, (3)*2, 165–185.

possible to use them as a significant indicator of early reading in preschool. The early readers were selected according to the results of more extensive research; there was no need to specifically seek them out. It was possible to work with each child individually, or, during some of the tasks, in small groups.

Methodology

The activity described here was first used to find respondents for dissertation research on early reading in September 2018 and was described in detail along with the procedure of other parts of this research (Zemanová, 2019). Since it turned out that it would be possible to carry out a general orientation reading test in this way at the very start of the children's school attendance, this group activity was subsequently verified in September 2019 in two first-year classes. A total of 260 pupils from eleven first-year classes at four primary schools in Prague took part in this search for readers at the start of their school attendance. In 2018, there were 210 pupils from nine classes at four primary schools, then in 2019 there were 50 pupils from two classes at one of the schools monitored in 2018. The results were then confirmed by the teachers of these pupils during the following weeks of their school attendance.

The basic research methods were observation and an interview. The interview took place after the group activity, and in it the teachers commented on the results in their class and compared them with their own observations. The observation was applied during a group activity in the classroom in which we monitored the children's reactions to the tasks assigned to them. We processed their results further in the manner described below.

The main goal of this phase of the research was to find out how many early readers there were among the first-year students at the selected primary schools. This study uses qualitative research methods, so it does not aim to obtain data detectable only by quantitative methods, particularly the number of early readers in the population.

Procedure for identifying early readers

The selection of respondents was crucial for the above-mentioned dissertation research. At the beginning, we were faced with the question of how to quickly and effectively carry out a screening for reading in the first year of primary school within a limited time period (the first weeks of the school year) so as to respect the principle of examining the knowledge and skills with which children came to school, not what they learnt at school. Because of the number of children included in the first part of the research, i.e. 210 children, it was not possible to perform individual testing.

It was necessary to look for ways to use some group activities, ideally for the whole class at once. For the research referred to by Seidlová Málková (2017),[7] early readers were selected on the basis of information from parents or preschool teachers. Such pre-selected groups of children were then tested using specific reading tests, such as a word reading test (fluency and speed were monitored – Matějček), or using more general reading tests (fluency, speed, and understanding were monitored – Tafa & Manolitis). Seidlová Málková (2017; pp. 50–51) proposes a three-step procedure for identifying early readers for further research. It consists of a knowledge of block capital letters (for Czech), a one-minute reading test (which proved to be a good indicator of early reading), and last but not least, a reading comprehension test, which would only be given to those children who succeeded in the first two tasks significantly better than the others (this task distinguishes readers from hyperlectics and thus confirms that they really are early readers within the above criteria).

However, it was not possible to use any tests for our research which are administered individually or in small groups. Therefore, it was necessary to use activities suitable for a larger group, i.e. for a whole school class of children at the start of their school attendance. However, according to the available information, there were no suitable tasks, so a completely new activity was developed for the purposes of this research which would meet its needs.

Our goal was to find about ten children who learnt to read before they started school so that they could be included in the next part of the research, in which we monitored the development of their reading literacy during their first year at school. We approached several teachers from different schools with whom we had collaborated in some way in the past. Thanks to them, we managed to find eleven teachers from four schools in Prague to cooperate with us. Apart from one school, the teachers were willing to continue cooperating during the entire following school year. Therefore, the schools were not sought out according to any predetermined criteria which could relate to their size, location, establisher, number of pupils, focus, etc.

For the purposes of the research and because of anonymisation, the schools were marked as colours – White, Black, Blue, and Yellow. All of the schools are located on the territory of the capital city, Prague, and are included in the Register of Schools and School Facilities.[8]

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[7] Matějček, 1987; Tafa & Manolitis, 2008.
[8] https://profa.uiv.cz/rejskol/.

The information about the schools was obtained from this register and from the websites of each individual school.

The White school is in a catchment area of which the establisher is one of the city districts of Prague. It has nine years with a total of eighteen classes attended by 500 pupils. There are two classes in the first year, each with 27 pupils.

The Black school is in a catchment area; the establisher is the city district. The school has all nine years and a total of 28 classes, of which 18 are in the first stage and ten in the second stage. In the first year, there are four classes, a total of 97 students. The school also has one preparatory class of fifteen pupils. The capacity of the school is 800 pupils, but it is currently attended by 650 children. The school has no special profile. This school was the only one interested in participating in only the first part of the research. While in the other schools, all communication took place directly with the class teachers of the given classes (with the consent of the school management), in the Black school, everything was handled by the deputy head, who also asked the teachers in each class to participate in the research.

The Blue school is a school with a church establisher; it has all nine years and 18 classes (two classes in each year). The school is attended by 450 pupils. There are 47 pupils in the first year, 23 in one class and 24 in the other. Because the school is not in a catchment area and parents are very interested in it, when enrolling in the first year, children are selected on the basis of their performance in various tasks to assess school readiness.

The Yellow school is also a school with a church establisher. It has nine years, with one class in each year. The capacity of the school is 230 pupils. There are 28 pupils in the first year. The school is not in a catchment area.

Table 1 shows a clear overview of the characteristics of each school, as indicated above.

All the first-year pupils of the given schools who were present at the school that day and whose parents signed an informed consent form took part in the research. We visited all ten classes in the first half of September, as soon as possible after the start of the school year, to capture as best as possible the reading skills with which the children came to school. We spent one lesson in each class. In all classes, we used the same activity for the general orientation reading comprehension test.

After an introductory meeting and motivation of the children, where we talked about what is done at school and whether the children had learnt anything in the first few days, we performed the general orientation reading comprehension test in nine classes. We showed the children the task they had to complete on an interactive whitebo-

Table 1. Characteristics of the schools involved in the research

School	Catchment area	Establisher	Number of classes in the school	Number of pupils in the school	Number of first-year classes	Number of first-year pupils
White	Yes	City district	18	500	2	54
Black	Yes	City district	28	650	4	97
Yellow	No	Independent (church)	9	230	1	28
Blue	No	Independent (church)	18	450	2	47

ard or on a television screen. The task was assigned in the form of a picture, which was an elf raising his hand. The children were to raise their hands just like the elf. All the children completed this task correctly and received a card with the number 1. Similarly, they received cards with other numbers of tasks if they completed them. The teachers of the given classes and the assistants, who were mostly present, helped monitor the children's reactions and handed out the cards (an assistant was present in seven of the nine classes, including the class from which the teacher left with the children who did not have the signed informed consent form). Tasks with odd numbers were always pictorial, but tasks with even numbers were given in the form of written text, the difficulty of which gradually increased. The children were not prepared for this, so they had to orient themselves quickly and resolve the unexpected situation. Whoever read the text was deemed to have completed the task. During the other tasks, the children were already expecting the written text and they commented on the situation. For example, they asked whether the elf would confuse it again and give them the task written instead of drawn, even though the elf knows that the children are in their first year and cannot read yet. It was important for us as evaluators to monitor who responded to the written text and performed the task immediately, and who looked around and imitated someone who had read the text. However, it quickly became clear which children were able to read the text, so then it was enough to focus mainly on them. It was always only a few children in the class. Moreover, the complexity of the texts increased, which meant the success of the children's reading decreased. The last task was again drawn and also served to say goodbye to the elf and his tasks. The children placed

the number cards they had obtained in signed envelopes which we had placed on their desks at the beginning of the lesson. Then the children sealed them and handed them over. At the end, each class received a book as a gift to put in the class bookcase.

Tasks assigned in text form:

2. ZAMÁVEJ (WAVE)
4. ZVEDNI PENÁL (LIFT YOUR PENCIL CASE)
6. Zatleskej. (Clap.)
8. ZAVŘI OBĚ OČI. (CLOSE BOTH EYES.)
10. Stoupni si a zamňoukej jako kočička. (Stand up and meow like a cat.)

Tasks assigned in picture form (see Appendix 1):

1. Raise your hand.
3. Cover your eyes.
5. Stick out your tongue.
7. Thumb your nose.
9. Pick up a pencil.
11. Wave and say AHOJ (HELLO). (For this task, the word AHOJ was written in a speech bubble next to the elf. We did not evaluate who read it; it was enough to wave and join those who read the word.)

The complexity of the individual texts gradually increased. The first text (ZAMÁVEJ – WAVE) consisted of only one three-syllable word, written in block capital letters. It contained three open syllables without consonant clusters. The second text (ZVEDNI PENÁL – LIFT YOUR PENCIL CASE) was already composed of two words. Here, the writing in block capital letters was preserved and in the first word, a more demanding group of sounds (the syllable NI) appeared. The third text (Zatleskej. – Clap.) was again one word but it was written as a sentence in lowercase letters with only the first letter capitalised. In addition, the word was followed by a full stop, i.e. a new character compared to the first two texts. While the first two texts could be read by children who only know capital letters, the third text required more advanced knowledge, namely reading lowercase letters. The fourth text (ZAVŘI OBĚ OČI. – CLOSE BOTH EYES.) was a short sentence with three words, but it was once again written in capital letters. Only the fifth, i.e. the last text (Stoupni si a zamňoukej jako kočička. – Stand up and meow like a cat.), was written in lowercase letters with only the first letter capitalised. However, the difficulty of the text was also determined by what letters appeared in the words – the relatively uncommon ň and a letter with a caron (č). The sentence was quite long and involved two tasks at once, so it was not even easy in terms of short-term memory. Therefore, the difficulty of the texts increased in terms of how they were written (uppercase and lowercase letters, full stop after a sentence), the use of frequent or less frequent letters,

Table 2. Results of the group activity (September 2018 and September 2019)

School and class	Year	Number of pupils in the class	Number of pupils who took part in the activity	Number of pupils who read all five texts
White 1.A	2018	27	27	1
White 1.B	2018	27	27	1
Black 1.A	2018	24	24	3
Black 1.B	2018	23	22	0
Black 1.C	2018	24	21	1
Black 1.D	2018	26	19	0
Yellow 1st year	2018	28	26	1
Blue 1.A	2018	23	22	2
Blue 1.B	2018	24	22	1
Blue 1.A	2019	26	23	1
Blue 1.B	2019	27	27	1
Total		279	260	12

and also in terms of content difficulty (a simple instruction at the beginning and a challenging task consisting of two instructions at the end). This structuring of the assigned tasks led to a clear finding of which children responded to the written text.

The whole activity was conceived as a game. While the children were completing the tasks, we commented on their reactions to encourage them and reassure them that they were performing the tasks correctly and that reading the text was not their task but it was a "mistake" on the part of the confused elf. If someone read the text and completed the task, we thanked him/her for helping the others, and then we completed the task once again all together. This alleviated any unpleasant feelings on the part of the children, who might have perceived it as a failure that they had not read the text. We also managed to keep the children in a good mood as a result of the fact that the elf was not only confused, but he also did things that should not be done, which the children also commented on and they scolded the elf (do not stick out your tongue, do not thumb your nose). After the activity, most of the children wanted to do some more tasks, because they found the activity interesting.

After visiting the classrooms, we evaluated the envelopes with the numbers of

the completed tasks and compiled a table for each class, in which we indicated who had read some of the short texts. We sent the results by email to the teachers of the individual classes, and from those who were willing to cooperate in further parts of the research, we selected children who read all the texts. We then asked the teachers to confirm whether the child could actually read at least individual words or short sentences and understand them, or whether the test had been misevaluated. They all confirmed that the test showed a knowledge of reading that they had meanwhile verified in the class themselves during the following lessons.

Of the total of 260 pupils who took part in the first part of the research, twelve pupils read all five displayed short texts, which contained both uppercase and lowercase block letters. The schools were not selected according to any special criteria, the sample was too small, the testing was very general, and the results were not verified in any way. While being aware of all these limitations, however, it is possible to state that the number of children who could read the given comprehension texts is approximately 4.6% of the total number of children, which is slightly more than Cobb (2014) and Olson (2006)[9] stated in their research. On closer examination of the results, we see that in some classes there are several readers, while elsewhere there are none. The age of the children was not taken into account either (e.g. children with postponed compulsory school attendance, or the difference in age of the children coming to school at the regular time, which may vary by an entire year), and nor was the type of school.

Conclusion and discussion

The aim of this contribution was to describe the procedure for the identification and selection of early readers for early reading research in the first year of primary school, which is based on available results of previous research on this topic, both international (especially Cobb, 2014; Olson et al., 2006) and from a Czech environment, which is, however, rare (Matějček, 1987; Seidlová Málková, 2017). Prior to the start of the research, it turned out that there was no suitable means by which it would be possible to seek out and identify early readers at the very start of their school attendance without the possibility of obtaining information from preschool teachers or from parents. We worked with children in the first year of primary school, right after the start of the school year. Because it was important to start monitoring the development of initial reading skills

[9] Verifying the number of early readers would be a task for quantitative research. Here we present it only as an indication.

Appendix 1. The tasks assigned in nine first-year classes of primary schools in the first half of September

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11. 

The author of the illustrations is **MgA. Michaela Bergmannová**.

and initial reading literacy in children who were to be surveyed throughout the school year, a rapid general orientation test of reading skills had to be performed in relatively large groups of children within a limited period of time. For this purpose, a procedure was developed to achieve this. The children were shown task assignments in the form of a picture or a short text. The children who responded to the written text were selected as early readers. The level of their reading skills was then confirmed a little later by their teachers, who had time to get to know the children better and test their reading according to their abilities. The parents of the selected children were then approached with a request for further cooperation in the research, which continued during the school year.

The disadvantage of the proposed procedure is that determining the level

of reading skills is only indicative. However, what is surveyed here is the comprehension of read text, which is essential for early reading. This approach does not aim to be the only one possible, but we believe that it could serve as an initial guiding tool to find out if some children in the class can read one or several words, or even a short sentence, with the inclusion of uppercase and lowercase letters. Any further research could be focused on a more detailed trial of this procedure in practice, or on modifying or adjusting it according to the findings. It also offers the possibility of designing another reading comprehension test, which would verify the conclusions of the first (general orientation) test. For the time being, it has served as a functional tool for identifying the required number of respondents for early reading research.

It would also be appropriate to build on this early assessment of early reading by designing methods for working with early readers. The subject of further research could therefore be to design and test such methods in practice.

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Mathematical Problem-Solving Processes in Students with Autism Spectrum Disorder

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Abstract: This study aims to describe how students with autism spectrum disorder (ASD) approach mathematical problems, how they process them cognitively, and what the specifics of the way they solve them are. We primarily focus on whether it is possible to find differences in the way these students approach the problems as compared to students with no known disabilities and whether we can find ASD-related differences in their problem-solving procedures. We draw on the qualitative empirical investigation that formed the basis of the author's dissertation. We worked with six upper-elementary school students (sixth- and ninth-graders) diagnosed with ASD and 12 neurotypical classmates. The results of the study show that the processing of mathematical problems in the students with ASD is influenced by the severity of the disorder as well as by the level of language and social skills. However, on the basis of the findings, we have to conclude that although we can find specific features in the behaviour of students with ASD referring to the core problems of the disorder, their cognitive processing of mathematical problems is very individual.

Key Words: Autism spectrum disorders, upper elementary school students, mathematical problems, word problems, reading comprehension, language abilities, cognitive processing

Introduction

Individuals with autism spectrum disorder have been the subject of interest for professionals in the fields of medicine, psychology, and education for the last 50 years. Because of their different social behaviour and communication, but also thanks to individuals with exceptional abilities in certain areas, there is an indication that neurodiversity can help professionals understand the cognitive processing not only of individuals with ASD but also of the general population. In fact, the variability of autism spectrum disorders covers both individuals with intellectual disabilities who are in need of constant support throughout their

lives and individuals whose symptoms are mild and who, thanks to learned compensatory mechanisms, are able to lead independent lives without the need for specific support.

More and more often today, we encounter students with ASD in mainstream elementary schools, where they work according to the school's curriculum without major modifications or support measures. At present, the education of students with ASD is governed by the Education Act 561/2004 Coll. and Decree 27/2016 Coll. as effective from 1 January 2021 (Decree 27/2016, [online]). According to these legal norms, specific requirements for a student's education are identified and the degree of support measures necessary for a successful educational process is determined. As a result, this means that there is a growing need in the Czech education system to analyse the specifics of students with ASD in education.

Theoretical Background

Cognitive Processing and its Specifics in Individuals with ASD

Autism spectrum disorders are now a fairly well-known diagnostic entity, although there are still many phenomena associated with them that are not comprehended completely and that even today's experts are unable to fully explain. Autism comprises a spectrum of developmental disorders on a neurobiological basis with a high degree of hereditary factors arising at an early stage of CNS development (Hrdlička & Komárek, 2004; Thorová, 2006; Šporclová, 2018).

In the course of the research investigation, we based our findings on several theories of the specifics of cognitive processing in individuals with ASD, while respecting the neuropsychological concept of differences in the function of individual brain centres, although it should be noted that these are only framework specifics that do not fully explain the variability of autism spectrum disorders, and, moreover, may not be present in all individuals with ASD. A brief description of their characteristics, however, will help us explain the test performance of the students who were monitored and their procedures and their behaviour during the research investigation.

Neuropsychological Concepts and Cognitivist Theories

Neuropsychological theories are based on the fact that autism is caused by functional changes in the brain that occur during the prenatal period or in early childhood, thus focusing on the relationship between brain functioning and individual behaviour (Thorová, 2006). Although it has still not been possible to pinpoint the area responsible for the

onset of autism, there are many findings on which some neuropsychological theories have been built. The ability to monitor brain activity also provides substantial information for explaining the basis of some previously researched theories of cognitive processing. We will therefore attempt to link them and show how they explain the specificities of individuals with ASD described primarily at the behavioural level.

Central Coherence Deficit Theory

One such theory is the theory of deficient hemispheric connectivity. According to this theory, the weak cooperation of individual brain centres is at the root of the problems of individuals with ASD, which results in the fact that an individual may have good or above-average performance in certain individual activities but is unable to integrate and connect them, thereby failing in complex activities (Thorová, 2006). This can be demonstrated in individuals with ASD, for example by their often above-average ability to put together puzzles or read letters (decode) but also by deficits in reading comprehension or explaining what is happening in the puzzle's picture.

Just et al. (2004) investigated the lack of connectivity on cortical activation and synchronization of the centres involved during sentence comprehension tasks. Their results showed, among other things, that the connectivity of individual activated centres was significantly lower in individuals with ASD than in the control group. This could explain the cause of the impaired central coherence (Frith, 2003). The theory in question points out that individuals with ASD often perform well on tests such as Raven's Matrices, the Block Design subest (WISC), or the Hidden Figures test. According to Frith, this is possible because unlike neurotypical individuals, individuals with ASD are unable to process information from the environment in a complex way as described by Gestalt psychologists (Frith, 2003). They tend not to move towards a whole form that is not a mere sum of parts but exhibits novel qualities (Hoskovec, Nakonečný, & Sedláková, 2002). Rather, they focus on parts, i.e. details that in some cases may not be important to the whole at all. Thus, even if in the given context we are talking about a weakened central coherence (deficit), it may act positively in the aforementioned tests (Frith, 2003; Happé, 1999). In practice, we see that individuals focus on insignificant details, which can qualitatively affect their ability to understand the spoken word or the text being read (Norbury & Bishop, 2002).

Theory of Mind and Deficits in Amygdala Function

The theory of mind is based on the fact that each individual creates an image of

their internal states (mental states[1]) and the surrounding world in their mind in order to process them further. The concept was postulated by Premack and Woodruff in the 1970s, when their research showed that even primates have the ability to "read the mind" of another member of their species and thanks to this explain and predict the behaviour of the given individual. One of the most famous applications of the theory in psychology is the research of Wimmer and Perner (1983), aimed at the possibility of testing this ability in children talking about a wrong belief. The concept of the theory of mind is widely adopted in our environment but Sedláková (2004) points out a certain inaccuracy in the name itself. She believes that the meaning of the English word "mind" would be better described in Czech by the word "psyche". We call the given image a mental representation. Hončíková (2008) explains that mental representations can be distinguished into several levels (orders). She distinguishes the first order of representations, which is the mental image of the world around us, the second order of representations, which is the image of the inner world of an individual, and the third order of representations, which is a reflection of the second order mental representation/mental representation of another person. Baron-Cohen, Frith, and Leslie (1985) showed that children with ASD exhibit difficulties in developing a theory of mind (Baron-Cohen, Frith, & Leslie, 1985). This led to the creation of the theory of mind tests and their inclusion in the diagnosis of autism spectrum disorders (e.g. Happé, 1995).

Baron-Cohen was aware, however, that the theory of mind cannot explain all the deficits described in individuals with ASD. Therefore, he introduced his E-S (Empathizing-Systemizing) theory based on the two factors of empathy and systemization and their representation in the individual's cognitive processes (Baron-Cohen, 2009). He describes the empathy factor as a theory of mind-based ability that enables an individual to respond appropriately to another's thoughts and emotional states; the factor scores lower for people with ASD than for all comparison groups. On the other hand, the second factor, systemization[2] (as a tendency to analyse or construct systems by identifying the rules that govern the system), is significantly stronger in people with ASD than in the general population, according to Baron-Cohen. Baron-Cohen proposes the theory of deficit function of the amygdala as

[1] Sedláková (2004) indicates that the mental state is the internal state of an individual, which has a psychological content and conveys the feelings of the individual or their reflections of the surrounding world.

[2] In Czech this is called sorting or designating (see Petráčková & Kraus, 1995)

a neural region responsible for social behaviour to explain these difficulties (Baron-Cohen et al., 1999).

The Theory of Executive Function Deficits

Sally Ozonoff and her colleagues approach executive functions in a broader sense, i.e. as all functions that direct our behaviour and actions leading them to a certain goal. These include, for example, cognitive flexibility, emotional control, planning, organization, and self-evaluation (Ozonoff, Pennington, & Rogers, 1991). Difficulties in these areas are encountered in patients with frontal lobe damage, so the explanation for the nature of similar difficulties in individuals with ASD relates specifically to impaired frontal lobe function. Individuals with ASD show impairment in these functions regardless of their level of intellectual ability.

While the theory of mind mainly explains specifics in social behaviour and communication, this theory tries to capture the aspect explaining the different functioning and cognitive processing of individuals with ASD in general. Rajendran and Mitchell (2007) state that it mainly focuses on explaining specific manifestations in individuals such as difficulties in cognitive shifting, a desire for constancy, perseveration, or deficits in self-regulation. Thorová adds that another deficit caused by executive function disorder includes problems in the ability to form mental representations of objects or activities, which leads to an inability to form a course of action, a system of steps leading to a goal (completion of an activity) (Thorová, 2006).

Tatyana B. Glezerman brings interesting insights to the whole discussion. She points out that a comprehensive neuropsychological view is not only about recording brain activity but we must also consider the introspective findings of individuals with autism, the products of the activities of those individuals, and case analyses of individuals with severe symptoms of disorders who are unable to talk about their states, thoughts, and emotions. She proposes the possibility of a new approach to the study of the brain in relation to autism, whereby brain abnormalities are first detected and then changes in brain activity are monitored on the basis of the reorganization of the brain's functional systems (Glezerman, 2013). We were able to observe a similar approach in a study by Baron-Cohen (1999).

Mathematical Skills in Individuals with ASD

Mathematical ability is often considered a less problematic area for individuals with ASD, so not many experts or research studies address it. The focus tends to be on individuals with above-average mathematical abilities or

savants.[3] Glezerman (2013) shows that Kanner and Asperger already laid some groundwork for the concept when they described cases of their patients with special talents who were extremely interested in mathematics and capable of complex numerical operations without being taught. *"His mother said that already early on in his schooling, he had set out a problem for himself – which is greater than 1/16 or 1/18 – and was able to solve it easily. When someone jokingly asked him, just to test his abilities, 'What's 2/3 of 120?' he immediately answered correctly, '80.' Similarly, he surprised everyone by showing that he understood the concept of negative numbers, which he had obviously taught himself and which others noticed when he remarked that 3 minus 5 equals 2 below zero. By the end of his first year, he could easily solve word problems such as – If two workers do a job in a certain amount of time, how much time will it take six workers to do it?" (cf. Asperger, 1991, p. 45).*

This boy, who was able to solve complex problems intuitively, was unable to learn basic arithmetical operations at school. Asperger also describes cases of other patients who were unable to use the usual procedures taught in school but used their own original processes, which were often based on very complex, intricate mathematical operations (Asperger, 1991). Glezerman emphasizes that these methods are not random; they are often based on a different approach to numbers and arithmetic. We can see that people with autism attribute properties or characteristics to numbers – they have emotional meaning for them. According to her, this is in turn related to the fact that the processing of numbers takes place in the right hemisphere of the brain, unlike in the majority population (Glezerman, 2013).

The idea of above-average mathematical abilities in individuals with ASD is supported by studies based on the assumption that many prominent mathematicians and physicists in history (e.g. Einstein, Gauss) can be found to have had symptoms consistent with autism spectrum disorder (James, 2010). On the other hand, Tasha M. Oswald and her colleagues (Oswald et al., 2016) charted the mathematical performance of 27 adolescents with ASD in their study and the results of their standardized tests showed mathematical aptitude in only one adolescent, while 20 had average results, and the performance of six of them was even consistent with a mathematical disorder. They thus warn against a template view of mathematical ability in individuals with ASD.

[3] Savant syndrome is a combination of exceptional mental or artistic abilities (exceptional memory, mathematical or artistic talent) combined with mental retardation (in the classic definition) or autism. (Velký lékařský slovník (The Great Medical Dictionary) online)

The mathematical abilities of individuals with ASD are as variable as those of the general population and it would be too simplistic to perceive individuals with ASD (with intellectual ability levels in the average or above-average range) as being automatically gifted in mathematics. We agree with Oswald (2016) that this can be counterproductive to the point of leading to some neglect of the area. Bae, Chiang, and Hickson's study (2015) shows that while children with ASD may perform well in numerical calculations, this does not imply good performance in word problems. The children's language level and the level of reading comprehension are also important here.

Difficulties in mathematics in people with ASD can be found across the spectrum, as is the case in the neurotypical population, with the level of intellectual ability and the level of development of language and social skills obviously coming into play. In our work, we examine students enrolled in mainstream elementary schools with levels of intellectual ability in the average or above-average range. We will therefore not analyse further the difficulties specific to students with ASD in combination with intellectual disability. We would like to mention, however, that it is not easy to find a unified or comprehensive approach in the literature. Often, a multi-sensory approach is emphasized for individuals with ASD combined with intellectual disabilities, and structured learning with strong visual support is recommended (cf. Vosmik & Bělohlávková, 2010 or Fletcher, Boon, & Cihak, 2010).

King, Lemons, and Davidson (2016) build on the idea that the variability in autism spectrum disorders underpins the different requirements for identifying difficulties in mathematics. They suggest that the core problems of autism also cause difficulties in mathematics for gifted students with ASD, particularly in the areas of critical and analytical thinking when solving more challenging problems. Donaldson and Zager add that they found difficulties with processing problems in students with high-functioning autism particularly in the areas of working memory, organization of information during problem solving, comprehension of word problems, and ultimately deficits in abstraction (Donaldson & Zager, 2010). The above areas are very general and it can be said that some of them (e.g. critical thinking) are problematic even in the neurotypical population.

Comprehension of word problems can largely be related to the overall level of a student's language, communication, and social skills. Students with ASD prefer direct instruction without social context but this does not correspond to the normal school reality. For example, as reported by Rendl and Vondrová (2013), according to mathematics teachers, problems with context are considered

to be word problems. They add that the main difficulty they see for students is not understanding the text and translating it into an idea of the situation and the nature of the problem at stake. The students either focus on a particular aspect of the assignment and disregard the rest of it or they manage a partial calculation but are unable to integrate it into the whole.

Here, we come to an issue we have not yet mentioned, which is motivation. Even Attwood (2005) points out that sometimes the major problem is that individuals with ASD are not motivated to solve problems if they do not find the solution simple and straightforward or if the problem is not about their favourite topic. On the other hand, there are individuals with ASD who are motivated by the fact that mathematical operations have clear rules and if they follow them, they always get the same results. Maths becomes a popular topic; students are motivated by the fact that they can count and this can even turn into a typical interest.

Research Methodology

The aim of the research was to compare the mathematical problem-solving processes of students with ASD with those of their neurotypical classmates and to show, through qualitative analysis, whether an "autistic cognitive style" can be distinguished and whether students with ASD can be expected to have good mathematical abilities because mathematics – being an exact science – suits their way of thinking better (see e.g. Baron-Cohen, 2009; Fitzgerald & James, 2007; Frith, 2003). In order to meet the objectives of the research investigation, the following research questions were established:

- **Do students with ASD use qualitatively different problem-solving procedures than their peers when working on mathematical problems?**
- **Is it possible to find similar particularities in the problem-solving procedures that are specific to the students with ASD included in our research and which are different from their neurotypical peers?**
- **Are the students with ASD in our sample more successful at problem solving than their peers?**
- **Do we see mathematical talent in the students we studied?**
- **Can we find qualitative differences in the processing of most of the problems assigned between the boys and girls in our sample?**

As is evident, we focused on whether the students with ASD in our research sample found a solution to the mathematical problem at hand that was original and different from their peers and from possible commonly proposed approaches. It was also important to determine whether the students with ASD would

perform in the same or similar ways, i.e. whether we could detect a similar specific style of problem-solving processes in several students with ASD.

For the purposes of qualitative research, we chose the following research method: solving mathematical problems, reflection on the procedure, interviews with the students about the problem-solving process, and observation of the students and analysis of the notes as well as graphical processing of the problems. For the sake of completeness, we further enhanced our observations by interviewing mathematics teachers. Examples of the mathematical problems are presented in Appendices 1 and 2.

Research Sample

The research itself took place at an elementary school and a grammar school in Prague, where they have been integrating students with ASD for a long time now, which means the teaching staff have extensive experience with teaching and supporting students. In the preparatory phase, we focused on the selection of students for the research investigation. Since we chose a qualitative approach, we paid a great deal of attention to this in order – as pointed out by Hendl (2006), for example – to meet the requirement of the suitability and appropriacy of informants for the research inquiry. We selected students in grades 6 and 9 for the sake of data variability and diversity. It was important for us that the students were at a developmental level where they would be able to reflect and report on their practices. In each grade group, we first administered a mathematics test (the Mathematical Kangaroo) as one of the criteria for "matching" pupils in mathematics lessons.

Subsequently, all the students with ASD in the class were approached and matched with classmates on the basis of age (the age difference could not be more than six months) and mathematics test scores. After an informed consent had been obtained from the parents and students, each student with ASD was matched with a boy and girl from the same class whose age and performance met the criteria (see Table 1) and who also did not have any specific learning difficulties (ADHD, learning disabilities, developmental dysphasia, etc.). Although we were aware of the specific diagnoses of the students with ASD, we did not consider these further in our data analysis. We assumed that, according to experts (cf. Frith, 2003; Šporclová, 2018), all individuals with ASD exhibit core difficulties, differing only in the degree and severity of their manifestations.

The Ethical Context of the Research

As mentioned earlier, an informed consent was obtained from the informants'

Table 1. Participants

Name	Grade	Age	Sex	Mathematical Kangaroo	Block Design WISC III	ASD
ADAM	**6**	August 2003	M	79	62	YES – childhood autism
AGÁTA	**6**	November 2003	F	57	44	NO
ALEŠ	**6**	August 2003	M	76	54	NO
BRUNO	**6**	March 2004	M	89	65	YES – Asperger syndrome
BEDŘICH	**6**	December 2003	M	88	61	NO
BARBORA	**6**	March 2004	F	87	66	NO
CYRIL	**6**	June 2003	M	95	56	YES – Asperger syndrome
ČENĚK	**6**	August 2003	M	103	58	NO
CECÍLIE	**6**	September 2003	F	91	56	NO
DAVID	**9**	September 2000	M	27	63	YES – childhood autism
DOMINIK	**9**	November 2000	M	32	59	NO
DITA	**9**	July 2000	F	29	39	NO
ELIÁŠ	**9**	June 2001	M	51	64	YES – Asperger syndrome
EDA	**9**	March 2001	M	54	61	NO
EVA	**9**	January 2001	F	56	69	NO
FILIP	**9**	June 2000	M	41	51	YES – Asperger syndrome
FERDINAND	**9**	October 2000	M	47	60	NO
FRANTIŠKA	**9**	October 2000	F	52	60	NO

legal guardians before their inclusion in the research sample, via which consent was also obtained for the audio recordings of all sessions. The informants themselves were then briefed about the research process at the beginning of the individual sessions and their verbal consent was obtained. They were also informed that they could end the session at any time – while working on a single problem, they could cancel a whole session or, alternatively, they

could withdraw from the research altogether. However, no one took advantage of this option.

Individual Sessions

During the individual sessions, the students were presented with mathematical problems to solve and were asked to describe how they arrived at their results. The mathematical problems were selected from freely available mathematical Olympiads, Mathematical Kangaroos, and the entrance exams to grammar schools (see Appendix for an overview). It was not essential for the aim of the investigation that students got the solution right; however, we were aware of the fact that if the problems were too challenging, it might affect the students' motivation to cooperate further. The session had no time limit.

Once a problem was completed, we did not reflect on whether the procedure and the results were correct. We asked about the procedure and the results they had reached. We did not analyse the errors or other possibilities of solving the problem. The ninth-graders solved six problems and the sixth-graders solved five problems (see Sotáková, 2019).

During the session, we kept notes of our observations, which we called testing notes. We recorded the students' behaviour during the session, and for the students with ASD, we also focused on the manifestations associated with autism spectrum disorder, whether these were manifestations in speech, social communication and behaviour, or unusual behaviour.

Data Processing

As is apparent from the previous section, quite a large amount of data was collected during the course of the research. The descriptions of the students' solutions were transcribed, and each student's progress was recorded, using transcription of the recordings into an abbreviated version, where we added our own notes and an analysis of the notes or graphical solutions to the problems. In this first analysis, we tried to distinguish areas, i.e. categories within which we could further compare the procedures of the students with ASD with their neurotypical classmates. Our aim was to reduce the data obtained to a form where we would be able to work with it further and identify individual aspects of the cognitive processing of each student.

The categories that we then divided and used to analyse each student's practices were as follows: **description of the solution to the problem or parts of the problem; comparison with the recommended solving procedure; analysis of the written solution to the problem/sketch; common and divergent points of the procedure and solution; manifestations of core problems associated with ASD; analysis of errors/**

critical points for successful problem solving; solution time.

Results and Discussion

The results of the study showed that finding a specific cognitive style in students with ASD that differentiates them from their classmates is difficult. They support the above findings by emphasizing that even if it can be said that certain manifestations of core difficulties can be traced in many individuals with ASD, the variability among them is still great and we would have to resort to simplifications that, given the distinctiveness of the individuals, would be uninformative or even misleading.

Summary of Sixth-grade Results

The results were mixed for the sixth-grade students. Although we detected at least partly the same problem-solving procedures for all the students with ASD as in their paired classmates in most problems (often corresponding to the recommended problem-solving procedure), in other respects, however, the processes of the students with ASD were different, both in terms of success in solving the problems and in terms of the procedures used. The least successful of the three students with ASD was Adam, who was not able to solve any of the problems. He was an elementary school student who also scored the lowest of the students with ASD in the mathematics placement test. It can therefore be assumed that his performance is consistent with his ability, which is at a lower level than Bruno and Cyril. It is, however, worth noting that Adam achieved the highest score of all three students in the Block Design subtest (WISC III). He got stuck on a specific part of a problem or disregarded the whole problem in most of the assignments. For this reason, we discussed the possibility of a significant weakening of his central coherence since his practices of ***focusing on a certain aspect of the problem***, on a certain detail, especially when the solution involved several steps or levels, corresponded to the performance profile as described, for example, by Happé (1999) or Frith (2003).

We observed a match in the solution in only one case, namely in the second problem as solved by Adam and Bruno, when both of them arrived at the same result. However, even here, their steps were not exactly the same; while Adam did not work with the sketch at all and directly converted the numbers from the assignment into mathematical operations, Bruno first tried to make a sketch (he made two) and only when he did not know how to proceed further did he come up with a simplifying solution.

Bruno was able to solve the first problem successfully, and for the second, third, and fourth problems he was able to follow the recommended solution at

the beginning but eventually reached a critical point, which he could not handle. His justification of the solution was interesting and here again, we found similar tendencies to Adam's approach. Neither of them doubted their solutions, they did not return to the wording of the assignment, they did not try to structure the problem by writing it down, and they argued for the result they reached. (Adam further supported this by making comments about his good mathematical skills.) Bruno showed a different approach only in the fifth problem. It was noticeably too difficult for him and he could not form an idea of the problem to be solved. This led to him returning to the original assignment for the first time, expressing his doubt about the solution (*"It's no use, I'll get it wrong anyway."*) and ending the session. For Bruno and Adam, an obvious tendency towards quick, direct solutions was also apparent. This is also evident in the solution times, which were shorter than those of their peers – in some problems significantly so.

Cyril was the most successful in solving the problems of the students with ASD who were observed. He solved three problems correctly, failing to solve only the second and fourth problems. Even in these problems, however, he started out correctly but in the second problem he was not able to take into account all the parameters of the assignment (we cannot say that he focused on only a certain part of the problem), which led him to an incomplete solution in which he made a numerical error on top of that. He thought that he had followed the correct procedure. For the fourth problem, he showed rigidity in his thinking when he was unable to "traverse" a critical point and consider a different solution procedure and repeatedly returned to the same point. He was the only sixth-grade student with ASD to revise his procedures, returning to the assignment's wording, although here, he was simply unable to grasp the problem from a different angle. His different approach during the research investigation was also reflected in the problem-solving times. Unlike the other sixth-grade students with ASD, we observed longer solution times in Cyril than in his peers. His problem-solving procedures were comparable both to the recommended procedures and to those of his neurotypical classmates, especially Čeněk. On the other hand, we cannot ignore the fact that he showed some of the behavioural manifestations of core ASD difficulties (fascination with the voice recorder, slow work pace, motor restlessness) and that visual support in the problem solving was important for him (he used pictures and sketches spontaneously for most problems). He had the most difficulty with the fourth problem, which was an equation without the possibility of graphical representation. Cyril finished at a point that was critical for most of the sixth-grade students. This was not surprising as the problem was

difficult for the students. However, we were intrigued that even after being given a hint and after crossing out the original solution, Cyril proceeded in exactly the same way over and over again. We attribute this to a certain rigidity in thinking – an inability to abandon a given procedure and try to look at the solution from a different angle. **Limited flexibility in thinking** is thus certainly one of the factors affecting performance in mathematics (see Donaldson & Zager, 2010).

In the sixth grade, the students with ASD were comparable to their paired peers in the course of problem solving, although we found some qualitatively different procedures. However, this was not the case for the majority of the assignments and, in addition, even the neurotypical students were qualitatively different in their procedures, particularly when they found the problem difficult and did not know exactly how to proceed. We detected the most irregularities in Adam, in whom there was a significant difference in his performance in the mathematical problems where he was unable to solve even one correctly while achieving an above-average result in the Block Design subtest (see Table 1).

Summary of Ninth-grade Results

The results of the students with ASD in the ninth grade were also variable. Each of the ninth-grade students was quite distinctive and it was difficult to find similarities between them, although they were qualitatively more different from their classmates in their procedures than the sixth-grade students. In this section, we will therefore attempt to compare their practices and detect areas of expression typical of students with ASD.

In terms of problem solving, the most successful student with ASD was Eliáš. Although his procedures were unusual and could be characterized by a tendency to convert the assignment immediately into a mathematical operation, he was able to proceed appropriately using adequate mathematical formulae when he understood the assignment. For problems that were difficult for the imagination and in terms of conceptualization, he typically converted the problem into an equation, which he then tried to simplify. For him, the equation represented the notation of the problem, giving him the structure needed for understanding, although from our perspective it was rather confusing, as he ended up with equations with two or three unknowns, which he could not replace with anything. Filip and David also had problems in forming an idea of the nature of the problem (this was also present in the neurotypical students) but they were qualitatively different. While Filip was able to form an idea for some of the problems, even though he was not able to solve them (for example, the first problem, where he knew how to proceed,

but because of a repeated numerical error he did not arrive at the result), for David, we noted that the problems were beyond his capabilities, i.e. he was not able to conceptualize the problem or understand its essence.

Problems with task conceptualization are certainly related to the students' mathematical abilities but may also be influenced by **impaired central coherence or deficits in executive functions** as described by Thorová (2006). Parameters supporting weak central coherence (Happé, 1999) were detected only in David; the other boys showed results comparable to their classmates.

We noted commonalities particularly in the boys' comments and descriptions of their own practices. David and Filip referred to formulae they did not know or had forgotten when they did not know the procedure. David: *"But it doesn't make any sense to me now, word problems like that, I'd have to have it in my head what formulae to put in, how to count them under each other, to reduce them, divide them, just..."* And Filip: *"I'm sorry, but the last time we learned volume conversions was in the first or second grade and I kind of don't remember it."* Comments unrelated to problem solving that described the boys' physiological or psychological state were also frequent. In our view, this was to relieve the boys' frustration when they did not know how to proceed or realised that the problem was beyond their capabilities. David's comments were mainly limited to *"I don't know... I don't get it."* Eliáš remarked, for example, *"You're checking if it's still being recorded; well, that's great..."* or *"I don't understand at all how teachers can give such long speeches because when I talk for a long time my mouth gets so dry, and especially when they have to shout at our noisy class..."* Filip expressed his frustration in comments that related to the authors or characters in the problem: *"Honestly, I think it's bullshit because they can't even physically fit in there, I mean, like, maybe into the new ones, yeah OK, but..."* Here, he contradicted the factual logic of the assignment but he also turned his attention to the persons in the assignment: *"Mr. Celer, holy shit, Comrade Celer."* We did not encounter such utterances among the neurotypical students. Disregard for social rules and difficulties in self-regulation of behaviour are widely described in the literature on individuals with ASD (Thorová, 2006; Wing, 2002; Attwood, 2005). **Deficits in executive functions** and misunderstanding of social rules are cited as the reasons. The described manifestations were exacerbated in moments of emotional strain (stress, problem difficulty, misunderstanding); similar manifestations appeared in the sixth-grade students with ASD but not in the neurotypical students.

On the basis of these results, we can answer the research questions posed above in the paragraphs that follow. We asked whether it is possible to confirm

that children with ASD **use qualitatively different problem-solving procedures than their peers when processing mathematical problems**. Our results only partially confirmed such a conclusion. In the sixth grade, the students with ASD mostly proceeded similarly to their peers in at least part of the assignment. Bae, Chiang, and Hickson (2015) reached similar conclusions, that is, that word problem solving for students with ASD is influenced to a large extent by their reading comprehension skills. The observed specifics can be related to the theory of impaired central coherence. In the ninth grade, the students' solutions were highly individual, both for the students with ASD as well as their classmates. This was particularly evident in problems that were difficult for the students to conceptualize, i.e. to form an idea of the situation in the problem.

During the course of the research investigation, we did not observe **any similarities in the problem-solving procedures among the observed students with ASD that were specific and different from their neurotypical peers**. We did, however, trace certain tendencies in the approach to problem solving. The first of these was a tendency towards rapid operationalization, i.e. translating the problem into mathematical operations. Most of the students with ASD (unlike their classmates) did not elaborate the notation but worked directly with calculations or rewrote the assignment into mathematical expressions (such as Eliáš using equations). The quick solution then sometimes led to a focus on a particular line of the problem regardless of the assignment (Adam, Bruno). This practice is usually attributed to weakened central coherence. However, on the evidence of our results, we cannot support Baron-Cohen's conclusions about an „autistic" cognitive style (2005). The tendencies described were not strong enough to claim that we found cognitive practices specific to students with ASD.

We also looked at whether the students with ASD in our sample would be significantly **more successful than their peers** in their solutions. This was not confirmed; we can talk about similar performance or even the opposite trend. In the sixth grade, the students' success varied but we can say that it was comparable between the students with ASD and their neurotypical classmates. In the ninth grade, performance was comparable between the students with ASD and at least one of their neurotypical classmates'. David approached problem solving similarly to Dita but Dominik was more successful. Filip, on the other hand, performed comparably to Ferdinand, while Františka performed better. We thus did not observe mathematical talent in our study.

Although we did not primarily focus on the social behaviour and communication of the students with ASD (we con-

sidered them to be core areas, i.e. we assumed that they would become apparent during testing), we approached them as an important source of information in the data analysis. For the children with ASD, we were able to observe not only their emotional dispositions but also the contents of their minds through comments given during the problem solving or their stereotypical behaviours. In contrast to their neurotypical classmates, they often described their physiological dispositions, thoughts, and assessments of the problems and their authors. The students with ASD fulfilled the criteria for **executive function deficits** (Ozonoff, Pennington, & Rogers, 1991), not only in the behavioural manifestations described but also in their approach to problems. Some had difficulty returning to the original assignment, revising their procedures, or planning and structuring their procedures in a way that led to successful problem solving (Adam, Bruno, Eliáš, Filip).

Another interesting aspect was the developmental shift we observed among the students with ASD in each grade. While in the sixth-grade students, we repeatedly saw that their procedure was detached from the assignment – that they were solving something else – they did not doubt their result (the exception was Cyril, who was able to revise his procedure and work with the assignment), the ninth-grade students, on the contrary, often stated that their solution was probably not correct and returned to the original assignment. Although we cannot generalize from such a small number of students, in whom the aspect in question may be due to the personal characteristics of the students, the above tendency supports the opinions of experts that emphasize the developmental aspect in individuals with ASD. They state that it is not possible to take a simplistic view of their specificities and deficits, as they may change significantly during development in interaction with the environment (Thorová, 2006; Šporclová, 2018).

The results of our study are therefore inconclusive. We can summarize that the performance of the students with ASD is similarly variable to that of their neurotypical classmates. Although we observed some specificities in behaviour and communication, we can speak of tendencies in terms of cognitive processing. The observed tendencies were consistent with the **theory of impaired central coherence and the theory of deficits in executive functions** but our results did not support specific problems in the theory of mind.

Conclusion

The results of our study show that it is not possible to conclude that students with ASD have a specific style for solving mathematical problems. However, we did reveal some tendencies in cognitive processing. The first of these was a ten-

Appendix 1. Example of mathematical problems – sixth grade

Problem	Procedure
Ruda got an alarm clock for his birthday. He was happy with it and adjusted it according to the exact time. Since then, every morning, when he got up (Saturdays, Sundays, and the holidays are excluded), he pressed the button that illuminated the dial for exactly four seconds. At the same time, he noticed that the alarm time was stopped while the button was pressed. Otherwise, the alarm does not delay or accelerate at all. On the afternoon of December 11, Ruda looked at his alarm clock and found that he was showing exactly three minutes less than he should. When did Ruda get this alarm clock?	1. First we find out how many times Ruda pressed the button, we divide the total alarm delay by the number of delays per day. So Ruda pressed the button a total of 45 times (180: 4 = 45). 2. We count down 45 days from December 11: In December (from 11th to 1st) it is 11 days, November (from 30th to 1st) is 30 days, which is a total of 41 days. We need to count down another 4 days in October: 31st, 30th, 29th, 28th. Ruda pressed the lighting button for the first time on October 28. He received the alarm the day before, i.e. October 27.

dency towards **quick, direct solutions.** The students with ASD were more likely than the typically-developing students to attempt immediate operationalization of the problem. For the sixth-grade students, this often resulted in them not grasping the assignment comprehensively but focusing on a particular aspect of the problem. They then presented their solution as the result, and although it was usually incorrect, they did not doubt it. They were unable to **revise their procedures or go back to the original assignment.** For the ninth-grade students, the outcomes were different. Although some of them also showed a tendency to work quickly, they were able to reflect on their procedures and solutions, going back to the assignment, realizing that the result at which they arrived was incorrect. We could therefore observe a certain development in their self-evaluation and the evaluation of their procedures, which was also reflected in the problem-solving process.

The results did not support specific differences in the processes of the students with ASD and their typically-developing classmates. All the students' performances were variable; sometimes their procedures intersected more and sometimes less. Nor did we find significant differences between the boys and girls in our sample. Differences in problem-solving procedures were more likely to be due to the mathematical abilities of individual students; however, we did observe some specificities in students with ASD that can be linked to theories of impaired central coherence and impaired executive functions. In conclusion, it should be stated that the mathematical abilities of students with ASD cannot be considered to be generally above aver-

Appendix 2. Example of mathematical problems – ninth grade

Problem	Procedure
A 30-member group came to a hostel. It fully occupied the same number of quadruple and double rooms. A person in a double room spent the night for 300 CZK per night, a person in a quadruple room for 200 CZK per night. Calculate how many rooms the group occupied. Calculate the price of accommodation for the whole group in one day.	1. We can solve this as an equation of one unknown: 2x + 4x = 30, the result is 5, together ten occupied rooms (five double, five quadruple) 2. We know that the group will occupy 5 + 5 rooms; in five double rooms there are ten people, i.e. 10x300 and in five quadruple rooms there are twenty people, i.e. 20x200, then you just need to add 3000 + 4000. The price for a group per day is 7000.

age; it is always necessary to consider the specific characteristics of the student and the severity of the manifestations of autism spectrum disorder.

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The Implementation of Inclusive Education after the 2016 Legislative Changes from Schools' Perspectives

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Abstract: This article aims at informing readers of the results of a qualitative analysis that was a complementary part of a quantitative investigation mapping the conditions of the implementation of inclusive education after the introduction of inclusive changes in the Czech Republic in 2016 from the perspective of school special educators and school managers. 992 respondents took part in the research. The article briefly presents its theoretical background and the selected methodology designed to determine the conditions in schools, to map proposals for changes in the system, and to provide space for free expression of opinions revealing more about the attitudes being examined in terms of inclusive education. A brief comparison with the results of the detailed qualitative part of the study reveals some major similarities – human and financial resources need to be ensured in inclusive education; the adverse factors include limitations in terms of staffing, high overall numbers of pupils in classes and of pupils with special educational needs (SEN), complex and burdensome paperwork, and the extensive rigidity of the system. Another key issue lies in the specific conditions in schools. The principles of inclusive education may only be applied if schools are provided with a certain degree of trust and powers. The respondents also mentioned the limitations of inclusion because of the specific type of disability – in particular, mental and behavioural disorders can hinder the management of inclusive education.

Key words: inclusive education, school special educators, school management

Introduction

Inclusive education has become a topical issue, especially in recent years since the governing legislation changed. Although the concept of *inclusive education* has been known since the mid-1990s, when it was coined at the Conference on Special Needs Education in Salamanca (Right to Education (n.d.), the implementation itself has taken place at different paces in different countries. As far as the Czech

Republic is concerned, there were several milestones defined with amendments to legislation enacting gradual inclusive changes, with the most significant change being the one from 2016, when Section 16 (9) of the Education Act was replaced to newly define a pupil with special educational needs as a pupil needing supportive measures, which were classified into five degrees of support. This change is also related to the existence of a new Decree No. 27/2016 Coll., as amended, on later regulations on pupils with special educational needs and gifted pupils, as well as the amended Decree No. 72/2005, as amended, on later regulations on counselling services.

This legislative amendment was the reason for the professional assessment of its impacts on educational practice in schools and became the topic of research examining this phenomenon from the perspective of school management and school special educators – the indispensable professional stakeholders in the process of the implementation of inclusive education. Research combining qualitative and quantitative methodologies was carried out in 2017–2019 and the resulting data was processed in 2020. The qualitative survey consisted of interviews with stakeholders. The data obtained from these interviews was analysed and used to generate a questionnaire aimed at quantitative verification of the data that had been obtained. The outputs of the research have already been published in the publication which we refer to (Mrázková, 2020); nevertheless, the open questions in the questionnaire have not been processed yet as they need to be subjected to qualitative evaluation. This contribution aims at such processing.

Theoretical and Methodological Definition

Inclusive education is a term often used in its abbreviated form "*inclusion*" (includere – to make someone a part of a whole), which is nevertheless a concept used in sociology and therefore possessing a broader meaning. It is widely used by both the pedagogical and lay public, though, so we will work with both the forms equally in this article. A fact worth mentioning is that inclusive education is not a steady state but a process that may never be completed in full. At the moment, most countries, including the Czech Republic, find themselves on the path between integration and inclusion – a shift from support provided to an individual to the benefit of the whole class, i.e. from adapting conditions to the needs of individuals to creating conditions for all children to work together (Booth & Ainscow, 2002; Mittler, 2012; Houška, 2017; Spilková, 2005). Inclusion can be perceived from the perspective of a mental health model or a psychosocial model (Soodak, 2006). The former somewhat

reduces the focus to pupils with special educational needs; the latter focuses on the benefits for all. The appropriate institution for applying this approach is an open school that perceives "otherness as an individual and normal characteristic" (Guidelines for inclusion, 2005).

The main qualitative part of the research was performed in 2017 and 2018, and the ensuing questionnaire was administered at the end of 2019. 992 answers with valid data were obtained, which in the case of the four qualitative questions of the questionnaire allowed evaluation of a total of 1017 statements.

Standard methods of data analysis were applied – encoding of open data and subsequent categorization. The research was based on the methodology of clusters, in which statements are classified and conceptualized into groups based on mutual overlapping or similarities between the identified units. This creates more general and inductively formed categories (Miovský, 2006). The analysis was performed using text colouring, keyword searches, and encoding. The respondents answered the following questions:

Question 1: Please list any other conditions of inclusive education that you consider important (under this question, the respondents only listed conditions in addition to those already presented – the questions formulated on the basis of the previous qualitative survey). N 21.

Question 2: Please indicate any other requirements that you consider important in terms of inclusive education (the respondents indicated requirements on the profession of a school principal/special education teacher in addition to those already presented). N 54

Question 3: Please describe briefly (using bullet points) how you would like to set up the system yourself (if you had the opportunity) so that pupils with SEN are well taken care of and, at the same time, you can enjoy your job at school. N 666

Question 4: Would you like to communicate anything else to us? N 276

The answers were partially overlapping, which is why we interlinked the conditions and the mutual requirements on the profession of a school principal/special educator. The evaluation of the question concerning the ideal structure of the system was interlinked with the final question asking for additional comments because of the same statements and categories appearing in both of them.

Conditions for Implementation of Inclusive Education in Schools

As far as the issue of ensuring conditions for the implementation of inclusive education is concerned, the qualitative

answers in the questionnaire can be classified as internal, external, and those reflecting both internal and external conditions. At the same time, the text reflects the professional demands required from the profession of the school special educator by the school principal and vice versa, which co-shape the conditions in the specific school.

The internal conditions for the successful implementation of inclusive education are, for example, dependent on the degree of support granted to the special educator by the school management. At the same time, the special educator contributes to the improvement of other teachers' working conditions. Speaking of the support provided by the school management, good mutual cooperation is appreciated, as well as support granted by the school management to the special educator's steps towards the teaching staff. Many answers do not formulate the conditions as such, but as evaluations of negative factors that allow the conditions to be inferred. We may therefore formulate the first condition here, which consists of the need for the school management to support the involvement of special educators as full members of the teaching staff. However, this may be complicated by the fact that special educators are usually funded from projects and not from school budgets. Another important condition is quality HR management implemented by the school managers; the shortcomings in this area have been formulated as follows: *the special educators does not perceive sufficient motivation on the part of the school management to contribute to the common vision, the management is ignorant of the reasons why and how the special educator works at the school, the special educator is never given a personal bonus, no matter how hard he or she works.* One of the key conditions on the part of the school management is the ability to implement or provide support and training to teachers in terms of the implementation of innovations and flexibility into teaching. The general but fundamental internal condition concerning schools as well as individuals (see also the individual conditions) consists of the activeness and initiative of the teaching staff and their good relationships with the children.

Another category of conditions can be classified as the **internal-external conditions**. They occur in situations where the implementation of inclusion is affected by factors inside and outside the school alike. The ability of the school principal to identify and manage these conditions plays an important role here, as do the attitudes of the education authority, settings of the system, and legislation. The area of the construction and technical conditions was defined by the respondents as a sufficient physical size and quantity of classrooms with respect to the local population (*full classrooms without any free space for*

relaxation during breaks or simultaneous activities of the assistant and the main teacher during lessons do not suit me) and sufficient facilities for pedagogical staff (such as staffrooms and school counselling offices). The respondents' comments suggest that a separate office for school counsellors is not a matter of course at many schools or that the office is often located inappropriately (*we do have a counselling office, but it is neighbours with the gym hall and is therefore rather noisy at the beginnings and towards the ends of classes*). With an increasing incidence of interventions (special education subjects, pedagogical interventions), appropriate rooms are lacking too.

As far as technical equipment is concerned, the respondents mentioned IT equipment or good acoustics of classrooms and offices. Another key factor is the way in which the mental health of teachers at schools is supported. Though the support was not further specified in the comments, we can consider support for professional skills in the teacher's work with a diverse team, support through counselling inside and outside the school, adjustment of the school climate, and targeted support for self-awareness and self-care.

When formulating **external conditions** (i.e. conditions given by the system and the state of society) for the successful implementation of inclusive education, the respondents were mostly mentioned theing funding of the school special educators and psychologists. Their answers as to whether the funding already has or has not been ensured differed significantly. One respondent in his comment expressed his satisfaction in his comment about the fact that the funding was provided through the European Structural Funds (so-called Templates), or from the system of supportive measures. However, other comments pointed to the unsystematic nature of such a method of funding and called for financing of the school counselling professionals from the state budget as employees for whom the school is reimbursable in the same way as regular teachers, and not from European funds and for limited periods of time.

The lack of certainty about the long-term financing of the school psychologist's and special educator's jobs because of the current project-based funding method may affect the willingness of candidates for the jobs to apply, which is a relevant observation if we consider the numerous comments related to the lack of school psychologists and special educators at schools (*a special educator is a scarce commodity at schools*). Better availability of special educators in towns compared to the countryside was mentioned too (*special educators are only in larger towns. That is irrelevant for municipal schools).* One respondent even believed that there were no funds available for the financing of special educators. The question

is whether the respondent believes that the system of supportive measures cannot include such funds or is ignorant of the option of drawing money from the Structural Funds.

Other comments concentrated on the potential consequences of the above situation in terms of a deterioration in the quality of education in mainstream primary schools and the subsequent tendency of some parents to address this issue by selecting six- or eight-year grammar schools for the education of their children. It is worth mentioning, though, that special educators (together with many other factors) enhance the quality of education.

The demand for psychologists and special educators in schools is reflected in the raised claim that was raised that these experts should be present in all medium-sized to large schools, while several smaller schools could share one such professional. Another option of for how to resolve the situation that the rRespondents mentioned, was to ensure the reimbursability of these professions by at least the minimum-time employment. However, that would not solve the issue of the lack of these professionals. The status quo within these professions was reflected in a commentary, which considered a 0.5 part-time employment insufficient, and yet there are many schools where these specialists have even shorter contractual part-time employment or no employments at all. Another comment pointed to the fact that it was often difficult for schools to find a teacher, let alone a special educator. Another answer described a situation where the expert was present at the school but fulfilled the duties of regular teachers because of the lack of those.

Some schools addressed the lack of special educators by employing at least increasing numbers of regular teachers qualified in the field of special pedagogy. One of the respondents mentioned a notable number of such teachers at their school (*there is not a position of a special educator at our school, but 50% of the teaching staff have a qualification in special pedagogy*).

In addition to special educators and psychologists, the profession of a guidance counsellor is mentioned too. According to a respondent (school principal) it is necessary to reduce the counsellors' direct teaching obligations in order to ensure quality counselling (*so that my guidance counsellor could teach 15 instead of 20 hours*).

The need for additional funding was mentioned in connection with the provision of care for pupils requiring first-level supportive measures, i.e. for pupils with the mildest difficulties, but whose further development is at risk. It should be noted that the data was collected at a time when the funding of pedagogical interventions fell into the second level of supportive measures and thus depended on the assessment of the

school counselling facility. Currently, this kind of support is the responsibility of the school, which pays for it from its budget. Likewise, one of the respondents articulated the need to secure funding for aids outside the system of supportive measures. It was proposed that the budget of schools should include funds to provide aids that the school would decide about on its own.

Prior to the enactment of the amendment on inclusive education (in 2016), insufficient funding and the problematic reimbursablity of teaching assistants were a frequent issue. This has significantly improved as a result of the change in the legislation (Mrázková, 2020). A current problem and a real condition for successful inclusion are represented by the availability of these professionals and their quality. According to one of the respondents, the growing need for teaching assistants is a reflection of the current composition of the pupil body in classes.

Among the conditions that we can classify as external is the optimization or reducing of the number of pupils in classes. It is not only the absolute numbers of pupils that are often perceived as high, but also the insufficient operability concerning changes in the number of pupils in a class depending on changing or otherwise complex circumstances. One of the respondents drew attention to the changing situation in the class *upon the arrival of a new pupil in an already functioning large class, because of the presence of more students with behavioural disorders in one class and the high or increasing number of pupils with SEN in a large class*. The possibilities of changing the number of pupils in classes are affected by the valid legislation, as well as by the current occupancy of classes and school buildings.

Legislation is an issue in itself. It is not commented on positively, but both general and specific reservations occur. One of the respondents mentions *completely insufficient legislative conditions*, without further specification or explanation, though. Other comments point to the large amount of paperwork associated with the new legislation, which places a significant burden on school counsellors, even though their number has increased (*colleagues still do not manage the rocketing inclusive legislation*). The paperwork is not always assigned to special educators; sometimes this task is fulfilled by another counsellor (guidance counsellor, psychologist, deputy principal, or principal of the school). This practice may be attributed to the fact that the funding of supportive measures is reflected in the school budget. The school principals therefore prefer to supervise correct reporting concerning this support personally. It is up to them whether they assume this responsibility themselves or assign it to another employee. One

of the options that presents itself here is to delegate part of the paperwork to newly-hired administrative staff, but the question is whether schools have funds available to pay such employees (*we have a new colleague who takes care of that; we would not manage without her at all*). Frequent changes in legislation, in particular Decree No. 27/2016 Coll., are perceived negatively too. The quantitative research did not confirm this criticism to a wider extent, though.

Individual conditions, i.e. those that the employees provide themselves in order to ensure a certain level of professional comfort, are based on seeking cooperation with other special educators aimed at the sharing of professional experience and joint professional growth.

The study has noticed certain risks resulting from insufficiently secured conditions or inappropriate perception of the principles of inclusion: *Because of inclusion, our small school has become a field office of a special school.*[1] Some respondents described the risk of endangering the quality of education because of the presence of pupils who significantly disrupt teaching or whose education in the current conditions is so demanding that teachers have limited opportunities to work systematically with the rest of the class. Furthermore, there is pressure against excessive consideration being given to pupils with special educational needs, as it carries the risk of lowered motivation of other pupils (and their parents) to make use of the students' potential and perform in the best way possible. The problem may lie in the teachers' limited competence to explain to both students and their parents different approaches to the education and assessment of pupils with SEN.

Proposed Changes to the System and Critical Observations

Though this question was formulated positively, the respondents sometimes articulated their critical comments concerning the current system. Several categories of issues were identified – staff, pupils and their limitations, funding, paperwork, the authorities, the authority of parents, the authority of schools, and proposals concerning the tertiary training of teachers.

Staff

As far as the staff is concerned, the respondents mostly commented on the supporting professions at school. They

[1] According to the current terminology, the respondent meant the elementary practical school.

focused on training and further education of pedagogical staff and on the numbers of professionals within the education system and they proposed various changes to the system of staffing. There were critical comments dealing with the real qualifications of teaching assistants, which seem to be unsatisfactory in many cases, and the assistants therefore do not provide teachers with the necessary degree of help (*they can help with the notice board or filling in of diaries, but they have no training in working with children – a course is not enough).* On the issue of further education, the informants pointed to the lack of meetings of special educators aimed at discussing methodology. They nevertheless did not rule out that such encounters take place somewhere. Besides that, the respondents requested extension of the scope of employment of prevention methodology specialists. One of the comments addresses the issue of qualification limits for work within the subject of special educational care, which should not be performed by a psychologist who is not an expert in reeducation of specific learning disabilities (SLD), though it is worth mentioning that the content of this subject should include psychological work with students. However, if the subject content consists of SLD reeducation, it should be taught by special pedagogues.

Understaffing was mentioned with regard to the positions of special educators, school psychologists, and assistants. Some respondents spoke about a general lack of staff who can be of benefit to pupils with special educational needs. The positions of regular teachers are often insufficiently staffed too (*if education is based on working pensioners (five out of 31) and unskilled staff members (four out of 31)..., the situation will not be better, even if the legislation created the best conditions for inclusive education*). The role of a school psychologist or special education teacher is frequently misconceived. Often an expert working for several schools simultaneously is designated as such (*there is only one school psychologist in the whole town with seven primary schools and a kindergarten*), even though it is recommended that a school psychologist should have at least 50% part-time employment at a school in order to fulfil their role properly. Some respondents suggested that certain professions should be eligible for reimbursement of the salaries paid to their practitioners – a teaching assistant in every class, a school psychologist/special educator at every school.

Pupils and their Limitations

This category was commented on extensively. Although it was meant as a platform for the articulation of proposals for changes, the respondents commented on the limits that they perceive in inclusive

education regarding pupils with special educational needs. In general they suggested a change in the area of the education of students identified as performing below the level of the educational mainstream. Limits on the education of pupils with mild mental retardation were mentioned the most frequently. The respondents described the consequences in the field of education itself (*students do not master the curriculum even with the support of teaching assistants*) and in the emotional area (*they do not experience success*). The consequences affect regular teachers and other students too (*for teachers it is a great burden to adjust the teaching and everything is to the detriment of other pupils, including gifted ones*). Within the context of the perceived limitations, the respondents also expressed the positives that inclusive education meant for the sector of special education – *smaller teams, a special educational approach*. In addition to pupils with a mild intellectual disability, pupils with a moderate intellectual disability were mentioned too. The inclusive education of such children is perceived as extremely complex. The respondents also mentioned pupils with borderline intellectual capacity who do not fulfil the diagnosis of a mild intellectual disability but have difficulties with mainstream education (*inclusion harms pupils with a borderline intellect – they cannot study at special schools and suffer at regular schools*). The above arguments need to be discussed.

Other limitations of inclusive education are related to students with more serious behavioural issues (ADHD and other psychiatric diagnoses, including autism spectrum disorders), where the emotional instability of the student poses a significant complication for teaching (*the student is capable of disrupting a lesson to the extent that the teacher cannot teach the remaining pupils properly*), while the attendance of such pupils in other than regular primary schools is problematic. Pupils with more serious learning disorders were mentioned too in the study. The opinion that inclusive education is only unproblematic in the case of physically handicapped pupils could be noticed, but it seemed to be marginal. The importance of naming these limitations of the pupils and not perceiving them as failures was pronounced too (*if an included is highly disruptive, we should not feel ashamed of it and we should act*). The limitations can also be seen in terms of the total number of pupils with SEN present in a class. If there are too many, the education of the other students becomes significantly more difficult (if there is above a certain number of such pupils, it is almost impossible to teach in the class).

In addition to pupils with special educational needs, attention was also

paid to gifted pupils, though they were mentioned only by one respondent, who suggested that pupils with SEN were cared for, while gifted pupils were still receiving much less attention. That could be due both to the fact that it is difficult to identify these students and that it is complicated to find space for their systematic support.

All the respondents described inclusion as a way of supporting pupils with special needs and did not relate it to all students.

They also mentioned the consequences that going beyond the limits of inclusive education can lead to for parents, teachers, and students in the class (*whatever-it-takes inclusion does not make sense, teachers are exhausted and parents are upset; the climate in the class deteriorates*), and for students with SEN who do not necessarily benefit from it entirely (*there are children for whom attending our school is of no use or benefit, who do not experience the joy of learning*). The personality of the student may be a limitation in itself too. There are students who are not motivated to do schoolwork despite substantial support provided by teachers (*one tries to help in every possible way, but they do not care*).

The risks ensuing from the limitations were described too. These are seen in the existence of some classes where the composition of the pupil body is so difficult that the quality of teaching is endangered. The situation may be somewhat paradoxical: ensuring the quality of education for pupils with SEN is preferred to the detriment of other pupils. Because of the complexity of the process of applying supportive measures, including the processing of the relevant paperwork, some schools retreat from providing them (*many schools – I know that because of the students transferred – prefer not to send pupils to the school counselling facilities at all – the less, the better. It's a step backwards).* The proposed changes consist of a reduction of the number of pupils in the class (the measure proposed the most frequently) or a decrease in the number of pupils with SEN in a class.

Funding and Paperwork

The respondents either demanded a general increase in the funding of the system of education, or directed their demands to the area of the funding of counselling and administrative staff in charge of inclusive education at schools. In this context they mentioned these positions: special education educators, school psychologists, teaching assistants, school assistants, social workers, and administrative workers. They also proposed that in the case of teaching assistants, schools should be provided with funding according to the number of pupils with

SEN. The paperwork was described as excessive to overwhelming.

Authorities

The respondents most often commented on the functionality of cooperation between pedagogical-psychological counselling centres and demanded better communication, more flexible collaboration, and better support for schools in the area of intervention activities. A formal approach on the part of counselling centres (*their staff only deal with papers and are not interested in children at all*) or their unprofessional advice were criticized. Two respondents also mentioned their desire to transfer a certain amount of authority from school counselling facilities to schools. They even suggested transferring the whole authority to schools, as is the practice in the Scandinavian countries. Communication with, and the activity of, the Ministry of Education, Youth, and Sports were also criticized. As a result, schools try to set up an effective procedure on their own initiative (*it is sad that the Ministry of Education, Youth, and Sports is unable to explain, prepare, and medialize everything, to ensure the conditions; at the end of the day, we are putting everything together on our own at school*). As to the proposals, the respondents suggested setting up a contact counselling centre, which would mainly provide consulting to teachers with little experience with inclusion, or to set up an office for a district special pedagogue who would regularly visit schools and support teachers.

Authority of Schools

According to several respondents, extending the powers of schools would contribute to the effective implementation of inclusion. However, this step could also lead to higher degrees of rejection where schools do not have suitable conditions, and that could prove controversial because of the risk of students being rejected by some schools in order to make their life easier. On the other hand, schools often have a very realistic idea of the potential barriers (*large numbers of children in classes, interconnected classes, absence of a special educator*) that may complicate inclusive education. Schools would also welcome more trust from the education authorities and the Ministry of Education, which would enable them to assume responsibility for their own actions. Amongst the options of how to increase the powers of schools we can name the suggestion of letting school principals decide about the proportion of direct and indirect work of a teaching assistant, as they know and may assess each specific case better than the decree or the school counselling facility.

Authority of Parents

The respondents were generally of the

opinion that parents had a lot of rights and that they would not oppose partial restriction of those. They describe situations where, according to the school, parents decide against the interests of the child or society. Following such a decision of the parents, the child is included in a programme that is beyond his or her capacities and the resulting knowledge and skills of the pupil are worse than would be the case if he or she were taught according to another programme or in another class or school. This baseline situation is associated with a more problematic application of the person in the labour market. The respondents thus question the right of parents to decide against the recommendations of a school counselling facility which is (for instance) suggesting the child be educated within the special education sector.

One of the respondents calls for greater responsibility on the part of parents for pupils' education with reference to the fact that inclusive education entails considerable financial costs (*expensive inclusion without the obligation of parents to participate in it somehow does not make sense*). We should nevertheless stress here the aspect of strengthening equal opportunities for pupils with insufficient support from their families. The need to set clear rules for communication between families and schools was another aspect that was mentioned. The rights and obligations of both parties should be balanced. One respondent drew attention to the risk of transferring parental responsibilities to schools.

Proposals Concerning Tertiary Training of Teachers

The need to extend the university training of future teachers by education in the field of special pedagogy and by greater practical training was mentioned frequently. Furthermore, it would be advisable to consider providing support to smaller schools in order to enable them to hire a school psychologist and a special education teacher. Schools would also benefit from the opportunity to split pupils into smaller groups, which is nevertheless hampered by spatial, staffing, and financial factors. Threshold numbers of pupils with SEN per school should be set too.

General Attitude to Inclusive Education

Although the qualitative part of the questionnaire did not include any direct questions on the attitude to inclusive education in general, the respondents frequently expressed themselves regarding the issue when answering the open question about changes to the system.

A wide range of attitudes was presented – from positive ones, through attitudes requesting the fulfilment of

further conditions in order to achieve the successful functioning of inclusion, to negative ones. The concept of inclusive education was largely accepted by small schools, one-room schools, or alternative schools (mostly Montessori schools), which explain their acceptance of inclusion as a result of working in an environment that is naturally inclusive in itself (*in Montessori schools, everyone is unique and everyone deserves a different approach; we are a small school, we have always done our best for every child*). These respondents also drew attention to the fact that they had already adopted the concept of inclusive education before 2016 (though they had not been using the expression itself) and now felt too burdened with the excessive paperwork and formal procedures required by the MEYS apparatus. One of the respondents highlighted the need for personal positive input if her students' needs are to be met (*our principal has to deal with the inclusion herself, with her heart and sometimes regardless of the legislation*). Another respondent pointed out the paradox of emphasizing compliance with formal procedures over the effectiveness of real help granted to students. The costs of inclusion are regarded as something unquestionable and necessary to accept. Financial security is a condition for inclusion to be implemented.

Negative comments about inclusive education were either statements concerning possible negative consequences of inclusion or statements perceiving inclusion as such negatively. The negative consequences were associated with all the stakeholders: pupils with SEN, "regular" pupils, and teachers who may feel demotivated or overwhelmed (*inclusion harms everyone; it harms ordinary students the most; our whole teaching staff is demotivated*). These negative consequences were further specified as a reduced level of education, a significant increase in paperwork, a collapse of counselling facilities, and increased bullying. The risk of lowering the level of education of "ordinary" pupils was mentioned repeatedly.

The other category of comments assessed inclusion in its entirety negatively, without any specific arguments. Some of these comments were strongly emotional (*inclusion is a crime against children; the whole infamous inclusion is just a big hype; inclusion was the biggest blow to our education system in the last 30 years; it is a mess and no one wants to do anything about it*). Several comments pointed to the low level of effectiveness of the current concept of inclusive education (*poorly presented and managed inclusion; the financial demands of inclusion are huge, while the benefits are minimal; it only presents excessive work to me, while there is no effect at all*).

It is also worth mentioning the oft-repeated statements that emphasize the importance of special needs education.

Some of these comments praise its existence and effectiveness (*special schools still exist and there are people who can tackle the issue*), call for preservation of special schools, appeal for the strengthening of this sector, criticize the abolition of this type of school, or call for their reestablishment, though it is common knowledge that the government has not given its assent to their abolition. Some of the statements go along the lines of the anti-inclusive concept in general. These respondents do not see any benefit in inclusive education. Other comments assess the existence of special education in the context of so-called *responsible inclusion* (Vaughn & Schumm, 1995), which supports inclusive education where possible, but acknowledges that it has certain limits, beyond which it is advisable to consider the education of a particular pupil with more severe disabilities outside the mainstream.

Discussion about Findings

The respondents' direct answers sometimes do not specify explicitly the conditions; these have to be deduced from the criticism expressed in the answers. The respondents paid significant attention to students for whom – in their opinion – inclusive education may not be the most effective option. The argument that pupils with a mild intellectual disability (MID) do not master the curriculum even with the support of a teaching assistant is based on the assumption that all pupils should achieve the same level of knowledge. However, the MID pupils (but not only these pupils) should not be subjected to the same requirements; individual and achievable goals should be set for them. This is also tightly linked to experiencing success and achievement, which are more likely to occur in the case of individually set goals. It should also be noted that the education of pupils with MID is usually carried out on the basis of the set minimum outputs of the FEP PE, which are incorporated into the SEP of the school and IEP of the specific pupil. Teachers should know and apply those if the educational counselling facility (ECF) so recommends.

The respondents abundantly mention the consequences of inclusion for other pupils in the class, who may be disturbed by pupils with SEN or suffer from a lack of space left to work with them. As for the findings of the quantitative part of the research about the growing parental activity perceived as burdensome by schools, we should admit that this may pose another complicating factor. Teachers need to concentrate not only on the effectiveness of the teaching process in the classroom, but also on the relationships with parents who are opposed to the presence of pupils with SEN, thus placing a heavy burden on the teacher.

This issue may be partly addressed through a greater focus on the effective education of other students in the class, provided, of course, that the internal and external conditions are met.

The respondents perceive inclusive education as inclusion of pupils with SEN among other pupils quite commonly. This perception of inclusive education is represented in the quantitative outputs to the same extent as the concept of inclusive education relating to all pupils. The qualitative survey nevertheless predominantly includes answers testifying to the concept focusing on the education of pupils with SEN.

Counselling facilities, criticized for their formal approach to the suggestions of supportive measures, need not be the greatest culprit', though. They are also burdened with the above-described lower flexibility of the system and long waiting times. All of that leads to a formalistic approach on the part of the ECF employees, even if they would prefer to work quite differently. Yielding greater powers to schools could leave the counselling facilities with more room for systematic work. The reproaches concerning unprofessional advice from ECFs could be avoided if greater opportunities were given to the ECF staff to get better acquainted with the specific school environment, the pupil and his/her needs, and the view of the school teachers. The supportive measures would thus be easier to set.

Enhanced mutual cooperation between the school management and the special educator is proving a key factor in greater support for inclusive education at schools. The survey revealed that the special educator is a profession much sought after by schools and a highly praised one, naturally hand in hand with other consulting and supporting professions. School principals need this position to be reimbursable and independent of partial projects. Considering the fact that the position of a special educator has been a standard part of Decree No. 72/2016 Coll., as amended, since 2005, we can assume that it already constitutes a stable position, at least in some schools, the existence of which is duly justified.

Let us return to the above-mentioned requirement of better training in the field of special education. It is completely justified. Teachers, regardless of their specialization, will be facing a diverse range of pupils, including those requiring specific support, more and more, and not all the issues that emerge can be solved by a special educator. The core teachers must be equipped with at least partial competencies in this field – especially the ability to identify difficulties, to determine subsequent steps, and to adapt their teaching appropriately.

In both parts of the survey the respondents complain that inclusive education was not sufficiently prepared by the Ministry of Education, specifically, that

it was not appropriately discussed with and communicated to educators. It is true that school associations provided the MEYS with their materials addressing the planned legislative change, but the discussion amongst institutions and authorities was probably not sufficient. Another question is whether and to what extent the authorities discussed the issue with their members who really live the reality of inclusion in schools and counselling facilities.

Another topic for discussion lies in the fact that the analysis showed rather negative answers and comments in response to the open-ended questions, which may give the impression that our respondents have adopted a rather anti-inclusive attitude. We should not forget, though, that the open-ended questions were a mere add-on to the items dealing with individually defined areas and therefore quite logically provoked statements along the lines of the deficiencies or limitations of inclusive education. To get an overall picture of how school special education teachers and school principals perceive inclusive education, please refer to the comprehensive data of the qualitative-quantitative research (Mrázková, 2020).

Inclusive education is a topical task associated with quite a number of issues. It is important to monitor the feedback of practising professionals who can specify useful requirements, as well as the limitations of inclusive education. Their advice can help in the implementation of inclusive education at schools.

Abbreviations and acronyms: ILP – individual learning plan; MID – mild intellectual disability; MEYS – Ministry of Education, Youth, and Sport; ECF – educational counselling facility; SEN – special educational needs; SEP – school educational programme; FEP PS – framework educational programme for primary schools

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Assessment of the Development of a Child's Comprehension of Texts Read Aloud[1]

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Abstract: The paper deals with the issue of evaluating the level of comprehension of a child of texts read aloud in nursery school and the related development of the relationship to reading. The attitude component as a part of reading literacy is especially strongly influenced by the family environment (Gavora, 2018; Meng, 2016; Trávníček, 2014; Baker, Scher, & Mackler, 1997). At the same time, nursery schools should create suitable conditions for the development of reading literacy and support the development of text comprehension and children's relationship to reading. One possible way is to use reading strategies while the teacher is reading aloud. The application of reading strategies in preschool education is not very widespread in the Czech Republic; teachers lack methodological support and the opportunity to gain experience (Koželuhová, 2020). At the same time, they need to see the contribution of new methods before proceeding with a permanent change in the way they work (Šeďová, Švaříček, Sedláček, & Šalamounová, 2016; Kindle, 2011). We conducted the research with the aim of proposing a procedure for evaluating the comprehension of children of a text read aloud. We developed the evaluation procedure and criteria on the basis of a case study, during which the development of comprehension in a randomly selected child in a nursery school was monitored over a period of 26 months. The results provided an overview of several phases of comprehension, and their characteristics were used in the creation of a simple evaluation tool suitable for preschool teachers to assess the level of understanding and relationship to reading in children. The examination of the effectiveness of the proposed instrument will be the subject of a more in-depth investigation.

Key words: assessment, reading, preschool education, development of comprehension

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Introduction

The issue of reading comes to the fore in the discussion of the definition of reading literacy. Functional reading literacy is seen as a prerequisite for an individual's participation in society, while the idea of a specific form of functional literacy is related to the culture in which it is assessed (Gavora, 2002; Rabušicová, 2002). We perceive functional reading literacy from a qualitative point of view, not as a developmental phase of the development of literacy (cf. Košek-Bartošová, 2014). It includes the attitude component – the perception of reading as a value, where reading is used not only as an activity necessary for participation in society, but also for personal pleasure and cultivation (Trávníček, 2014; Vykoukalová & Wildová, 2013). We are not born readers; the path to reading is a process that is influenced by many factors. It begins in early childhood, when a child first comes into contact with the world of books through an adult. The period of the development of reading literacy, during which the preconditions for reading and writing are developed and the foundations of future interest in reading are formed, lasts until the child enters the first grade, when systematic teaching of reading and writing begins (Koželuhová, 2020; Kucharská, 2014; Helus, 2012). It is characteristic of this period that the child spontaneously acquires assumptions about literacy, i.e.specific skills and knowledge "emerge" (Koželuhová, 2020; Rohde, 2015; Kucharská, 2014; Lonigan, 2004). The conditions and socio-cultural context in which the child grows up are therefore key to the development of reading literacy.

Influence of the environment on the development of reading literacy

At preschool age, two social groups primarily influence the child's development. The first is the family, the second is the nursery school. The influence of parents' reading and their attitude towards reading arguably represent the most important factor involved in shaping children's future attitudes to reading (Gavora, 2018; Meng, 2016; Trávníček, 2014; Baker, Scher, & Mackler, 1997). If parents are convinced of the importance of reading, they also read to their children. The age at which parents begin to read to their children also plays a role; an early start of reading, ideally before 24 months of age, has a great effect. According to a survey, Czech parents read to their preschool children, but only less than 40% daily (Gavora, 2018; Fasnerová, 2014). Other factors are also important – the frequency, length, and method of reading (Sonnenschein & Munsterman, 2002). Comprehension is an important factor in developing a relationship with reading. If the child does not understand a text that is read aloud, it misses not

only the content of the reading, but also the meaning of reading. The experience of the meaningfulness of reading as an activity that leads to the fulfilment of needs (pleasure, satisfaction of curiosity, experience, relaxation, etc.) is a motivating factor for mastering reading and writing and for overcoming any difficulties associated with it. Therefore, it is essential for reading to be accompanied by facilitation of comprehension (Gavora, 2018). This can take the form of explaining unfamiliar words or plots, putting questions to a child, having a conversation about what was read, or referring to illustrations in a book.

Nursery schools complement family education with their educational offer and should create optimal conditions for the development of reading literacy. This includes ensuring suitable material conditions: a sufficient and varied offer of quality children's literature, freely accessible to children, the establishment of a place for reading and children's libraries and creating time for spontaneous "reading" of books by the child. Preschool teachers should be erudite in their knowledge of didactic procedures to support the development of skills preceding reading and writing and in their familiarity with the current literature for children. Reading to children should be involved in educational activity, not only during resting time. Also, in nursery schools the correct way of reading to children is important; it is necessary to facilitate children's comprehension, engage them in dialugue with reader, and strive to develop comprehension.

Development of comprehension in preschool age

We understand comprehension as a complex cognitive process that allows us to acquire the meaning of a message. It occurs because of interaction with the text in the context of the reader's activity and the reader's cultural environment. Comprehension is influenced by the reader's experience (including knowledge of the topic), his/her approach to the text (motivation, way of working with the text), and the level of his/her cognitive functions (attention, memory, analytical thinking, imagination). Therefore, the level of comprehension is an individual matter and may vary from reader to reader (Zápotočná, 2015; Rybárová, 2018; Gavora, 2002). For preschool children, differences in the comprehension of a text read to them can be very significant. This is due to differences in the breadth of their vocabulary, the level of development of their speech, and the level of development of their thinking. They must perceive the causal relationships and internal states of the characters (their motives, the goals of the characters, their experiences) and connect the individual episodes with each other (McNamara, 2007). This is often difficult for a preschool child, so

it needs facilitation from an adult. One way to help children comprehend stories that are read to them is to use reading strategies.

Reading strategies in preschool education

Reading strategies are intentional and thoughtful ways of working with a text that aim to achieve comprehension. In preschool age, their use is possible and appropriate, although it has its own specifics (Burris & Brown, 2014; Strasser & del Río, 2014; Fellowes & Oakley, 2010; McNamara, 2007). In nursery school, a teacher chooses a suitable reading strategy and provides children with support in comprehension through modelling or scaffolding. This is usually in the form of asking questions, working with illustrations, models, or graphic schemes, activities with props, etc. The aim of this procedure is to help the child to imagine the story and to understand the causal relationships in the story. To do this, it needs to recall its previous experience and knowledge of the topic. Suitable strategies for preschool age are therefore strategies of making connections, prediction, reasoning, visualization, summarization, evaluating, and questioning (Koželuhová, 2020; Nádvorníková, Svobodová, Švejdová, & Vítečková, 2019; Wildová et al., 2019; Strasser & del Río, 2014; Roberts, 2013; Fellowes & Oakley, 2010; Duke & Pearson, 2009; Robb, 1996). In the Czech Republic, the use of reading strategies in preschool education is not yet a common method. Teachers more often proceed intuitively when reading, without prior training, when they respond only to children's immediate reactions. They do not think so much about the meaning of the story. However, there is a risk that the facilitation of comprehension will be insufficient and will not lead to the expected results (Koželuhová, 2021; Maňourová, Štefánková, Laibrt, Garabiková Pártlová, & Bílková, 2019). One of the consequences of a lack of comprehension can be children's lack of interest in reading, and even at the time when these children later learn to read, they do not strive for independent reading. Therefore, it is important that preschool teachers monitor the level of comprehension and try to develop it when reading to children and working with children's literature.

Teachers must be convinced of the benefits of the new methods in order to be willing to implement them (Šeďová, Švaříček, Sedláček, & Šalamounová, 2016; Kindle, 2011; Richardson, Andres, Tidwell, & Lloyd, 1991). In the Czech Republic there is not enough research data to prove the effects of reading strategies in preschool age. Abroad, research shows that the application of reading strategies in preschool education has a positive impact, especially when the teacher reads to the whole class (Pentimonti & Justice, 2010). In her study,

Roberts (2013) examined the ways in which parents read to children. It turned out that the experimental group of parents, who were guided with application strategies through several workshops, showed a statistically significant increase in their children's comprehension of the text within eight weeks. Kendeou, Van Den Broek, White, and Lynch (2007) examined the development of understanding in a sample of 229 children aged four and six years for two years. They concluded that children's levels of comprehension evolve as they develop speech and vocabulary and that it is important to support the development of comprehension through reading strategies. This recommendation corresponds to the recommendation of the National Panel for Education (NICHD, 2000).

However, preschool teachers in the Czech Republic perceive the employment of reading strategies in an ambivalent manner. They declare positive results in the form of an increased interest in reading, better comprehension of the text, and an overall higher development of thinking and speech. They state that their work with the text is of better quality, more thoughtful, and more interesting for them when they employ reading strategies. On the other hand, they perceive reading strategies as challenging and requiring more time to prepare for reading. Because of that they include reading strategies irregularly (Koželuhová, 2021; Koželuhová, 2020). On the basis of these findings, we developed methodological recommendations. We supplemented these with video samples from practice, which should help teachers to work more easily with reading strategies and apply them effectively. It is necessary to verify the impact of these recommendations. It is also necessary to offer teachers a simple tool to monitor the progress of children's comprehension, so that they are able to evaluate their work.

Methodology

Goal and research questions

The aim of the survey was to propose a procedure by which teachers should be able to evaluate the effectiveness of the use of methodological recommendations for working with reading strategies. Furthermore, another intention was to determine the identifiers that preschool teachers could apply in evaluating the development of comprehension of children. The indicators were based on the mapping of the comprehension development of texts read aloud to a preschool child. The following research questions were formulated:

1.) How does the child's reaction to reading change in the context of the application of reading strategies by the preschool teacher?
2.) What characteristics of the reaction to reading can be observed in

a preschool child during a reading in nursery school?

The survey followed up on action research, in which the preschool teacher sought to incorporate reading strategies into her reading to the children. As part of the action research, we monitored the development of children's level of comprehension of stories, in connection with the monitoring of the level of development of their speech. (Koželuhová & Rybárová, 2020) The data obtained in the action research was secondarily analysed and used in this survey to describe the development of comprehension of a read text.

Research strategy, case selection, data collection and analysis

A qualitative approach was chosen in the design of the case study. It makes it possible to describe the processes in the context of a change in the way a preschool teacher reads to children. It allows the phenomenon to be looked at from different perspectives and the factors involved considered (Yin, 2018; Švaříček & Šeďová, 2016; Hendl, 2005). Because of the specifics of the survey, which took place in the preparation of methodological materials and was therefore its initial verification at the level of one class, it is not possible to generalize the results. Therefore, we chose a descriptive type of case study to describe the case (Yin, 2003). We paid attention to the selection of a case that would meet the selected criteria arising from the research questions (Yin, 2018; Hendl, 2016; Miles & Huberman, 1994). We selected four children that met these criteria: 1.) the child was present in the class for the entire duration of the survey; 2.) the child was present when the teacher applied reading strategies. One child, a boy, was randomly selected from these children. We monitored the development of his comprehension in the period from October 2018 to December 2020. During this time, we made a video recording of the teachers' readings. The video was always filmed by a second colleague in the class who the children knew. Thus, the class environment was not disturbed, and the children´s reactions were not affected by shyness towards the researcher. We transcribed the uncut recordings later and analysed them; we used an observation sheet, on which the application of reading strategies by the teacher and the corresponding reactions of the child were recorded. We recorded 26 videos with a total length of 468 minutes. Another source of data was semi-structured interviews with teachers and the child's mother. The interviews were transcribed and manually coded; first by open coding (ad hoc), then by axial. We used logical modelling to create a summary report (Yin, 2018). To ensure

internal validity, we provided the report to the participants in the survey – the child's teachers and his parents.

The context of the school

We conducted the survey in one class of a six-class nursery school in a regional town. The class was mostly age-homogeneous, the first year most of the children were aged four to five years, and only a few children were younger (the case was subsequently selected from among them). In the third year of the survey, after the departure of most children to primary school, the composition of the class turned into a heterogeneous one, with children from three to six years, and the child who was being observed was one of the oldest children. There were 26 children in the class; the average attendance was 21 children. Both teachers were qualified with a bachelor's degree in the study programme of preschool teaching. They both had two years' experience. Before the survey started, the teachers read to children in the usual way, usually when they went to bed for their afternoon nap. During the reading, they explained unfamiliar words and asked the children questions to verify the memorization of the information heard (e.g. Where did the teacher put the Oakman?). After they had become acquainted with the methodological material, the way of reading changed, reading strategies were included, and the teachers began to provide support for the children's comprehension in the form of open questions. The organization of reading also changed; it was regularly included in the educational activity and was followed by other activities motivated by the text that had been read.

The context of the family

The boy comes from a complete family. The father and mother are both university-educated; the mother works as a high school teacher; the father is a designer. The boy has a sister 2.5 years older than him. She is attending the third grade of primary school and enjoys reading on her own. The family spends a lot of time together, mainly doing sports activities and going on trips (both parents are active athletes). Both parents are interested in their children's education, communicate with his teachers, and participate in activities organized by the nursery school. They have been reading to children since they were little, they have an evening ritual connected with reading, and both parents take turns reading. They consider themselves readers. The boy entered nursery school at the age of 3.0 years because of his mother's employment. It was in the middle of the school year. The boy was included in a homogeneous class of three-to-four-year-old children. He became the youngest child in the

class. His adaptation went smoothly. He liked attending the nursery school.

Results

The period between 3.5 and 4.0 years of the boy's age was characterized by his interest in reading. The boy always sat next to the teacher who was reading and listened intently, fixed on the teacher's eyes or the picture being shown, or reacted to another child who was answering questions or commenting on the reading. He himself was not actively involved. The boy's interest in reading was due to his being from a family in which the children were regularly read to. *We started reading when he was a baby, because by having an older sister, she was two and a half when he was born, which means that we had been reading goodnight stories for a long time, so he felt it from an early age. It is the early experience with books that is important for the development of interest in reading. I would say that as he got older, he started to be interested in those books earlier, I would just say because we actually read to him from an early age*. At this age, the boy could not yet memorize more facts from the story or perceive causal relationships and understand the main idea of the story. It is evidenced by the boy's result in a comprehension test conducted as a part of the action research. In it, individually and without the presence of other children, the teacher asked questions about the story he had just read. The questions were focused on recalling explicit and implicit information from the text (what characters appeared in the story, what happened in the story, where it took place, why a certain event took place). The boy mentioned only the main character from the story and answered one causal question inaccurately (Why did the piglet escape from the farm? He did not like it there.).

At age 4.0, the boy made progress in comprehending the story. This happened after three months of the application of reading strategies by his teachers. This resulted from repeated testing in action research. There was only a slight shift in the field of speech (from 11 points to 14). The memory processing of explicit facts had improved; the boy introduced two characters from the story and two different locations, and described one story episode. He could now answer all five causal questions correctly (e.g. Why was it important for the piglet to find the sparrow? He wanted to put him back home; Why didn't the sparrow remember the pig? Because he hit his head on a tree). Progress in the comprehension of causal relationships can be linked to a change in reading methods, with the teachers systematically guiding the children to understand causality through their questions during the reading. At this time, the mother also noticed an increase in the boy's interest in reading and his need to share the experience of

the book being read. *He tells us about books that are read in the class. He wants to read during the day when he rests, or when he is sick.* Also, the boy began to spontaneously engage in reading discussions in the class.

The period from 4.0 to 4.5 years was characterized by an interest in reading and the onset of sharing reading experiences. The boy began to actively engage in reading and responded to questions. He was able to recall the information explicitly stated in the text. However, he was not yet able to think independently and link the information in the text (What will the dwarf do now? He spoke. What did he say? He tells the story of the whale.). He began to spontaneously link information from the text with his experience and knowledge. E.g., in response to the information that the protagonist of the story would be named Jakub, he responded: "I know him, it's in a fairy tale, it's not just Jakub, but it's a machine."

At the age of 4.8, the boy began to anticipate and judge in response to the teacher's questions with the help of a picture, and he was not afraid to communicate his suggestions to others.

Teacher: The fairy tale we will read has a colour that is not in the rainbow.

Boy: Black! I saw the black one a little.

Teacher: What will the Moon do?

Boy: That the sun peeks out.

He was active in the readings, sitting close to the reader, reporting, and responding to the teachers' questions. He also spontaneously linked information from the book with his experience (There the sun shines from a fairy tale). The mother also registered his anticipation. *He told me, (…) that he always guessed what might be in the next chapter.*

Linking the text with his own experience began to become more pronounced at the age of 5.8; the boy repeatedly mentioned during the reading what the text reminded him of (This is a PET bottle. And we have it there, he showed). He foresaw (for example, that he would think of something and it would appear), while his predictions were more accurate and he took more account of the facts from the story. His foresight was not affected by his imagination as much as it was before. He noticed the details in the picture and used the details for anticipation and reasoning. He began to evaluate the story and show sympathy for the inner states of the characters (If only he had the fish!). For the first time, spontaneous reasoning was also recorded (That he would enchant those shoes and go alone.). The frequency of involvement in the reading increased significantly; during a 19-minute reading 25 spontaneous reactions or responses to the teacher's questions were recorded. During the reading, he was focused, fixating the teacher with his eyes, and not being disturbed by younger children who had not kept their attention for so long.

The teachers rated the boy's reaction to the reading as very strong. *He comprehended the story very well and surprised me. But he already has reading experience.* The increased comprehension was reflected in a further increase in interest in reading, when the boy, although he had enough books at home and also went to the library, began to borrow the books from the nursery school that he wanted to read at home.

At the age of 5.11, the boy began spelling for himself spontaneously and managed to read some words. *Reading has become one of the ways he spends his free time. Quite often, he crawls over, lies down on the couch, and entertains himself by looking at a magazine and telling the story. He anticipates from pictures and reads the first words, and expresses his reading preferences (usually it must be about animals).*

During the survey, the mother emphasized that although the family tried to encourage the boy's interest in reading, she perceived a significant benefit from the nursery school. For the boy, it led to a gradual need to share reading experiences. As a result, the mother also found that the style of reading in nursery school differed from the one they practised at home. *He subsequently modified it. We build on that (note: on the style of the teacher), we always read, but in fact only when he came and started telling some stories from the nursery school, it was only when I read something to him that I thought of what to ask him. Otherwise, I had it as "I read a nice fairy tale for good night and then good night". And I went, but he, when he suddenly came with that interest from the nursery school and told me what he learned, what they read about, so except for that account, I also started asking him questions. I probably wouldn't have thought of that on my own.* The original "reading to the child" became a common family reading, where both the reader and the child actively communicate, and the adult provides support for the child's understanding.

The results of the survey showed that the comprehension of reading in preschool age changed qualitatively, while the development was not uniform and was influenced by external conditions. At the beginning, there was an interest in reading in the form of listening to reading and looking at illustrations. During the reading together, the boy was passive, did not engage in discussions, and only watched. Comprehension was on a literal level. After the incorporation of reading strategies as a method used by teachers to facilitate comprehension, the boy developed a rapid implicit comprehension, in which he was able to realize and recall the causal relationships between episodes in the story. Later, in connection with the development of thinking, the boy's activity increased during the reading, to the extent that after the age of five he had a dialogue with the teachers, he actively inquired, and he came

Table 1. Summary of the development of the child's observed interest in reading and reactions to it

The age of the child	Age 3.8–4.0	Age 4.0–5.8	Age 5.8–5.11	Age 5.11–6.0
Observed manifestations	**Interest in reading:** Demonstrates interest in reading – during the reading he listens and looks at the illustrations in the book. **Comprehension:** Explicit: He remembers the main characters of the story. He remembers one episode. Implicit: Does not understand causal relationships.	**Interest in reading:** Concentrated listening. Independent search for books and browsing through them. **Comprehension:** Explicit and the beginnings of the causal. Understands simple causal relationships and explains them. He answers questions and retells the story with their help. **Response to reading:** He begins to link the content of the text with his experience. He needs to share reading experiences from nursery school with his parents.	**Interest in reading:** Concentrated listening, spontaneous involvement in discussions. He borrows books from nursery school and requests a reading. **Literal and derived understanding:** Understands simple causal relationships. On the basis of the teacher's questions, he anticipates, judges, and evaluates. Tells a story. **Response to reading:** Takes an evaluative view of the actions of the characters in the story. He can live through the feelings of the characters in the story.	**Interest in reading:** Suggests books for group reading. At home, he reads by himself in his free time. **Literal and inferred understanding:** Spontaneously connects, anticipates action, reasons. Assumptions as the story unfolds are more accurate. He can summarize the story. Asks questions about the text. **Response to reading:** Forms an evaluative opinion. He comments spontaneously on the plot of the story. **Application:** Starts spelling spontaneously, reads the first words. He begins to read the construction instructions from construction kits.
External influences	In nursery school, teachers read in the usual way, most often before the afternoon nap. The teachers' questions were aimed at recalling the facts.	Teachers began to apply reading strategies. They began to ask open-ended questions – judgment and evaluation.	Reading strategies continue to be applied in the class.	Reading strategies are still applied in the class; the frequency of readings within the controlled activity has increased to two to three readings per week.

up with his own spontaneous observations. Gradually, the ability to predict and reason improved; from random suggestions that were influenced by the boy's imagination, his suggestions began to reflect more on the information provided in the text. With his social and emotional development, at the end of the preschool period, comprehension of the internal states of the characters and an evaluation of their actions appeared.

We identified some manifestations of comprehension that can serve as identifiers for preschool teachers. It can be used to assess the level of comprehension of a text read to children. It is an **interest in reading, sharing reading experiences, connecting, anticipating, reasoning, and evaluating**. During the boy's development, these traits gradually appeared, and their quality changed. In Annex I, there is a figure that lists the individual characteristics with a qualitative definition. It can serve as a simplified indicative assessment tool of the level of development of children's comprehension.

Conclusion and discussion

Differences between levels of comprehension and interest in reading can be used to evaluate the effectiveness of the application of reading strategies. Preschool teachers do not have standardized tests for assessing the development of speech and comprehension, so their evaluation is based on their subjective experience, often only on their observation of the children's interest in reading (Koželuhová, 2021). Developmental scales that deal with reading (Havlínová et al., 2020; Košťálová, 2017) only report characteristics from the end of the preschool period. This is insufficient for the practice of nursery schools. Some of the characteristics that are listed, such as "begins to choose books according to illustrations, according to the cover, according to his interest and with the help of an adult" (Havlínová et al, 2020, p. 6), can be observed in children younger than the age at the end of the preschool period. We therefore believe that long-term monitoring of a larger sample of preschool children during reading and recording their reactions could serve not only to create an evaluation tool, but also to help preschool teachers in preparing a suitable educational offer to support the development of comprehension. The proposed criteria for assessing children's comprehension, which arose from this long-term observation of one child, will also be used to verify the impact of the implementation of reading strategies into teachers' work on children's comprehension. Changes in children's manifestations (especially their activity and cognitive processes associated with anticipation and reasoning) will be monitored during a limited period of three months, during which teachers will intentionally use reading

Annex I

	I.	II.	III.
Interest in reading	He/she concentrates while the teacher is reading or they are browsing through books together.	He/she starts to choose books to read, he/she demands it. He/she accepts the offer of a book to read or view.	He/she chooses books to read and view according to his/her interest. He/she spontaneously chooses reading or viewing as a leisure activity.
Reading behaviour	He/she listens intently, looking at the illustrations.	He/she listens intently and responds to the teacher's questions.	He/she listens intently, initiating a conversation about the reading.
Explicit comprehension	Introduces the main character of the story.	He/she introduces several characters from the story and some of its episodes. He/she retells the story with help.	He/she retells the story independently.
Implicit comprehension	He/she cannot infer causal relationships even with help.	He/she predicts, with help, trying to deduce new information from known facts.	He/she predicts independently and can derive new information from the information in the text.
Making connection	He/she recalls a situation like the one in the story.	He/she recognizes familiar text, character, or event.	He/she independently connects his/her experience with information from the text.
Evaluating	He/she can say if he/she liked the story or the fairy tale.	He/she can take a stand on the actions of the characters or events in the story.	He/she independently expresses evaluative opinions on the actions of the characters or on the events in the story.

strategies. This timespan is long enough to show possible effects (Koželuhová & Rybárová, 2020), while the factors of the child's natural development are not significant in such a short time.

The results of the survey cannot be generalized; they represent only the first small step in trying to describe how the development of comprehension manifests itself in preschool children and what indicators teachers can monitor and, according to those, choose an appropriate educational offer. These manifestations at a specific age represent only a description of the specifics of one case and it is not possible to relate them to a whole age group. However, they can serve as a guide in designing a developmental scale for comprehension by children of texts read aloud to them in

preschool age. This is the first experiment and will have to be subjected to a larger and more extensive examination on a larger research sample.

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