

Development of Elementary Literacy in the Czech Republic

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Abstract—There is great attention being paid in the field of development of first reading, thus early literacy skills in the Czech Republic. Yet inconclusive results of PISA and PIRLS force us to think over the teacher's work, his/her roles in the education process and methods and forms used in lessons. There is also a significant importance to monitor the family environment and the pupil, themselves. The aim of the publishing output is to focus on one side dealing with methods of practicing reading technique and their results in the process of comprehension. In the first part of the contribution there are the goals of development of reading literacy and the methods used in reading practice in some EU countries and a follow-up comparison of research implemented by the help of modern technology of an eye tracker device in the year 2015 and a research conducted at the Institute of Education and Psychological Counselling of the Czech Republic in the year 2011/12. These are the results of a diagnostic test of reading in first classes of primary schools, taught by the genetic method and analytic-synthetic method. The results show that in the first stage of practice there are no statistically significant differences between any researched subjects taught by different methods of reading practice (with the use of several diagnostic texts focused on reading technique and its comprehension). Different results are shown at the end of Grade One and during Grade Two of primary school.

Keywords—Elementary literacy, eye tracker device, diagnostic reading tests, reading teaching method.

I. INTRODUCTION

THE teaching of elementary reading and writing, followed by reading and comprehension, belongs among the most important skills which pupils must absorb within primary education. During its evolution it has undergone a variety of changes, which can be seen in the development of fonts, in individual methods or in the very concept of education.

Contemporary education is trying to modify the conditions of the teaching process so that they reflect the most recent times and demands which are imposed on everyone. Currently, one significant influence is the use of technical advancements, e.g. interactive boards, textbooks, tablets and other teaching aids in school, that influence the process of reading and writing skills themselves, including individual motivation [1].

In recent years, the Czech Republic has been intensively dedicated to the development of early reading literacy. Firstly, from the outset it is necessary to explain the notion of reading literacy. Domestic and foreign scientific studies state different

definitions of reading literacy. Eurydice studies this issue in "Teaching Reading in Europe" [2] and defines reading literacy as ability to understand, use and respond to written impulses in order to achieve personal and social satisfaction. It tries to point out the fact that reading literacy requires more than the decoding of words, i.e. facilitation of cognitive components of reading, comprehension. But at the same time, reading literacy requires motivation, personal interest, experience, and also social, linguistic, psychological and cultural skills [3].

II. INTERNATIONAL COMPARATIVE RESEARCH PISA, PIRLS

The above mentioned term, reading literacy, was adopted into professional Czech terminology from abroad in the 1990s, together with international research of reading literacy PISA (Programme for International Student Assessment), PIRLS (Progress in International Reading Literacy Study), TIMSS and others.

International assessment researches of pupils (PISA, PIRLS) are carried out by agreed conceptual and methodological frameworks with a goal to provide politically oriented indicators. The given indicators from the international surveys should be used with a caution, because there are several significant differences among countries, which then influence the outcomes of education, but are not related to education policies [2].

PISA belongs among the most well-known. The project focuses on finding functional literacy in 15-year-old pupils, who were examined in the following areas: Reading, Mathematics and Natural Sciences. "The survey focuses on three basic aspects – skills (alias activities or procedures), content (knowledge or traditional elements of school curricula) and situations (implementation of solved tasks into a context). Testing is not focused on reproduction of gained knowledge, but skills to use all learnt knowledge in various situations of a common life [4]." There are 34 countries within the OECD (Organisation for Economic Co-operation and Development) and another 32 countries involved in the project.

Research is carried out every three years. The latest results published are from the year 2012 (see Table I).

Table I shows shows increasing interest in the research, because the number of countries has doubled since it began in 2000. In 2012, only Asian countries occupied the ranks of the five best. Finland always holds a very good place among European countries. The results of pupils from the Czech Republic in comparison with the average results of OECD countries are average or below average. During years from 2000 to 2009 there was a distinctive deterioration in the

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performance of pupils from the Czech Republic, which was reflected in achieving below-average results. Improvement can be seen during in the years 2009 to 2012, with pupils improving by a total of 15 points [5].

TABLE I
PISA'S RESEARCH RESULTS (2000–2012) – READING LITERACY [5]

Research year	2000	2003	2006	2009	2012
Number of countries involved	32	41	57	65	66
Main research filed	RL	ML	NSL	RL	ML
Average results in CZ	492	489	483	478	493
Average of OECD's countries	501	497	495	499	496

Reading literacy = RL, Mathematical literacy = ML, Natural science literacy = NSL

While studying individual national reports, we were interested that in 2000 pupils were worst at tasks which were focused on gaining information from a text; while on the contrary, the best result was text interpretation. In a comparison of results – field of reading literacy, there are surprising results from assessment of pupils' questionnaires. Compared to 2000, the most significant change was the overall decline in the number of pupils who read for fun, in distinctive deterioration of discipline during classes of Czech language or statements that pupils are in general bored [6].

The international survey, PIRLS, directly focuses on the testing of reading literacy of 4th grade primary schools' students. Testing is coordinated by The International Association for the Evaluation of Educational Achievement – IEA). The PIRLS cycle survey lasts for five years and tries to map the family, school and wider environment that contributes to the development of pupils' reading literacy. First testing was implemented in 2001, the next in 2006 and then in 2011 (see Table II). Within PIRLS, the survey for reading literacy is considered to be a creative and interactive process emphasizing the functional characteristic of reading. The readers are expected to master reading strategies, to apply existing knowledge and experience, and have the ability to think and create their own ideas about read text or identify their own and substantial thoughts and information [7].

TABLE II
PIRLS'S RESEARCH RESULTS (2000–2011) – READING LITERACY [7]

Research year	2001	2006	2011
Number of countries involved	35 countries	40 countries	45 countries
Average result in CZ	537 12 th place	No participation	545 14 th place
Average results of PIRLS	522	500	500

Czech pupils participated in the PIRLS survey twice and their results were always relatively good – above average of the total PIRLS result. In 2011, Czech pupils scored even better with 9 points in comparison to the scores of 2001.

Thanks to the broader context of the questionnaires, more factors influencing reading literacy could be assessed. In most countries the results revealed that pupils who come from households with a greater number of books obtained better

results. Girls gained higher results in almost all countries for the reading literacy testing. Other factors to be assessed included, for example, pupils' watching TV and videos, attendance at school and town libraries, use of textbooks, and the role of additional material during lessons or for homework [8].

Comparative studies and researches cannot show all sides and competences of pupils' monitored areas, e.g. in reading literacy. As well, they do not highlight the right choice of strategies and processes to improve individual areas and to create intrinsic motivation in pupils and their relationship to reading. Therefore, an attempt has been made to discover the inspirations in countries (towns) that generally achieve excellent results (Finland, Singapore, Hong Kong, and Russia, etc.)

III. DEVELOPMENT GOAL OF EARLY READING LITERACY

In the period of reading literacy, we analyse the so-called period of early/initial reading literacy, which represents Grade One and Grade Two of primary school, which has its own specific educational goals, methods, forms etc. It is an expression of a broader concept than the term early (the very initial) reading, which is often connected with the development of basic reading skills, along with the reinforcement of reading comprehension.

“The goals of the development of early reading literacy are based on a general concept of teaching at primary education and from a concept of teaching the mother tongue during this period. In analysed state documents of most EU countries there are only general goals and their concretization represents a regional task, more school curriculum (e.g. Italy, Denmark, Austria, Luxembourg, Germany, and The Netherlands). A different situation has emerged in recent years in Greece and Great Britain, where documents published by Ministry of Education are very similar official documents regarding initial reading, which also emphasize the aims of development of this skill” [3].

The aims at the state level are set for different lengths of time stages (e.g. France, Great Britain), they are mostly set for a period exceeding the first year of schooling. In Germany and in France, the main aim of initial reading for grade one of primary school is the development of the reading comprehension technique and motivation for reading. In England and Wales, it is supplemented by reading for fun, in Ireland the stress is put on the functional use of reading for work with information, and in Austria the “cultural perspective” is given as the basic goals. In the French community in Belgium (at the same time there is also a German speaking community and a Flemish community), and in Portugal there are goals for this stage mainly defined by a level of functional reading use [9].

In Italy, the goals of initial reading literacy are very generally defined, where at the end of 1st year of schooling a pupil is required to be able to read a short connected text fluently. “On the contrary, very detailed goals are emphasized in the National Curriculum of Great Britain, which are defined

on a level of assessment of pupil's development. In the formulation of general goals, it is presumed that a pupil at the age of seven years will be able to read correctly, fluently with comprehension, with fun and that during reading s/he is able to use experience which s/he had gained in the previous period" [3].

IV. DEVELOPMENT METHODS OF EARLY LITERACY SKILLS

The traditional concept is based on mastering reading techniques. Pupils analyse sounds by hearing a word and then they match a letter to an appropriated speech sound, they make a so-called voice synthesis in a syllable (word). The emphasis is mainly focused on the development of the reading technique where compression is assigned. It is about development of the basic mechanism of reading (graphic/phonetic correspondence), which is currently very widespread. In the Czech Republic, this method of reading skills is referred to as the analytic-synthetic method.

In recent years, Portugal is among the influential countries which focus on development of strategies based on the knowledge of word meanings that emphasize the importance of learning to read the content of documents, and then after learning the meaning of a word, conduct an analysis of a syllable or a part of a word (thus on a "higher" level, than a speech sound/letter).

The concept where the reading technique being developed "side by side," while exploring the meaning of words, is very significant e.g. in the French community in Belgium. It is referred to as the method of structure. The starting point is a story, containing basic words, which are given to pupils in a picture supported way, from where isolated speech sounds are identified. For example, it is similarly taught in Flemish community in Belgium, in Spain, in France and in Luxembourg.

The Danish concept is focused on integrating the development of the reading technique and the development of getting to know the meaning of words (namely, strategic reading). In terms of this concept, there should be word identification and its parts (sound-letter connection), and at the same time there should be meaning attached to the word, and the word should then be used in a sentence context as a means of further reading development. This process can be described as a process emphasizing the balance of analytic-synthetic procedures during the development of initial reading literacy, and at the same time, the importance of working with the text's meaning [3].

Due to the complexity of the issue, the author focuses on methods which are described as "without the ABC book". The methods are based on the consistency of teaching reading and writing without the use of textbooks, commonly referred to as reading via writing. The prerequisite for the application of these methods is in respect to an individual pupil and his/her precondition for development of reading and writing skills. The child's spontaneity is used in these methods, and in its graphic design, where pupils note down (mostly in capital letters) sentences or words, which they make themselves up.

As previously stated, in the Czech Republic the most used method is the analytic-synthetic method and in ca 12 % also genetic method. The reading technique is also based on the analytic-synthetic method on speech sound synthesis. The target unit of the synthesis during reading is not represented by a syllable, but a word. From the beginning training pupils to spell and then read the word, and then read the word globally, which continues until they read words globally with a present understanding. The authors have tried to compare analytic-synthetic method and genetic method in various research studies.

V. RESEARCH RESULTS OF READING SKILLS BY USING EYE TRACKER TECHNOLOGY

For the purpose of monitoring eye there is a device Eye Tracker Tobii TX300 used together with the software Tobii Studio at the University of Ostrava in the Czech Republic. The stated device enables with help of infrared light to monitor eye movements (fixation, saccades and regression). Fixations represent the locking of the eye look on a concrete point for a certain interval. Moreover, a proficient reader will exhibit fewer fixations on a line of text during read. Saccades are understood by the rapid change in eye movement that allows it to maintain the sharpest image of the object observed and regressions as a return to the already viewed section of the text [10].

"Camera recorded eye moments are visualized with the help of software in several forms, such as Heat Map, Gaze Opacity Map, Gaze Plot and Gaze Replay, or are transformed into statistical data; while at the same time, a recording is made of the sound of words and the reactions of studied individuals" [11].

With the help of eye tracking, pupils attending Grade One of primary school who were involved in the research where assessed and their level of text understanding was observed, while a strategy was employed during reading that consisted of a starting text combined with questions and tasks.

The pilot consisted of two groups of pupils attending the Grade One of primary school engaged for the 2014/2015 school year. One group of children was taught using the analytic-synthetic method (with syllables) and the second group using the genetic method (reading speech sounds, whole words). Both methods are described in detail in the second published contribution (Reading Literacy and Methods of Improving Reading). The reading skills of students were monitored and measured using the eye tracker at the start and end of the school year, November 2014 to March 2015, with a third measurement taken in June 2015. The aim of the study was to discover the mastering reading technique, and also the students' ability to understand the read text. In this regard, the authors concluded that all monitored pupils during the first measurement were fixating individually on each letter of a spoken word (in the case of difficulties, of course, there were regressions). Nevertheless, an interesting difference was in the way they expressed words and sentences out loud. Several different strategies of synthesis in words appeared for each method [12].

The second measurement was carried out at the beginning of March 2015. During the creation of the text material, certain limitations still remained in the composition of text from letters in those pupils taught in the analytic-synthetic method. Once again, the quality of reading and comprehension was tested. Pupils were required to read aloud three blocks of text parts and then select which of four images associated with the text best matched the content. The second image presented the students with quite a daunting task, where the aim was to determine if the pupils were able to register a change in letters in one of the words they had read. An illustration was provided to support the problem solving [12]. All in all, from the results, it was possible to observe an improvement in those pupils who were taught using the analytic-synthetic method, and also that the differences between both groups of respondents began to slowly blur, which was also reflected in the accuracy of their reading.

From the eye movement records of the second measurement (March 2015) a conclusion was made, which is that just as during the initial measurement (November 2014), pupils fixate on each letter during reading. Slight differences started to appear in some individuals with regard to the length of the saccades, the number of fixations and also the regressions; however, it cannot be said collectively that the eye movements of the monitored respondents were significantly different. There was no clear manifestation of two distinct and diverse reading strategies, which could be characterized by the methods of teaching reading.

With regard to the final measurement taken in June 2015, there was no need to create test material to adapt to either method, as the pupils had already mastered all the letters. As part of the assessment, pupils were asked to read aloud seven sentences making up a story, and then select the correct image for each sentence from three choices.

It was proved that from the analysis of reading correctness, pupils studying the analytic-synthetic method (81.3% correctness) made fewer mistakes than pupils applying the genetic method (78.1%). In terms of text comprehension, i.e. selection of the correct illustration for the text, pupils applying the analytic-synthetic method achieved better results during third measurement, with the correct illustration being selected in 89.3% of the cases; while for the group of pupils studying with the genetic method showing a success rate of 82.9%. A significant change was observed in the comparison of the second measurement, where genetic method students were successful in 96.3% of cases, while analytic-synthetic method students were only successful in 76.7%.

If we correlate the last two mentioned characteristics with the third measurement, it is possible to prove, if a pupil who was reading while making mistakes was still able to understand the text or not. From this point of view, both groups of pupils, the analytic-synthetic method (87.5%) and the genetic method (80.0%), coped with their own reading mistakes [10].

As the authors' state: "We feel an obligation to prove these concluded outlines on a wider research sample. We do not dare to anticipate any conclusions. Based on the

experience we have gained so far, we can state that working with the modern technology of the eye tracker opens possibility to map a process of development of reading better and more precisely. The record of this course can be viewed repeatedly, and allow for the export of various data that quantitatively characterizes the pupils' reading performance and could complement essential qualitative analysis" [10].

VI. RESEARCH STUDY OF READING BY THE INSTITUTE OF PEDAGOGICAL AND PSYCHOLOGICAL COUNSELLING IN THE CZECH REPUBLIC

The Czech Republic has a long tradition of using diagnostic reading tools. This research investigated how the reading and writing skills of contemporary pupils differs from the normative performance of pupils in the 1980's (thus, if the diagnostic materials are still valid), and if differences exist in the development of pupils learning using the analytic-synthetic method or the genetic method, which are not common aspects of research for this topic [13].

Despite the fact that this study included newly implemented testing via above mentioned method of the eye tracker, the research by Wild (of over 2,000 pupils) can be considered as representative. That research focused on the comprehensive factors in developing reading and reading literacy. Part of the research involved monitoring the quality and quantity of reading (speed, error rate, technique and comprehension) in both used methods employed in this current study. The results revealed different reading development [14].

Contributing to this work are the project results of the Institute of Pedagogical and Psychological Counselling in the Czech Republic, which recorded the development of reading and writing using both educational methods employed in this study from the start for Grade One primary school students. The great advantage of this project was that the authors studied almost five hundred pupils Grade One students at selected schools from different parts of the Czech Republic. This study developed new diagnostic or assessment reading texts, where they assessed pupils studying in the Grade One at the end of first term and again at the end of the first term of Grade Two. Aside from the dynamics of reading and writing, the study monitored reading comprehension. Students of the Faculty of Psychology at Charles University in Prague participated in the data processing, analysis and interpretation of the results.

A total of 452 pupils enrolled in the research in the first year, which was represented by 329 pupils who were taught using the analytic-synthetic method and by 123 pupils who were taught by the genetic method. The ratio between boys and girls was balanced.

From the contribution of the previously mentioned research, we would like to list just the most interesting factor among all others—understanding of a read text, the pupil's ability to reproduce the read text. This is where the most significant differences between both groups appear. For the tested period, none of the students taught using the genetic method were found to read without understanding, while for students taught

using the analytic-synthetic method who were tested during the first half term of Grade Two, almost 5% read completely without understanding.

The authors state that the essence of the genetic method, where reading is linked with meaning, reading comprehension is developed from the very outset of learning to read, whereas in the analytic-synthetic method, it is important to first learn the technique – teaching syllables, followed by the subsequent transition to continuous reading. Only after mastering the technique we can a student develop reading comprehension.

They state in the research survey that the analytic-synthetic method and also genetic method guarantees in all monitored parameters a certain movement of improvement, and during the first year of schooling there are more or less significant differences between the methods, and therefore, in the half-term of the second year of this research the differences become smaller, although some characteristics of reading retain their specific value of interpretation according to a given method [13].

VII. SUMMARY AND CONCLUSION

Teachers of initial reading literacy should select practices from the elaborated methods (taught in our country or abroad), but not from templates. Teachers can adapt and develop their own method of effective procedures for teaching reading, relying on the results of surveys and research, and mainly focusing on the individual needs of pupils. The main aim of primary education for reading literacy complies with other states that are to develop the right conditions and a foundation to encourage pupils to read for fun, to be motivated, and to develop an interest in reading and self-education.

From the research results of the Institute of Pedagogical and Psychological Counselling, the analytic-synthetic method firstly involves mastering a technique, which is then followed by the phase of understanding (therefore errors and misunderstanding in the first phase of training was higher), while for the genetic method reading as it is taught, is connected with text comprehension from the beginning.

The research results of the study by the University of Ostrava also showed how pupils taught with the analytic-synthetic method (in terms of making errors and in terms of text comprehension, students recorded the worst results at the end of the first class at 76.7% , while students studying with the genetic method tested for the same period recorded 96.% reading and comprehension success), improved in the half-term of second class and surpassed the performance of pupils learning the genetic method.

Also in [15] focusing on a comparison of both methods of reading after first testing in the half-term of Grade One, a result has been reached (article - Reading Literacy and Methods of Improving Reading), that 96% of pupils taught with the genetic method read correctly with full comprehension, while in comparison, students taught with the analytic-synthetic method recorded only a 66 % success rate. This confirms the view of the research study of the institute [12], that since the genetic method is based simultaneously on training techniques and reading comprehension, for example,

as taught in Spain, the French community in Belgium, as well as in France.

Clear conclusions cannot be determined, on the contrary, it is necessary, as also mentioned researches, to continue in a longer-term study employing a wider sample of respondents. At the same time, it is necessary to realize that there are exceptions to the investigated methods for teaching reading, not only in our country, through various innovative principles, for example, the modified analytic-synthetic method or the “sfumato reading” technique, also known as “blended reading”. There are other factors that enter into the whole process of initial reading literacy which can interfere with a pupil’s reading ability (teacher, teaching method used, speed of educational process, textbooks, classroom structure, influence of family, parents, etc.).

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