Reading Comprehension and Context of the Digital Generation of Secondary Engineering Schools’ Pupils in the Czech Republic

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Abstract. Reading comprehension and reading context are in mutual interaction and influenced by several factors, particularly the level of reading literacy and the level of individuals’ reading strategies. Reading is part of communication applying the correct (de) coding of written information. An important factor in understanding the information is the set of knowledge and skills elements of a sociological, psychological, ethical and media nature. Language as a tool for the transmission of information and human thinking concurrently reflects the values of the individual and society. This study aims to characterise the level of reading strategies of secondary vocational school students in the Moravian-Silesian Region in connection with the findings of an international survey of reading literacy of 15-year-old students (PISA 2018), which pointed out that Czech students (especially boys) achieve a below-average level in analysed reading strategies. Fifteen-year-old pupils of the region are among the worst regional groups in the Czech Republic. The second goal of the research was to find out which factors influence the development of pupils’ reading literacy, during and after working with the (e)text, reading comprehension and the effectiveness of reading comfort. An analysis of the responses of 488 students of three secondary schools of engineering showed that students who read for knowledge prefer a particular topic when reading and that students who ask questions while reading or after reading a text also look for new information to discover a context of information. Another important finding was that reading comfort and reading context are in mutual interaction. To develop an individual’s language culture, it is significant to support reading not only as a part of school duties but as an integral part of everyday life.

Keywords: Pupils’ reading literacy · Reading context · Digital generation of pupils · Types of texts · Reading comprehension

1 Introduction

The reading context is developed by a diverse range of factors in interaction with the individual’s level of literacy and reading strategies. However, the use of transmitted code is essential for understanding the text. The comprehension is influenced by the
range of knowledge-based elements of sociological, psychological, ethical, media and general nature. Language is inextricably linked to human thinking and reflects the values of the individual and society. The implementation of the constructivist concept of teaching in the Czech Republic lags behind the development in European and other developed countries, which may be the cause of the decrease in the reading literacy of the current digital generation, including students of technical schools. Tompkins (2006), Sandberg and Norling (2020), Oakhill et al. (2014), Stuart and Stainthorp (2015), Hejsek (2015), Vicherková (2017, 2018). Several findings have been provided by international literacy surveys (PISA 2009, 2018) or Whitcroft (2018).

Applying the correct code in the text decoding as a condition for understanding requires not only language skills, communication and reading strategies, skills, competencies, but also the ability to use a range of knowledge-based elements based on a general overview and current context. A language is a crucial tool for creating and fixing personal values. The language sign is a stimulus to the thought process and the formation of connections between concepts and acoustic images. “Reading behaviour reflects the individual’s attitude to reading and written culture in general” (Najvarová 2008, p. 46). The first aim of the study is to characterise the level of reading strategies of in the Moravian-Silesian Region in connection with the findings of international literacy survey of 15-year-old students (PISA 2009, 2018) since Czech students (especially boys) achieve below-average levels in reading literacy. The second goal is to name factors influencing the development of reading literacy among Czech pupils of secondary vocational technical schools.

2 Key Factors in Literacy Development

Elements of cold communication manifest in today’s communication at school and the family. Rhetorical “beauty” disappears from family communication, the devaluation of messages in journalistic and artistic literary expression is escalating. The haste of passing on information points to the fact that in a regular expression, we prefer factual argumentation, speak in abbreviations, minimise utterances. Podgórecki (1999) points to a caution in the current trend of communication and reminds that “too ascetic form causes certain ossified, or scholastic language patterns, which frequently contribute to the “immobilisation” of content” (p. 78). Communication without personal interest is also reflected in reading. The emphasis on the semantic accuracy of the text disappears from the process of reading. Four fundamental factors in the development of reading were considered for the study: the language function, the role of text in education, the author’s communication intention, the text reception.

2.1 Language Function

Certain language functions apply to each speech act. Jakobson (1960) classified the functions of language into six intertwining categories (cognitive, poetic, emotional, conative, factual, metalanguage). People use symbolic signs reflecting the level of thinking of the participants in the communication. According to Doroszewski (1962, p. 67), “language reflects and interprets reality. Reflecting reality, as well as its
interpretation, is one of the cognitive and social functions of language because thinking is a social process.” In the text work, we also recognise a certain level of reading literacy and reading strategies in the reader. The degree of understanding is also a manifestation of the individual’s thinking. According to Podgórecký (1999, p. 171), it is the manifestation of the learners’ thinking that “communicative competence indicates the ability to communicate through language”. Reading strategies and reading skills are part of reading competencies, classified as components of communicative competencies. “The level of communication competence can be one of the sources of predicting a pupil’s success in school” (ibid., P. 176). Communicating effectively and functionally correct is also a prerequisite for success in everyday reality.

### 2.2 Text in Education

In school education, it is possible to encounter scholarly, but also other types of non-artistic or artistic texts. Apart from teaching the mother tongue, insufficient work is done with structured, journalistic, administrative texts and texts of a plain communication style. In literary education, students learn to understand artistic texts; reading is performed through work with excerpts of texts in reading-books rather than with texts of authentic authorial work. Paper text predominates, electronic forms occur in the form of specialised texts placed on school websites. At present (in March 2020), in connection with the COVID-19 pandemic, elements of inequality in education have emerged in the Czech Republic with the introduction of compulsory distance learning. Socially weaker families do not have technological equipment required for digital communication with schools.

Moreover, parents of children from socially disadvantaged backgrounds do not have enough education and a suitable level of professional and technical knowledge and skills to operate current information resources. Some teachers also experienced problems with electronic communication with students. Although it is clear from the results of the international reading literacy survey (PISA 2018) that Czech pupils have improved in the overall level of written information comprehension, compared to the results of the same international reading literacy survey (PISA 2009), there is a growing national need to develop reading comprehension in all age categories through lifelong learning. Fifteen-year-old Czech boys repeatedly remain on the border of average and below average in comparison with the international group of pupils. It creates a legitimate interest in examining the factors influencing the level of understanding of written information in secondary school students. Students’ experience with different types of texts in home, school and out-of-school environments encourages the need to lead students to acquire the skills to understand the information correctly in terms of content and form. It is also desirable to pay attention to non-text components affecting the quality of the information acquisition. It is necessary to strive for the enrichment of their cognitive area, development of emotions, attitudes, behaviours and the cultivation of interpersonal relationships.
2.3 Author’s Communicative Intention

The communicative intention, text cohesion and coherence form the basic properties of a comprehensible functional text. In today’s educational reality, there is a growing trend that students encounter not only traditional textbook texts, but also complex, both artificial and authentic, texts. Students also gain reading experience in working with encyclopaedic texts, tables, visualisations of information, e.g. graphs or maps. There are many authorial approaches in the classification of texts according to their didactic functions. The emphasis is laid on enriching teaching with experience from everyday texts. Educationally oriented information and everyday life correctly creates an inseparable pair. The educational reading experience should be based on the traditions, goals, needs and requirements arising from life in the society of the 21st century as well as the prognoses of the life of the coming generations. The student of the contemporary school should understand the essence of the explanatory text, the text containing organisational information, the illustrative text, the text with different fonts and the supplementary text.

2.4 Text Reception

The text reception can be understood as receiving and processing information from the text by implementing a three-phase model: perception, understanding, memorisation. According to Gavora (1992), the problem of the text understanding can be perceived as a psycholinguistic activity in which the phenomena of objective reality relate to the elements of the text that denote the given phenomena. It includes the importance of connecting words, sentences, supra-sentential forms and the connection of text elements with several parts of the recipient’s knowledge structure. In educational practice, it is necessary to strengthen the complex of analytical and synthetic activities at work at different levels of the text. The research focuses on the student’s reading strategies, i.e. how the student analyses the text and sorts the information, how can they reduce the text, etc. Following the International Reading Literacy Research (PISA) we are interested in three processes employed during the work with text for Czech pupils of secondary vocational schools of engineering, namely: information retrieval, information processing, information evaluation. Vicherková (2017, p. 61) in agreement with Hnilica (1992) emphasises the importance of “the work of two-dimensional representation of relations among key concepts in the stage of text summarisation”. Knowledge, skills, communication and other key competencies, reading experience, reading strategies, critical thinking, stimulating reading climate, assertiveness contribute to increasing the quality of text comprehension.

3 Researches on Teaching Strategies for Reading Comprehension

Hinchman’s (1987) research of the strategies used by teachers in teaching focused on the social side of textbook use, confirmed that the use of textbooks by the three teachers differed significantly. Teachers used textbooks as a primary source of information as
well as a complementary or activating teaching resource. The author classified the use of textbooks into three categories. Peacock and Cates (2000) found out that beginning teachers did not make adequate use of all textbook authors’ recommendations for exposure, fixation, and application of science to students. The author’s intention and potential of the teaching source were not presented in satisfactory quality and quantity. In line with Procházková’s (2006) opinion, it can be argued that the Reading Literacy and Project Teaching web portal presents interesting ideas for the development of pupils’ reading strategies based on educational practice. According to Průcha et al. (2009), the internal factors of literacy are directly related to the innate dispositions, signs, peculiarities of the individual’s nervous system, their personality potential, manifestations and experiences gained throughout the development of humankind. “Objective factors of literacy include those that emerge in an actor’s form from the social, cultural and economic context, i.e. from the environment of education in the family, school, but also from the social context” (Vicherková, 2017, p. 51). Working with textbooks and contact with different types of texts also belong to the external factors influencing the level of students’ and learners’ reading strategies across age. The key to the development of reading strategies is “regular, thought-rich interaction and activating work with the text in school teaching, in the home and out-of-school environment” (Vicherková, 2017, p. 54).

4 Research

A questionnaire survey on a group of pupils from three secondary schools studying engineering in the Moravian-Silesian Region of the Czech Republic was carried out from September 2019 to January 2020. Data were obtained from 488 respondents, mostly boys (467, 95.7% of the total number of students in the 1st to 4th year of engineering studies). The structured questionnaire contained 21 items focused on reading literacy and reading strategies in the teaching of engineering subjects and on students’ motivation to study at this type of school. Items providing the possibility to find out whether the differences in the above variables were caused by the differences between paper form or in digital form were selected for the analysis.

Test tasks designed by students themselves, e.g. tasks to find relationships in the image (e.g. gear and hoist), multiple-choice tasks, tasks based on interactive video recordings, quiz sets, tasks with one correct answer to questions about the vocational text of an engineering company, Speak the Words Set, tasks based on summarising, tasks on a timeline for recording chronologically divided events (e.g. description on how to build a closet), working with aphorisms and creating a newspaper headline, identifying the meaning of a message, finding relationships in a text, tasks for a final recapitulation of communication, working with error, jigsaw puzzle, pair reading with reporter and interrogator roles, organising tasks and also selected methods of critical thinking (e.g. five-leaf clover, bingo, diamond, true/false, save the last word for me, etc.) are included among the research methods that contributed to the evaluation of the concept of “understanding” the text.
4.1 Research Aims

The first aim of the research was to characterise the level of reading strategies of pupils of secondary vocational mechanical schools in the Moravian-Silesian Region and to name the factors influencing their development. The second objective was to identify the priorities of selecting topics in reading for cognition, types of reading strategies and activities with an impact on the quality of text comprehension, pupils’ motives developing thinking about a technical problem and ways of acquiring knowledge by reading for cognition.

The research problem was decomposed into the following research questions:

1. Do students prefer a particular topic for (e)reading?
2. Is there a connection between the student asking questions during reading and after reading the text and the student’s search for context about the information from the text?
3. To what extent does the teaching of vocational subjects encourages thinking about a technical problem towards the search for context about the information from the text (also in connection with the digital context) influence pupils?
4. Is there a connection between the student’s acquisition of knowledge from vocational subjects in the form of self-study and their ability to create their own structure of the text(s)?
5. To what extent does the ownership of a home library affect the pupil’s preference for reading?
6. Is there a connection between the pupil’s reading and their assessment of the importance of working with the text for everyday experience?

Orientation in the issue, research goals and research questions led to the formulation of a total of six research hypotheses, which are presented simultaneously with the results of their statistical verification in the next chapter.

4.2 Descriptive Research Data

Descriptive data further characterise the reading status of individuals in the research sample. The survey in the field of expressing a personal relationship to books and reading showed that 272 (i.e. 56%) respondents read for knowledge, 270 (i.e. 55%) respondents read more than three books in the previous calendar year, 127 (i.e. 26%) discusses the read text(s) with another person at school, at home. In the field of reading procedures, reading strategies) it was found that 196 (i.e. 40%) respondents require a teacher’s interpretation to understand the text, 360 (i.e. 74%) pupils prefer a particular topic when reading the text, 134 (i.e. 27%) of the respondents create auxiliary questions during (e)reading, or after reading the (e)text, 310 (i.e. 64%) pupils look for connections about the read information. As for the third research area concerning reading at school, 266 (i.e. 54%) respondents read books only from school duties, and 307 (i.e. 63%) pupils read and analyse a text only in their mother tongue.
4.3 Relational Research Results

Six hypotheses were verified using Pearson’s chi-square. The source data and the corresponding statistical results are given in the following tables.

Pupils answered question A2 (reading for knowledge) and question B2 (preference of certain topic) in the questionnaire.

**Table 1.** H1 hypothesis testing result (contingency table)

| Question A2/B2 | Yes  | No   | Line totals |
|----------------|------|------|-------------|
| Yes            | 172  | 43   | 215         |
| No             | 188  | 85   | 273         |

Pearson’s chi-squared = 7,707798 degree of freedom = 1 significance p = 0,005498

**Hypothesis H1** stating that students who read for knowledge prefer the topic more frequently than students who do not read for knowledge has been verified (Table 1). There is a statistically significant relationship between the cognitive purpose of reading and pupils’ preference of the topic of reading.

Pupils answered the question B5 in the questionnaire (ancillary questions while reading and after reading) and the question B6 (searching for context of the information).

**Table 2.** H2 hypothesis testing result (contingency table)

| Question B5/B6 | Yes  | No   | Line totals |
|----------------|------|------|-------------|
| Yes            | 126  | 56   | 182         |
| No             | 184  | 122  | 306         |

Pearson’s chi-squared = 4,078670 degree of freedom = 1 significance p = 0,043428

**Hypothesis H2** stating that pupils who ask ancillary questions, look for the context of the information more frequently than pupils who ask helpful questions, has been verified (Table 2). A significant relationship was found between the parallel cognitive activities accompanying reading and the search for thematically related information.

Pupils answered question C5 in the questionnaire (whether they are helped by teaching activities to understand and memorise the text) and question C4 (consideration of working with text at school to be important for their everyday experience).
Hypothesis **H3** stating that students whom teaching activities help to understand and remember the text, consider working with the text as important for everyday experience more frequently than students who are not helped by teaching activities to understand and remember the text has been verified (Table 3). The implementation of auxiliary activities to understand the text is thus related to the pupils’ perception of the importance of working with the text at school.

Pupils answered question B4 in the questionnaire (creating the structure of the text) and question B5 (ancillary questions while reading and after reading).

**Table 3.** H3 hypothesis testing result (contingency table)

| Question C5/C4 | Yes       | No        | Line totals |
|----------------|-----------|-----------|-------------|
| Yes            | 167 (137,05) | 153 (182,95) | 320         |
| No             | 42 (71,95)   | 126 (96,05)   | 168         |
| Column totals  | 209        | 279       | 488         |

QC5 – helped by teaching activities to understand and memorise the text, QC4 – working with text at school to be important for everyday experience.

Hypothesis **H4** stating that “students who create the structure of the text ask ancillary questions more frequently while reading or after reading the text than students who do not create the structure of the text” has not been verified (Table 4). No connection was found between structuring the text and asking ancillary questions in the perception of the text. This somewhat surprising finding will require further analysis.

Pupils answered question Q27 in the questionnaire (vocational subject teacher’ guidance to think about a technical problem) and question B6 (looking for the context of the information).

**Table 4.** H4 hypothesis testing result (contingency table)

| Question B4/B5 | Yes       | No        | Line totals |
|----------------|-----------|-----------|-------------|
| Yes            | 58 (49,98) | 76 (84,02) | 134         |
| No             | 124 (132,02) | 230 (221,98) | 354         |
| Column totals  | 182        | 306       | 488         |

QB4 – creating the structure of the text, QB5 – asking ancillary questions while reading or after reading the text.
Hypothesis H5 stating that “pupils who have stated that vocational teachers guide them to think about a technical problem seek connections about the information more frequently than pupils who have stated that vocational teachers do not guide them to think about a technical problem” has not been verified (Table 5). It would mean that teachers are not the factor that triggers students’ curiosity and subsequent search for the context of the information. It may be the content of the text itself or other individual factors, including the pupil’s internal motivation and interest in the subject or field of study.

Pupils answered question Q25 in the questionnaire (acquiring knowledge from vocational subjects) and question B4 (creating the structure of the text).

Hypothesis H6 stating that “pupils who acquire knowledge from vocational subjects rather than through self-study create the structure of the read text more frequently than pupils who do not acquire knowledge from vocational subjects rather than through self-study” has not been verified (Table 6). It can thus be stated that the structuring of the text by pupils, if it occurs, is not tied to the autodidactic or hetedrodiactic way of acquiring knowledge and can thus take place in both forms.

5 Discussion and Conclusion

The results demonstrate the current state of reading strategies of secondary vocational schools of engineering students in the Moravian-Silesian Region of the Czech Republic. Actors influencing the level of understanding the information (e.g. teaching

| Table 5. H5 hypothesis testing result (contingency table) |
|--------------------------------------------------------|
| Pearson’s chi-squared = 0,086666 degree of freedom = 1 |
| significance p = 0,768459                              |
| Question 27/B6 | Yes | No |
|----------------|-----|----|
| Yes            | 249 (247,75) | 141 (142,25) |
| No             | 61 (62,25) | 37 (35,75) |
| Column totals  | 310 | 178 |
| Q27 – teachers’ guidance to think about the technical problem, QB6 – looking for context of the information. |

| Table 6. H6 hypothesis testing result (contingency table) |
|--------------------------------------------------------|
| Pearson’s chi-squared = 0,331336 degree of freedom = 1 |
| significance p = 0,564874                              |
| Question 25/B4 | Yes | No |
|----------------|-----|----|
| Yes            | 41 (43,66) | 118 (115,34) |
| No             | 93 (90,34) | 236 (238,66) |
| Column totals  | 134 | 354 |
| Q25 – acquiring knowledge from vocational subjects, QB4 – creating the structure of the text. |

5 Discussion and Conclusion

The results demonstrate the current state of reading strategies of secondary vocational schools of engineering students in the Moravian-Silesian Region of the Czech Republic. Actors influencing the level of understanding the information (e.g. teaching
strategies and learning strategies of teachers, pupils’ reading strategies, emphasis on the student: understanding the meaning of individual words, understanding the meaning of the whole text, understanding the meaning of parts of the text, understanding the meaning of parts of the text and the whole text, understanding the content and form of the text) were identified. The research supported the need to work with texts for everyday experience, create pupils’ home libraries, develop their critical and technical thinking. It also emphasised the development of pupils’ metamotivation and metacognition to reading comprehension and strategic thinking. The sample of Czech pupils uses identical or related reading strategies when working with both paper and digital text forms.

The research has shown a statistically significant relationship: between the student’s reading for cognition and the preference of a specific topic, between the student’s ancillary questions when reading or after reading the text and the their search for context about the information, as well as between students’ reading strategy and their evaluation of working with the text for everyday experience. The research has not shown a statistically significant relationship between the pupil’s ability to create the structure of the text and asking questions while reading and after reading the text, between teachers of vocational subjects’ guidance to think about a technical problem and the pupil’s search for connections about the information. The relationship between the pupil’s acquisition of knowledge from vocational subjects rather than by self-study and their use of ancillary questions while reading and after reading the text has not been confirmed as well. Other researches have dealt with reading literacy or reading strategies of primary school pupils (Sandberg and Norling 2020 and Genlott and Grönlund 2013) and lower-secondary school pupils (Sieglóvá 2017). According to Oakhill et al. (2014, p. 4) “The ultimate aim of reading is not the process but to understand what we read and comprehension can take place at many different levels”. Research (Trávníček 2017) has dealt with the problem of reading and media literacy through the lens of four reading generations of contemporary Czech society. The curriculum of Czech secondary school studies should aim to strengthen the links between technical studies and everyday reality, the need to understand texts, respond to dynamically changing reading needs and interests with regards to the requirements of the emerging digital generation. The professional competencies of secondary vocational schools of engineering graduates should be based on the interest of learners in the technical profession, digital technologies, processes of automation and robotisation, digitisation reading comfort, communication and reading rationality, strategy and interest in lifelong learning.

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