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ELEMENTARY AND NATURAL SCIENCE TEACHERS' ONLINE READING METACOGNITION

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Abstract. *A new generation of students should learn from e-materials on tablets, notebooks and smart phones. This consequently means that teachers must be competent to teach new literacies, needed for reading/learning from PDF texts, hypertexts and/or World Wide Web. The presented research investigated future teachers' metacognitive awareness in the process of reading online texts. The sample of 53 2nd year students at the university study program Elementary education and 28 students of natural science and mathematics, pedagogical study, was tested with the OSORS, method for measuring three types of online metacognitive awareness: general reading metacognition, problem-solving reading metacognition and support reading strategies. The results give an insight into future teachers' online metacognitive skills and guide toward conclusions concerning further investigation in the field of new literacies didactics.*

Key words: *reading metacognition, linear text reading metacognition, online metacognition, informative and explicatory text online reading metacognition.*

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Introduction

For more than two decades, researchers have called for our attention towards the fact that besides *new abilities and competences* the educational system should focus on the changed reading competencies, needed for finding and processing the information and knowledge, accessible in the new media in the age of information (Aberšek, 2014). They point out the importance of identifying the information-seeking and reading strategies that we use while reading on the Internet to better inform both research and practice and develop them in the education process (Alexander, Jetton, 2000; Leu, 2002).

The new research in reading comprehension has pointed out the role of metacognitive awareness and motivation while reading (Alexander, Jetton, 2000; Guthrie, Wigfield, 1999; Pressley, 2000). Researchers agree that awareness and monitoring of one's comprehension process are critically important aspects of skilled reading and learning. Especially important is such understanding of one's own comprehension process while reading for elementary teachers, since in the educational system they seem to be responsible for developing reading skills in the population. If a teacher is not able to monitor, control and navigate his own comprehension and learning process while reading, if he does not understand, what is going on in his head, he will not be able to teach his students what to do to understand better (Bregant, 2010). And analogically – in the age of implementing e-reading material in the education system on all levels of the school system, also on an elementary level – he will not be able to guide the process of his students' online functional literacy. He will not be able to tell his students 'what to do' to understand and learn better, what he is reading in his e-textbook and how to understand, what he has found on the World Wide Web.

The term "metacognition" is most often associated with J. Flavell, (1979) and refers to higher order thinking which involves active control over the cog-

nitive processes engaged in learning. Activities how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature. According to Flavell (1979, 1987), metacognition consists of both metacognitive knowledge and metacognitive experiences or regulation. Metacognitive knowledge refers to acquired knowledge about cognitive processes, knowledge that can be used to control cognitive processes.

Short after the role of metacognition in cognitive processes has been established and the described research, investigating reading comprehension, noticed the importance of a metacognitive awareness in reading comprehension. It was perceived that expert readers use a range of strategic processes when comprehending text (Paris, Wasik, & Turner, 1991; Pressley & Afflerbach, 1995) such as previewing the text, setting goals, making predictions, monitoring understanding, asking questions, and interpreting text (Duke & Pearson, 2002; Pressley, 2000). Skilled readers also construct a range of diverse connections within and between texts (Hartman, 1995) while integrating textual clues with background knowledge to enhance comprehension (Garrison & Hynds, 1991).

Informational and Explicatory Text Reading Metacognition

Although reading researchers agree upon the fact that the above listed metacognitive strategies are important for processing all kinds of texts, further research revealed that they are more important in the process of comprehending the narrative text (Graesser, Golding, & Long, 1991) and they become insufficient when readers read informational text (Dreher, 2002). This can be explained with the circumstance, that both, informational and explicatory text, are distinctly different from narrative text in terms of structure and intent (Duke, 2000) and with the circumstance that educational system traditionally 'taught reading' on fictional texts and the fact that traditionally 'skilled reading' was understood as the competence of understanding metaphors and symbols in a poem or prose. Consequently, informational and explicatory text comprehension is still neglected in the school, since the teaching paradigm changes very slowly if it was not a part of the teacher's own school life.

Current research indicates that both children and adults have more difficulties reading informational text than reading narrative text (Biancarosa & Snow, 2004). This is why it is important to pay closer attention to (meta) cognitive processes while reading explicatory and informational texts.

Cognitive processes in reading explicatory and informational texts have been identified and described. The key elements, important to explicatory and informational text comprehension processes are prior-knowledge, inferential reasoning and affective variables related to efficacy and motivation. During the process of reading explicatory and informational text a skilled reader activates two groups of prior-knowledge to construct meaning: prior-knowledge of the topic (Alexander, Kulikowich, & Schulze, 1994) and prior-knowledge of text structure (Englert & Hiebert, 1984). Inferential reasoning, the ability to read between the lines while making connections not explicitly stated in the text, is considered as a central component of skilled reading (Garnham & Oakhill, 1996). Early reading research has proved, that to facilitate their comprehension of informational and explicatory text readers with sufficient prior-knowledge make many more inferences than readers with insufficient knowledge (Kintsch & Vipond, 1979; Voss, Vesonder, & Spilich, 1980).

Online Reading Metacognition

In the age of promoting e-learning reading materials in e-learning environments' as computers, tabs, mobile phones, a key question of functional reading didactics is: *"Are metacognitive skills for reading explicatory and informational text universal and can be declared as sufficient also for online explicatory and informational reading?"* If the answer is no, the next question should be: "Which are the metacognitive strategies that must be taught in the age of analog information and knowledge transfer?" Well, the opinions are divided. Some researchers say offline/linear text metacognitive reading strategies could be sufficient, while others point out they are necessary, but not sufficient for reading hypertexts and texts available on the World Wide Web. Actually, they even emphasize, there is a difference between reading hypertext and text on the World Wide Web. For reading hypertexts (as usually used in e-textbooks) and for reading internet texts skilled readers use two sets of different metacognitive approaches.

Usually hypertext is an information system in which the contents are organized in an interrelated network with nodes and links (Salmeron, 2005). There is a remarkable difference between linear text and hypertext concerning the metacognitive reading processes. In a linear text a set of coherent arguments throughout the text are maintained. On the global level paragraphs and sections flow from one to the other in a coherent manner. The

reader can add the information in the text in to the scheme he had created while reading previous information in the text. Typical for a hypertext is the open possibility for the reader to jump from any text section to a variety of other sections. Jumps, which are not coherent, result in additional processing load for the reader (DeStefano, 2005), as the reader must generate the necessary inferences to incorporate the textual information from the new node into what has been previously read and into what he already knows from his background knowledge. A variety of possible links in a hypertext (may) cause difficulty in the reader's comprehension (Foltz, 1996) and the reader could get lost in the text. To avoid such lack of comprehension and to maintain the understanding the coherence of the text a student must be able to use the navigation tools the hypertext is offering, such as map and node titles which signal the structure of the text. These signals serve in the hypertext/e-textbook as guides for locating additional nods that would flow coherently with the previously read nodes. Therefore, to use hypertext structured e-textbook successfully, a student must develop a set of rules and then choose, which rules to use for different situations. Doing so, the student will have a set of possible actions for navigating through the text and a set of search methods for finding the most effective paths through the text.

Getting information from World Wide Web and learning from it underlies different laws, because information/learning environments differ in many ways. The internet is an open, networked system, in contrast to a closed hypertext environment, which is typically a static system with one organizational structure; users typically enter the system from the same starting point. According to the rule, a hypertext system does not contain outside advertisements, links that change from one day to the next. Internet texts are part of a complex open-ended information system that changes daily in structure, form and content. Readers may enter at any point of an Internet text and have access to an endless amount of information.

Cognitive strategies used on the Internet have been carefully explored. Hill and Hannafin (1997) found that metacognitive strategies, prior-knowledge of subject and Internet text systems, and perceived self-efficacy influenced adult learners' ability to interact with an Internet text. Further Coiro and Dobler (2007) explored the reading comprehension strategies of skilled sixth-grade readers when they were using Internet search engines and informational websites. They focused on three aspects of comprehension (locating, evaluating, and synthesizing), which seemed important from new literacies perspective (Leu et al., 2004). To explore these issues, they conducted a qualitative study of reading strategies for reading on WWW. They were guided by two related questions: what characterizes the reading process as skilled readers search for information on the Internet and what forms the choices skilled readers make while reading for information on the Internet? They found out that skilled internet readers use conventional (meta) cognitive strategies and additional (meta) cognitive strategies, which they have specially developed for searching information and learning from World Wide Web. According to their results, skilled Internet readers are using, beside their prior-knowledge in the conventional meaning of the word, also the prior-knowledge of informational website structures and prior-knowledge of Web based search engines. In the frame of inferential reasoning strategies, skilled Internet readers/learners are using conventional types of inferential reasoning applied to printed text, a process of the forward inferential reasoning and a process of the multi-layered inferential reading. In the frame of metacognitive or (as they named them) self-regulated reading processes Coiro and Dobler (2007) observed also specific complexities of seeking processes on the Internet. This set of self-regulatory cognitive reading processes (planning, predicting, monitoring, and evaluating) was combined with an associated set of physical reading actions unique to electronic reading environments (typing, clicking, scrolling, and dragging). These physical reading actions introduced new technical reading skills required to navigate open information sources on the Internet above and beyond those required to navigate within the pages of a printed book.

To sum up, skilled readers of online texts (in hypertext or on the internet) dynamically combine general (meta) cognitive reading strategies, which raise comprehension of both types of text, linear and online. They use pre-knowledge, inferential cognitive processes and metacognitive reading skills for finding information and to comprehend information. And they use specific navigating strategies as they read on the Internet. Among the skilled readers on the Internet each click within a search engine reading context required readers to cycle through this multifaceted, complex comprehension process.

The aim of the study was to acquire concrete arguments for listing Online reading didactics into the curriculum for teachers of natural science. To prove that teachers need declarative knowledge about reading, because such knowledge encourages readers/learners metacognitive awareness and is the prerequisite for teachers' competence to teach their students to read online and comprehend the online informational and explicatory text effectively. The goal of the study was to measure, which type of online metacognitive strategies do students of different study programs use more often, and which do they use only rarely. And finally: to compare the frequency in using global,

problem solving and support online reading strategies among those students, who attended the subject Reading – and have got metacognitive knowledge –, and those, who did not listen to the subject Reading.

Based on the theoretical background and the main research goals the following presented research questions were defined:

- which metacognitive strategies use future teachers while reading informative and/or explicatory texts online?
- which group of metacognitive strategies are they using more often when they are reading online informational and/or explicatory text: global reading strategies, problem solving reading strategies or support reading strategies?
- do future elementary teachers use metacognitive reading strategies more often than future natural science and mathematics teachers?

Methodology of Research

General Background of Research

To evaluate and compare future teachers' metacognitive awareness while reading online informative and/or explicatory text, two groups of students in pedagogical study programmes were chosen. In March of the summer semester of the 2013/2015 study year the questionnaire – an instrument for measuring online metacognitive awareness – was handed out. In this instrument metacognitive strategies were listed. The students had 45 minutes to read each item in the instrument and to decide, whether they use a particular strategy, how often they use the described strategy or if they do not use it at all.

Data Collection Instrument

Students' online metacognitive awareness of reading strategies was measured by using The Survey of Reading Strategies (SORS) developed by Sheorey & Mohktari (2001) and adapted for measuring and self-evaluation of readers' online metacognition by Amer & Al Barwani (2010). Authors named the revised survey tool the Online Survey of Reading Strategies (OSORS). The adapted survey OSORS consists of 34 items, while original SORS consisted of 30 items oriented towards identification of three types of metacognitive strategies students are using while reading explicatory text. The instrument divides *Global reading strategies, Problem-solving strategies* and *Support strategies*. Global strategies are those metacognitive strategies, which are intentional and carefully planned by the reader to monitor and evaluate their reading comprehension (having a purpose in mind while reading, taking an overall view of the text to see what it is about before reading it, reviewing the text first by noting its characteristics like length and organization, using tables, figures, and pictures in the text to increase understanding, using context clues, using typographical features like bold face and italics to identify key information, critically analysing and evaluating the information presented in the text). *Problem-solving strategies* are, according to the survey, the actions, readers employ while they are working directly on the text, especially when the text becomes difficult, like reading slowly and carefully to increase comprehension, deciding what to read closely and what to ignore, stopping from time to time and thinking about what was read, trying to visualize information to help remember what was read, guessing the meaning of unknown words or phrases. *Support strategies* are, according to the survey, what readers use to aid comprehension, such as taking notes while reading, reading aloud when the text gets difficult, using reference materials (a dictionary), paraphrasing ideas in readers' own words, asking before reading, translating from English into the native language. OSORS used the same 30 items with the difference that they were adopted for online reading with the phrase "online" each time a reading task was referred to. The second adoption from SORS to OSORS was the addition of four items that measure cognitive reading strategies:

- three global strategies (*scanning the online text to get the basic idea of whether it will serve the purposes before deciding to read it* (29), *critically evaluating the online text before choosing to use its information* (30) and *looking for sites that cover both sides of an issue* (32) and
- one problem-solving strategy (*distinguishing between fact and opinion in the online text* (31).

This four support strategies were a necessary change in the shift from investigating offline metacognitive strategies to online metacognitive strategies, since the World Wide Web offers an overload of information sources and overload of information. It is vital for the reader to possess strategies and criteria for decision making in the process: what to skim or, what to read to the end and when to stop reading and jump to the next site.

The third adoption was modifying two support strategies while reading online (*I print out a hard copy of the online text. Then I underline or circle the information to help me remember it*, and *I go back and forth (mouse) in the online text to find relationships among ideas in it*.), which was necessary, according to the online reading situation.

One metacognitive strategy (*when online text becomes difficult, I pay closer attention to what I am reading*) was transferred from the GLOB subscale to PROB subscale. It is the consequence of rethinking of the aim of this strategy: a reader uses it, when he notices problems in his comprehension of the text.

Participants and Sample Selection

Two groups of students participated in the research: 53 4th semester students of the university study program Elementary education at the Faculty of Education (EE group) and 28 4th and 6th semester students of pedagogical natural science and mathematics study programs at the Faculty for Natural Science and Mathematics (NSM group), both at the University of Maribor, Slovenia. The explanation for the circumstance that the half of the sample from the natural science students were one year longer in the study program than the other half of the sample and that consequently the sample from Faculty for Natural Science and Mathematics were older than the sample from Faculty of Education is the fact that the number of matriculated students in pedagogical natural science programs is very low. The students from 2nd and 3rd year of natural science study programs were chosen, to get a minimal standard sample.

Context of the Research

The students of Elementary education were selected, because they participated in the 1st semester of their study programme the course Reading, where they were taught decisive factors, which influence reading comprehension, about reading metacognition, levels of reading comprehension and metacognitive strategies a reader can use to reach better comprehension. They have passed the exam and confirmed their knowledge of reading after the 1st semester. After that they had the opportunity to transfer this knowledge into their study strategies while using it for their study/learning after 2nd and 3rd semester. The opposite study programs for future natural science and mathematics teachers do not offer knowledge about reading, so these students revealed and developed their metacognitive strategies, including online metacognitive reading strategies, as self-learners/intuitively. This difference between the curricula of their study programmes gave us the opportunity to verify and prove the necessity for the study subject Reading in the curricula of teaching programmes.

The instrument, OSORS survey, was handed out and participants were instructed to choose the answer on the Likert scale.

Data Analysis

Quantitative data of elementary education students and natural science and mathematics students were collected, reviewed and rated by a group of experts in the department of elementary education. Quantitative data collected was analysed according to the following phases, or by: encoding, defining and organizing the data and interpreting the results. For statistic processing of the data an IBM SPSS programme was used. For the basic statistic interpretation of the results mean and standard deviation values of the data were used. Statistically relevant differences were acquired by using the Mann-Whitney test.

Results of Research

The participants' use of online global metacognitive reading strategies is presented in Table 1.

Table 1. Mean scores and Mann-Whitney test for elementary education students (EE) and natural science and mathematics students (NSM) perceived use of online Global metacognitive strategies.

Global Strategies	Group	N	Mean	SD	Mann-Whitney U	Mann-Whitney p
I have a purpose in mind when I read online.	NSM	28	2.75	1.04	565.5	0.067
	EE	53	3.22	1.04		
I think about what I know to help me understand what I read online.	NSM	28	3.42	0.99	573.5	0.075
	EE	53	3.81	0.83		
I take an overall view of the online text to see what it is about before reading it.	NSM	28	4.14	0.80	690.0	0.582
	EE	53	4.01	0.88		
I think about whether the content of the online text fits my reading purpose.	NSM	28	3.89	0.87	628.5	0.239
	EE	53	3.62	1.00		
I review the online text first by noting its characteristics like length and organization.	NSM	28	4.07	0.89	733.5	0.929
	EE	53	4.07	0.93		
When reading online, I decide what to read closely and what to ignore.	NSM	28	3.78	1.06	637.5	0.268
	EE	53	3.58	0.84		
When online text becomes difficult, I pay closer attention to what I am reading.	NSM	28	3.85	0.97	700.0	0.660
	EE	53	3.96	0.83		
I use tables, figures, and pictures in online text to increase my understanding.	NSM	28	2.96	1.23	730.0	0.902
	EE	53	2.90	1.04		
I use context clues to help me better understand what I am reading online.	NSM	28	3.28	1.01	655.5	0.364
	EE	53	3.50	0.97		
I use typographical features like bold face and italics to identify key information.	NSM	28	3.53	1.13	613.0	0.176
	EE	53	3.92	0.87		
I critically analyse and evaluate the information presented in the online text.	NSM	28	3.07	0.89	544.0	0.036
	EE	53	3.52	0.79		
When reading online I check my understanding when I come across new information.	NSM	28	3.28	0.89	562.5	0.055
	EE	53	3.64	0.85		
I try to guess what the content of the online text is about when I read.	NSM	28	2.60	0.95	409.0	0.001
	EE	53	3.43	0.93		
I check to see if my guesses about the online text are right or wrong.	NSM	28	3.07	1.05	603.0	0.147
	EE	53	3.39	0.88		
I scan the online text to get the basic idea of whether it will serve my purposes before deciding to read it.	NSM	28	3.89	1.19	490.0	0.010
	EE	53	3.20	1.19		
I critically evaluate the online text before choosing to use its information.	NSM	28	2.96	1.13	690.5	0.594
	EE	53	3.09	1.04		
When reading online, I look for sites that cover both sides of an issue.	NSM	28	3.82	1.09	734.5	0.936
	EE	53	3.92	0.82		

As seen from Table 1, elementary education students (EE) use global strategies more often than natural science and mathematics students (NSM). According to the Mann-Whitney test, in the majority of global strategies there is no statistically relevant difference between the groups. There is, however a statistically relevant difference between the groups in three global strategies:

- *I critically analyse and evaluate the information presented in the online text*, (p=0.036);
- *I try to guess what the content of the online text is about when I read*, (p=0.001);
- *I scan the online text to get the basic idea of whether it will serve my purposes before deciding to read it*, (p=0.010);

In these rates the two-tailed sig. value was less than 0.05, which is sufficient to claim that this difference applies for the whole population. From the Mann-Whitney test it is also evident that it is possible that there is a statistically relevant difference also between global strategies:

- *I have a purpose in mind when I read online*, (p=0.067);
- *I think about what I know to help me understand what I read online*, (p=0.075);
- W*hen reading online I check my understanding when I come across new information*, (p=0.055);

Table 2. Mean scores and Mann-Whitney test for elementary education students (EE) and natural science and mathematics students (NSM) perceived use of online Problem-solving metacognitive strategies.

Problem – solving metacognitive strategies	Group	N	Mean	SD	Mann-Whitney U	Mann-Whitney p
I read slowly and carefully to make sure I understand what I am reading online.	NSM	28	3.07	1.01	501.5	0.012
	EE	53	3.67	0.91		
I try to get back on track when I lose concentration.	NSM	28	3.82	1.02	617.5	0.190
	EE	53	4.11	0.93		
I adjust my reading speed according to what I am reading online.	NSM	28	3.46	1.07	678.5	0.500
	EE	53	3.67	0.91		
I stop from time to time and think about what I am reading online.	NSM	28	3.14	1.14	628.5	0.231
	EE	53	3.56	0.82		
I try to picture or visualize information to help remember what I read online.	NSM	28	3.60	0.95	622.0	0.210
	EE	53	3.88	0.91		
When online text becomes difficult, I re-read it to increase my understanding.	NSM	28	3.67	1.09	595.0	0.110
	EE	53	4.07	0.70		
When I read online, I guess the meaning of unknown words or phrases.	NSM	28	3.92	0.81	718.0	0.800
	EE	53	3.88	0.89		
I can distinguish between fact and opinion in the online text.	NSM	28	3.71	0.97	686.5	0.539
	EE	53	3.86	0.78		

As is evident from Table 2, elementary education students (EE) the same as with global strategies, also more often use problem solving strategies.

According to the Mann-Whitney test, in most problem-solving strategies there is no statistically relevant difference. There is, however a statistically relevant difference between the groups in the strategy: *I read slowly and carefully to make sure I understand what I am reading online*, (p=0. 012).

Table 3. Mean scores and Mann-Whitney test for elementary education students (EE) and natural science and mathematics students (NSM) perceived use of online Support metacognitive strategies.

Support metacognitive strategies	Group	N	Mean	SD	Mann-Whitney U	Mann-Whitney p
I take notes while reading online to help me understand what I read.	NSM	28	2.32	0.90	685.000	0.556
	EE	53	2.49	1.12		
When online text becomes difficult, I read aloud to help me understand what I read.	NSM	28	2.35	1.09	588.500	0.117
	EE	53	2.83	1.28		

Support metacognitive strategies	Group	N	Mean	SD	Mann-Whitney U	Mann-Whitney p
I print out a hard copy of the online text. Then I underline or circle the information to help me remember it.	NSM	28	2.64	1.16	543.000	0.041
	EE	53	3.18	1.11		
I use reference materials (a dictionary) to help me understand what I read online.	NSM	28	3.10	0.95	659.500	0.388
	EE	53	3.39	0.98		
I paraphrase (restate ideas in my own words) to better understand what I read online.	NSM	28	2.89	1.25	718.500	0.810
	EE	53	2.98	1.18		
I go back and forth in the online text to find relationships among ideas in it.	NSM	28	3.17	0.90	703.000	0.680
	EE	53	3.30	0.88		
I ask myself questions I like to have answered in the online text.	NSM	28	3.60	0.87	740.500	0.987
	EE	53	3.64	0.90		
When reading online, I translate from English into my native language.	NSM	28	3.85	1.38	724.000	0.849
	EE	53	3.96	1.22		
When reading online, I think about information in both English and my mother tongue.	NSM	28	2.96	1.34	570.000	0.077
	EE	53	3.52	1.11		

As is evident from Table 3, elementary education students (EE) the same as with global strategies, also more often use support metacognitive strategies.

According to the Mann-Whitney test, in most support metacognitive strategies there is no statistically relevant difference. There is, however a statistically relevant difference between the groups in the strategy: *I print out a hard copy of the online text. Then I underline or circle the information to help me remember it*, (p=0.041).

Discussion

The interpretation of statistical results, calculated on collected data on using online metacognitive strategies and the comparison of data between the two sample groups indicates that there is a tendency and also a statistically relevant difference between the groups. This difference is more noticeable in global online reading strategies, and it can also be seen in support metacognitive strategies and problem-solving strategies – strategies that are used, when the text becomes difficult.

All of this becomes even more visible if we use for interpretation of mean values the criteria, suggested by authors of the original survey (Mokhtari, Reichard, 2002). According to the guidelines for interpreting the results, reached with the use of the Likert five step scale, used in the instrument, scores of 2.4 or below demonstrate low strategy use, 2.5 to 3.4 show moderate strategy use, and 3.5 or above signify high strategy use.

The interpretation of the results in the group of global online reading strategies makes the 'positive trend' become even clearer and more promising. Statistical data show statistically relevant difference between the groups in three strategies and the tendency that statistically relevant difference could be in four strategies. A closer look of mean values of participants' perception of using their global online metacognitive strategies shows a high frequency in the EE group and a moderate frequency in a NSM group. EE students perceived 13 global online metacognitive strategies as very frequently used. NSM students perceived as very frequently used 8 of 17 global online metacognitive strategies. EE students expressed 4 global online metacognitive strategies as moderately frequently used NSM students expressed 9 global online metacognitive strategies as used moderately frequently. EE students expressed, that their most frequently used strategy is: *I review the online text first by noting its characteristics like length and organization*, NSM students expressed as most frequently used global online metacognitive strategy: *I take an overall view of the online text to see what it is about before reading it*. EE students selected strategy: *I use tables, figures, and pictures in online text to increase my understanding* as less frequently used. NSM students selected as less frequently used strategy: *I try to guess what the content of the online text is about when I read.*

Statistical data of using problem solving online reading metacognitive strategies show statistically relevant difference between the groups in one strategy. A closer look at the mean values of problem solving metacognitive

strategies and using Mokhtari, Reichard (2002) criteria in evaluating the results, shows following: both groups: EE students and NSM students expressed high frequency in using problem-solving online metacognitive strategies. EE students perceive all 8 problem-solving online metacognitive strategies as very frequently used. NSM students perceived as very frequently used 5 of 8 problem-solving online metacognitive strategies. They expressed 3 problem-solving online metacognitive strategies as used moderately frequently. EE students expressed, they use most frequently the strategy: *I try to get back on track when I lose concentration*. NSM students expressed as most frequently used problem-solving online metacognitive strategy: *When I read online, I guess the meaning of unknown words or phrases.* EE selected strategy: *I stop from time to time and think about what I am reading online* as less frequently used. NSM selected as less frequently used strategy: '*I read slowly and carefully to make sure I understand what I am reading online'.*

According to the statistics, presented in Table 3, which presents results on support online reading metacognitive strategies, there is also one strategy that shows statistically relevant difference between the elementary education students and natural science and mathematics students. Interpretation of mean values from the point of view of using Mokhtari, Reichard (2002) criteria, we noticed, that the participants' perception of their using support online metacognitive strategies shows a moderate frequency in both groups. EE students perceived 3 of suggested 9 support online metacognitive strategies as very frequently used. NSM students perceived as very frequently used 2 of 9 support online metacognitive strategies. EE students expressed 6 support online metacognitive strategies as moderately frequently used; NSM students expressed the same number of support online metacognitive strategies as used moderately frequently. The same group (NSM) expressed the frequency of strategy: *When online text becomes difficult, I read aloud to help me understand what I read* as low frequently used. EE students expressed, they use most frequently the strategy: *When reading online, I translate from English into my native language*; NSM students expressed the same strategy as most frequently used support online metacognitive strategy. EE selected strategy: *I take notes while reading online to help me understand what I read* as less frequently used support strategy: *I print out a hard copy of the online text. Then I underline or circle the information to help me remember it* was selected in both groups with moderate frequency.

The results of the presented study interpreted in this way also confirm the results of the previous research, where OSORS was used. The average of perceived use of online metacognitive reading strategies in our study is 3.48 – which is slightly higher, but still very similar to results Amer et. all. (2010) reached, when they measured online metacognitive reading strategies on the sample of students in the EFL study programme. Their sample scored 3.3 in the area of total online metacognitive reading strategies, reaching 3.4 in the area of Global online metacognition, 3.5 in the area of Problem–solving metacognition and 3.05 in the area support metacognitive strategies.

Conclusions

Results show a statistically relevant difference in the use of online reading metacognition between future Elementary education teachers and future pre-service natural science and mathematics teachers in five strategies and a slight positive trend in four strategies. Statistically relevant difference and the tendency between the groups can best be seen in global online reading strategies. A closer look of the results and the comparison of results – and using original criteria for interpretation of mean values η shows the importance of measured differences. The most noticeable difference between elementary education and natural science and mathematics students is in perceiving their use of problem solving online reading metacognitive strategies, those, which a reader can use, when the text becomes difficult and his comprehension starts to decrease. Being aware of such problem solving strategies, having knowledge of them and knowing, when to use them, is an important prerequisite for a teacher, when confronting the comprehension problems in his students' online reading situations.

In search of explanation, why the statistical data does not show a higher difference between teachers, who have knowledge in reading metacognition, and those, who have got online metacognition only through their experience with online texts, another close look at the results of both groups in our research could be helpful: Mean scores of all participants seem to be very high, 3.5, given as a dividing line between high and moderate use of metacognitive strategy. A very high number of results is in the area of highly used metacognitive strategies and the majority of results in the area of moderately used metacognitive strategies (2. 5 – 3. 4) is scored higher than 3.0. Only one strategy: *When online text becomes difficult I read aloud to help me understand, what I read*, was scored in a low frequency area. This happened in the present research as well as in Amar's research. So, it could be concluded, the results of the research give us a good insight in future teachers' online metacognitive skills,

but they guide us to the conclusions that further investigation is needed in the field of describing and measuring students' online reading metacognition, in the direction of separate observing hypertext reading metacognition and World Wide Web reading metacognition and consequently designing specialised surveys for observing each of them. Only such research could guide towards the didactics solutions oriented towards students online reading metacognition needed for learning from all kinds of e-materials that e-competent teachers are offering their students in current schools.

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