Development Of Student Text Comprehension And Language Semantics In Primary School

Maile Timm a, Krista Uibu b *

a Preschool of Kõrveküla, Lasteaia 4, Tartu County, 60512, Estonia
b University of Tartu, Salme 1a, Tartu 50103, Estonia

Abstract

Understanding the meaning of words is necessary to comprehend text. The aim of the longitudinal research was to study the extent to which changes occurred in student word recognition and text comprehension in primary school. Four hundred and sixty four students participated in the research and completed the test over three consecutive years. The study revealed the students who knew the meanings of the words better also had better text comprehension results. Also, differences were found between boys’ and girls’ results in reading. Girls outperformed boys over three years in more sophisticated text comprehension and vocabulary knowledge tasks as well as previously studied words. To support boys’ vocabulary and text comprehension skills it is essential to consider their developmental characteristics.

Keywords: word recognition; text comprehension; gender differences; longitudinal research

1. Introduction

Text comprehension is a cognitive process (Cain, Oakhill, & Bryant, 2004), which comprises the process of coding words for text comprehension (Kabilan, Seng & Kee, 2010). Text comprehension is related to semantics (Häkkinen, 2007), which may cause problems for many students due to different factors – how complicated the text is and their distractibility. New words may not become fixed in the learner’s the memory and their meaning might be
incomprehensible. Earlier text comprehension and word recognition research has shown that students have difficulties understanding age-specific texts and word semantics (Cain et al., 2004; Häkkinen, 2007; Puksand, Henno, & Lepman, 2010). There are only a few longitudinal studies of student word recognition and its relation to text comprehension in primary school. The aim of the present study was to study longitudinal changes in student word recognition and their relation to text comprehension in the Estonian primary school.

1.1. Acquisition of word recognition and text comprehension at primary school

Different language acquisition theories emphasize vocabulary development in primary grades (Mayberry, 1993; Meisel, 2008; Saxton, 2010). In terms of word recognition level, students have to analyze every word letter by letter, because every letter is a separate unit and all of them together constitute meaningful words (Schroeder, 2011). By analyzing new words, the meaning of the word is fixed in the memory and transferred from short term memory to long term memory (Tulving & Madigan, 1970). In vocabulary acquisition, three levels have been defined (Prado & Plourde, 2011; Zhang, Gu, & Hu, 2008). At the first level of word recognition, the word is perceived as being connected with real life. At the second – parsing level, further associations between the word and real life are recognized (Tulving & Madigan, 1970). After the parsing level students perceive pictures and transform the meanings of the words into real life. At the third level, students use the previously learned word in an appropriate context. To acquire vocabulary, it is necessary to pass through all three levels.

As different studies have shown, text comprehension is a difficult process for a considerable number of primary school students (Begeny & Silber, 2006; Masterson & Apel, 2006; Schroeder, 2011). According to Saxton (2010), word acquisition also differs according to the type of words being acquired. The easiest is to acquire concrete nouns because the student can understand their meanings. Abstract nouns are more difficult to acquire (Hirsh-Pasek, 2006). The most difficult are verbs (Imai, Okada, & Haryu, 2005), because students need experience with the meanings of these words before they can understand and acquire them (Saxton, 2010).

1.2. Impact of preknowledge and gender on student text comprehension

Preknowledge affects how students understand the meaning of the word in the conception of the sentence (Broek & Espin, 2012; Soalt, 2005). According to Eason et al. (2012), children who have little contact with new vocabulary do not understand the meaning of the text. Understanding the unknown word is necessary if the words the students hear have a familiar sound for them (Begeny & Silber, 2006). To help recognize the meaning of the words it is important to use words in different contexts. According to Hall and Sabey (2007), if there are unknown words in the text then the student will simply move on through the text, and in the end they will not fully understand the meaning of the text. However, to offer students the exact meaning of the new words gives them self-confidence in the text (Wise et al., 2010). That, in turn, becomes associated with success and that inspires the student to read more.

It was found that text comprehension is also associated with gender. In primary school girls and boys are at different cognitive levels, and this also affects their text comprehension capability (Bray & Barron 2003; Logan & Johnston, 2010; Ning, Dai, & Zhang, 2010; Prado & Plourde, 2011). In addition, the international comprehensive research PISA (OECD, 2009; OECD, 2013) has found that in language learning girls outperform boys. It has also been proved by Räty, Kasanen, Kiiskinen and Kykky (2004) to be true for primary school. The reason for this might be that girls read more literature outside school than boys do (Kelley & Decker, 2009). In turn, this causes a positive effect on girls’ text comprehension skills.

1.3. Relations between word semantics and text comprehension competence

In the primary school one of the aims is to develop reading skills to achieve good text comprehension competence (Eason et al., 2012; Prado & Plourde, 2011; Primor, Pierce & Katzir, 2011). However, the text comprehension is connected hierarchically with several other skills (Zhang et al., 2008). Thus, in the first stage, students have to acquire elementary reading skills (Primor et al., 2011; Uibu & Troppe, 2013; Uibu & Männamaa, 2014). In the second stage, the aim is to develop thinking skills. This requires higher-levels of text comprehension competence from students; for example, analyzing and generalizing (Põhikooli riiklik õppekava, 2010). If students
have not acquired elementary reading in the first stage of primary school then they also will not be able to understand the meaning of a more sophisticated text in the second stage of school. In addition, text type can play an important role in how well students understand the meaning of a text (Eason et al., 2012). A good option is to use narrative texts. First, narrative texts are appropriate for teaching students how texts can be logical and coherent (Chun, 2009). Second, narrative texts comprise new words and expressions that belong to the context and make the texts more understandable. Third, narrative texts may be used to develop critical thinking in the students (Soalt, 2005) by asking them to describe different characters and analyze the content of the texts. Additionally, preknowledge becomes associated with new terms and stimulates student opinions (Block & Pressley, 2002).

1.4. Aims and hypotheses

Word recognition has an important role in developing text comprehension competence. The aim of the present research was to analyze the extent to which changes occurred in student word recognition and text comprehension skills in Estonian primary schools. Therefore, four areas of research were established for the study.

1. Relations between new with previously learned words and using these in a new context has an important role in the development of student vocabulary (Broek & Espin, 2012). We expected that students who knew the meaning of the words better in Grade 3, also know the meaning of the words better in Grades 4 and 5.

2. According to earlier studies, language skills in girls and boys differ significantly in primary school (Logan & Johnston, 2010; Ning et al., 2010; Prado & Plourde, 2011). Language development is faster in girls than in boys, and this gives them an advantage in learning vocabulary in comparison with boys (Van de Gaer, Pustjens, Van Damme, & De Munter, 2009). We expected word recognition development in Grades 3 to 5 to be better in girls than boys. In addition, the previously learned word recognition improves in time and girls outperform boys in primary school.

3. Text comprehension skills give the reader the opportunity to realize what author was trying to say (Cain et al., 2004; Primor et al., 2011). We expected that lower-level text comprehension is equally feasible for boys and girls, but differences are revealed in higher-level text comprehension tasks (Krathwohl, 2002; Mayer, 2004).

4. Earlier studies have found that vocabulary revision constantly helps to develop word recognition skills (Prado & Plourde, 2011) and student vocabulary range is connected to understanding the meaning of texts (Eason et al., 2012). We supposed that student higher-level text comprehension competence is predicted by their word recognition and different text comprehension skills.

2. Method

2.1. Sample and procedure

The primary school students (from Grades 3 to 5) from 28 Estonian schools and 46 classes participated in the longitudinal research. School location, school type and class size were considered in the sample selection. The main aim of the study was to identify changes in student word recognition and text comprehension skills. Therefore, only these students who participated in the study in three consecutive years were analyzed. The average age of the students at the beginning of Grade 3 was 9.08, SD = .37; in Grade 4 10.00 years, SD = .36; and in Grade 5 10.98 years, SD = .35. The students, whose average language test results in Grade 3 were statistically lower (> -2.0 SD), were excluded from the analysis. The final data set was based on 464 students, 214 (46.1%) boys and 250 (53.9%) girls. The students were tested at the beginning of the school year in three consecutive years. The language tests were sent to schools, the test was held by the class teacher during the language lesson.

2.2. Measures

Student word recognition and text comprehension skills were measured using three language tasks. The tasks were compiled by the second author of this article based on revised Bloom’s taxonomy (Krathwohl, 2002; Mayer,
2004) and official national academic placement tests (Uibu, Kikas, & Tropp, 2010; Uibu & Tropp, 2013). In all tasks student answers were coded dichotomously: 1 (right answer), 0 (wrong or not marked answer). First, the students’ word recognition was measured using a vocabulary task. Students had to find the right words from a pool of words given from the text. The internal consistencies (Cronbach’s alpha) of the tasks were: 0.58 (3 items) for Grades 3; 0.89 (5 items) and 0.85 (10 items) for Grades 4 and 5. Second, in the lower-level text comprehension task, information finding and recognition skills were measured. According to the meaning of the text, students had to decide whether the sentences given in the task were right or wrong. The internal consistencies of the tasks were: 0.46 (7 items), 0.75 (8 items) and 0.86 (11 items) for Grades 3, 4 and 5 respectively. Third, in the higher-level text comprehension task, the ability to integrate contextual information from the text was measured. This task was related to the students’ analyzing and inferring skills. The internal consistencies of these tasks were: 0.90 (6 items) for Grade 3, 0.82 (6 items) and 0.88 (7 items) for Grades 4 and 5.

2.3. Data analysis

Data analysis was carried out using SPSS Statistics, version 20.0. To identify differences among students in terms of word recognition and text comprehension skills in Grades 3 to 5, a repeated measure ANOVA was used. To examine differences between gender groups a post-hoc analysis with Bonferroni adjustment was used. In addition, a one-way ANOVA was used to detect differences between previously studied words over three consecutive years. To present statistical significance in addition to p-value, the effect size η² was also used (Cohen, Manion, & Morrison, 2007). Multiple regression analysis was used to calculate the effect of word recognition and previous text comprehension results on students’ higher-level text comprehension skills.

3. Results

To examine changes in word recognition, the descriptive statistics were calculated. To compare the results of whole vocabulary tasks over three consecutive years, the mean scores for the tasks were used. For previously learned words, the sum scores were calculated. The results for the entire sample for boys and girls separately are provided in Table 1.

Table 1. Descriptive statistics for vocabulary tasks

<table>
<thead>
<tr>
<th>Vocabulary task*</th>
<th>Complete sample (N = 464)</th>
<th>Boys (N = 214)</th>
<th>Girls (N = 250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>M = .62, SD = .31</td>
<td>M = .60, SD = .33</td>
<td>M = .64, SD = .30</td>
</tr>
<tr>
<td>Grade 4</td>
<td>M = .84, SD = .25</td>
<td>M = .78, SD = .27</td>
<td>M = .90, SD = .21</td>
</tr>
<tr>
<td>Grade 5</td>
<td>M = .58, SD = .21</td>
<td>M = .54, SD = .22</td>
<td>M = .61, SD = .20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Previously learned words**</th>
<th>Complete sample (N = 464)</th>
<th>Boys (N = 214)</th>
<th>Girls (N = 250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>M = .98, SD = .64</td>
<td>M = .93, SD = .64</td>
<td>M = 1.02, SD = .64</td>
</tr>
<tr>
<td>Grade 4</td>
<td>M = 1.60, SD = .64</td>
<td>M = 1.45, SD = .70</td>
<td>M = 1.72, SD = .55</td>
</tr>
<tr>
<td>Grade 5</td>
<td>M = 1.65, SD = .59</td>
<td>M = 1.50, SD = .65</td>
<td>M = 1.78, SD = .50</td>
</tr>
</tbody>
</table>

Note. * mean scores, ** sum scores

To examine changes in student word recognition, a 3 (task) x 2 (gender) repeated measure ANOVA was implemented. It was revealed that time was significant as the main effect in solving the entire task, F(2,462) = 187.96, p < .001, η² = .29. Post-hoc comparisons revealed statistically significant differences between three years (p < .005). The students had the highest word recognition results in Grade 4 and the lowest in Grade 5 (Table 1). Student gender also played an important role in the implementation of this task: F(1,462) = 18.53, p < .001, η² = .04. The results for girls were significantly higher than for boys in all grades (p < .001). However, a time and gender
interaction in regard to student vocabulary knowledge was not identified. Next, differences were revealed between boys and girls in terms of remembering previously learned words over the three consecutive years. The one-way ANOVA revealed that girls managed better than boys with word recognition in Grade 4, $F(1,461) = 22.69$, $p < .001$, $\eta^2 = .047$, and Grade 5, $F(1,462) = 27.77$, $p < .001$, $\eta^2 = .057$. However, there were no differences between the results for boys and girls in Grade 3.

To estimate the differences between boys and girls in lower- and higher-level text comprehension, two reading tasks at different cognitive levels were used. The mean scores and standard deviations for the tasks are provided in Table 2.

<table>
<thead>
<tr>
<th>Table 2. Descriptive statistics for text comprehension tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete sample (N = 464)</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td><strong>Lower-level text comprehension</strong></td>
</tr>
<tr>
<td>Grade 3</td>
</tr>
<tr>
<td>Grade 4</td>
</tr>
<tr>
<td>Grade 5</td>
</tr>
<tr>
<td><strong>Higher-level text comprehension</strong></td>
</tr>
<tr>
<td>Grade 3</td>
</tr>
<tr>
<td>Grade 4</td>
</tr>
<tr>
<td>Grade 5</td>
</tr>
</tbody>
</table>

*Note. M – denoting the mean score of correct answers*

The repeated measure ANOVA revealed that time was significant as the main effect in solving lower-level text comprehension task, $F(2, 461) = 33.61$, $p < .001$, $\eta^2 = .068$. Post-hoc comparisons revealed significant differences between years ($p < .005$). Student gender also played an important role in the implementation of this task: $F(1, 462) = 13.03$, $p < .001$, $\eta^2 = .027$. The one-way ANOVA revealed that girls had better results than boys in Grade 4, $F(1, 462) = 5.96$, $p = .015$, $\eta^2 = .013$; as well as in Grade 5, $F(1, 462) = 9.51$, $p = .002$, $\eta^2 = .020$. However, a time and gender interaction in regard to student lower-level text comprehension was not identified. In the case of higher-level text comprehension task, the analogous effects of time were, $F(1, 461) = 25.89$, $p < .001$, $\eta^2 = .053$, and of gender, $F(1, 461) = 9.25$, $p = .002$, $\eta^2 = .020$. Girls outperformed boys over the three consecutive years ($p < .001$), but the difference did not increase between boys and girls over time.

Next, standard multiple regressions were employed to investigate whether students’ word recognition and text comprehension in different grades predict students’ higher-level text comprehension competence. The first regression model for higher-level text comprehension of Grade 3 with word recognition and lower-level text comprehension as predictors explained only 1.5% of variance (adjusted $R^2 = .015$). A significant standardized beta coefficient was found for word recognition, $\beta = .107$, $p = .022$. The second regression analysis with five independent variables (word recognition and lower-level text comprehension of Grades 3 and 4, and higher-level text comprehension of Grade 3) was implemented to examine these components’ impact on students’ higher-level text comprehension in Grade 4 (adjusted $R^2 = .017$). The significant influence on higher-level text comprehension was elicited by word recognition of Grade 4, $\beta = .27$, $p < .001$, and lower-level text comprehension of Grade 4, $\beta = .17$, $p < .001$. In addition, higher-level text comprehension of Grade 3 predicted higher-level text comprehension of Grade 4. The third model for higher-level text comprehension in Grade 5 included eight independent variables: word recognition tasks of all grades, both text comprehension tasks in Grades 3 and 4, lower-level text comprehension task of Grade 5. The regression model explained about 29% of variance (adjusted $R^2 = .29$). The most significant predictors appeared: lower-level text comprehension of Grade 5, $\beta = .23$, $p < .001$, and higher-level text comprehension of Grades 3 and 4, respectively $\beta = .20$, $p < .001$ and $\beta = .12$, $p = .006$. In addition, word recognition of Grades 4 and 5 had significant $\beta$-values: $\beta = .12$, $p = .013$ of Grade 4, and $\beta = .10$, $p = .035$ of Grade 5.
4. Discussion

The current longitudinal research examined the changes in student word recognition and text comprehension in Estonian primary school. It was revealed that students who had better word recognition skills were also better in text comprehension. The most important finding was that word recognition was an essential factor for higher-level text comprehension competence. According to previous studies (Rätä et al., 2004; Bray & Barron, 2003), gender differences occurred in student word recognition skills over three consecutive years. In addition, the greatest differences were revealed in higher-level cognitive text comprehension skills. Girls knew previously acquired words better than boys. First, we examined changes in student word recognition skills. The students’ results were the highest in Grade 4 and dropped in Grade 5. The reason for this might be that word acquisition is divergent according to word type. It is easier to acquire nouns with the specific meanings, and more difficult is to learn verbs and abstract words (Saxton, 2010). In our research the amount of abstract words increase in Grade 5 in comparison with Grades 3 and 4. This might be the reason why the student results decreased in Grade 5. For example, the meaning of some words (e.g., grave, clumsy) might be unknown to the students, although these words appeared in the text. Second, the activity where the students had to choose words with the correct meaning from a word pool included more options in Grade 5 than in Grade 4. In earlier studies, it was found that the number of options in multiple-choice tasks might influence student performance. When the number of options increase, the likelihood of answering correctly with a random selection decrease (Rodriguez, 2005). Comparing gender groups, it was found that word recognition skills in girls were higher than in boys in all three years. Previous studies have found that boys and girls differ in terms of their verbal abilities, which is an important factor for vocabulary acquisition and word recognition competence (Cain & Oakhill 2011; Saxton, 2010). In the current study, no time-gender interaction was found for student word recognition skills. Thus, gender differences in terms of vocabulary knowledge remained consistent, but did not increase over the years. Student knowledge of previously learned words was examined using two abstract words that recurred in the vocabulary task over the three consecutive years. It was revealed that in Grade 3 there were no differences among boys and girls; however, the girls outperformed the boys in Grades 4 and 5. Previously, it was noticed that the acquisition of abstract words is difficult and takes extra time (Saxton, 2010). Gender differences in cognitive development (Logan & Johnston 2010; Ning et al., 2010) explain why the boys had difficulties with the previously learned words. According to previous statements (Krathwohl, 2002), it was assumed that girls would outperform boys in higher-level text comprehension tasks (Uibu & Tropp, 2013). In Grade 3, the lower-level text comprehension task was equally feasible for both boys and girls. However, the girls outperformed the boys in the higher-level text comprehension task, where the students had to match two clauses, over all three consecutive years. Therefore, knowledge of syntactic and grammatical constructions as well as the ability to extrapolate information (Uibu & Männamaa, 2014) helps in the performance of text comprehension tasks. Although, girls outperformed boys in our research, it is possible to raise the boys to the same cognitive level (Bruemmer, 2006; Corthals, 2010). It is important to guide boys in how to analyze texts and give them direct instructions for going through the text. In addition, the use of different teaching methods that support thinking and analyzing skills in boys has been suggested (Gleason & Ratner, 2009). Next, the predictive impact of students’ word recognition and different text comprehension skills on higher-level text comprehension was of interest. It was revealed that the students’ knowledge of the meanings of words was the most significant predictor for students’ higher-level text comprehension skills in three consecutive years. The students, who managed in word recognition better, also achieved better results in the higher-level text comprehension task the subsequent years. Thus, word recognition is of utmost importance in text comprehension development. Without vocabulary knowledge, the comprehension of sentences as well as of entire texts is complicated (Karlep, 2003). Another important finding was that students coped better with the higher-level text comprehension task in Grade 3, managed better with the same tasks in Grades 4 and 5. According to the aims of the second stage of primary school (Põhikooli riiklik õppekava, 2010), the development of text comprehension is of the utmost importance. Therefore, it was presumed that students who had better skills in text comprehension managed these tasks better. By analyzing the predictive impact of lower-level text comprehension task to higher-level text comprehension task, we found influential effect over the two years. The students who achieved better results in the lower-level text comprehension tasks in Grades 4 and 5, also had better results in the higher-level text comprehension in Grades 4 and 5. Some limitations were also of important in our study. First, the text for Grade 3 differed from the text for Grades 4 and 5. Second, although the types of tasks and
the instructions were the same over the three years, the vocabulary task comprised a different amount of words in different years. When compiling the vocabulary tasks, it is important to take into consideration that in addition to the multiple-choice list, the meaning of the word is sensitive to context. Third, in the current study no additional factors (e.g., reading accuracy and speed, reading motivation) were taken into consideration when testing word recognition and text comprehension skills. Nevertheless, this study used a three-year longitudinal design and representative sample, which allowed us to make valuable conclusions about student vocabulary knowledge and text comprehension in primary school. Our conclusions are as follows: 1. Word recognition and text comprehension exhibit a causal relationship to each other. 2. Word recognition, including previously learned words, and text comprehension skills are better in girls than in boys. 3. It is important to take into consideration the developmental peculiarities of boys and to support their vocabulary and text comprehension development.

Acknowledgements

This work was supported in part by the Estonian Ministry of Education and Research (Grant No. 3-2/TA5966) and in part by the ESF Program Eduko (Project No 1.2.0302.09-004).

References


