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AGNIESZKA ANDRYCHOWICZ-TROJANOWSKA
Warsaw University

PERCEPTION OF TEXTBOOK MATERIAL BY DYSLECTIC AND NON-DYSLECTIC STUDENTS: AN EYE-TRACKING EXPERIMENT

A textbook of English is one of the tools used by both teachers and students in the process of teaching/learning the language on the lessons of English at Polish (upper) secondary schools. Owing to the big variety of such textbooks on the market every teacher can choose the one that will comply with different criteria and will meet teacher's and students' expectations. It is also a fact that the students are not homogenous – the differences appear not only on personality, social, intellectual levels etc. but also on the level of different specific difficulties in the process of learning, often resulting from the students' special educational needs. All these diverse students use the same (glotto)didactic materials although their perception abilities may be different. That is the reason for asking about the influence of the layout of the textbooks and workbooks of English on the way the students work with that type of (glotto)didactic materials. To find the answer to the above problem the eye-tracking methods were used – a textbook and workbook examples were checked on a group of (upper)secondary school students. In the experiments the students represented two groups of (upper)secondary school students – dyslectic and non-dyslectic ones. The aim of the study was to compare the way the students work with the textbook material, show tendencies in their way of doing it and check if there are any significant differences between dyslectic and non-dyslectic students dealing with the particular English textbook examples.

1. Background

The process of foreign language learning/teaching is usually supported by the set of tools used by the teacher to make the process more efficient. Still the most important and the most common tool is a textbook (also called *a student's book*) together with a workbook. In case of the English language there is a wide variety of textbooks (and workbooks) on the Polish market offered by a few publishing houses. The textbooks (and workbooks) are prepared in

a professional way, they are correct from the methodological point of view, they are adjusted to the age of a student, teaching aims, student's mother tongue, conditions of the didactic process, time for learning/teaching etc. (see more: Pfeiffer 1975: 10-12), to intellectual and psychological capabilities of students (see more: Styszyński 1993: 57) and they meet all the important criteria as to be accepted for school use by the Ministry of National Education.

The textbooks (and workbooks) of English that are the subject of the author's interest are the ones for the (upper)secondary school students, i.e. teenagers of 16-19 (or more). The textbook and workbook, together with the teacher's book, CD recordings (audio materials), materials available on the Internet and prepared by the publishing house for the particular textbook, video materials are called a basic set of integrated glottodidactic materials (Pfeiffer 2001: 164). The textbook is the most important part of the integrated materials, whereas the workbook is aimed mainly at consolidating the material. Such a textbook should be accommodated to the level of language fluency of the students, should present the material in an interesting and methodologically proper way and should meet the requirements of the curriculum.

A typical textbook of English for the Polish (upper)secondary school students consists of a few parts. The first part is usually a table with short, basic information about the topics of every unit (very often it is divided into subsections, for example Grammar, Vocabulary, Reading, Listening, Speaking, Writing). The second and the most important part are the units (usually from 8 to 14 units, depending on a textbook), divided into subsections, too, i.e. Grammar, Vocabulary, Reading, Listening, Speaking, Writing; Reading & Listening, Speaking & Functions, Culture Corner; Reading and vocabulary, Grammar and listening, Listening, speaking and vocabulary, Culture, vocabulary and grammar etc. The third part is very often a mini-dictionary of words and phrases used in every unit together with their Polish equivalents, sometimes with pronunciation of a word or phrase. The fourth part is a short compendium on the grammar topics, examples of written activities (e-mails, letters, notes etc.) etc. mentioned in the units. The workbook (printed one) consists of the same number of units as the textbook (usually 8-14) and is aimed at practising the language skills from the analogical part of the textbook. Usually, a particular unit in the workbook is divided into grammar part, reading part, speaking part, writing part and vocabulary one. In both textbook and workbook there are the following types of activities/exercises: multiple choice, gap filling (in the sentence or in the text), true/false exercises (less and less popular type), matching words to their definitions, matching speakers with the statements/opinions, "odd-one-out" activities etc.

Except for the above-mentioned characteristics, one of the textbooks' main features is their visual attractiveness – they are full of colours, different fonts, pictures, graphic elements etc., they are printed on a high quality paper. However, the workbooks are different – very often they are black-and-white or gray, with not so many graphic elements and are printed on the paper of worse quality.

Because of the fact that the user of the textbook/workbook is a student it should be emphasized that the students are not homogenous – there might be some differences between the classmates in the way of dealing with the given material. The differences between the students appear not only on personality, social, intellectual levels etc. They also occur (and that is the most important in the described below eye-tracking experiment) on the level of different specific difficulties in the process of learning, often resulting from their special educational needs (a frequent difficulty in the process of learning is dyslexia). All these diverse students use the same (glotto)didactic materials although their perception abilities may be different. It is a fact that in one class there might be students suffering from dyslexia, Asperger syndrome, depression, students with special educational needs, as well as very talented ones who also need a special support and stimulation. It is worth mentioning that to a group of the students with special educational needs belong the disabled and mentally disabled ones, less intelligent students, visually impaired ones, hearing impaired ones, the ones suffering from speech disorders, but also students with specific learning problems (sometimes also very talented students) (Bogdanowicz, Adryjanek 2005: 12; see also Bogdanowicz, Adryjanek, Rożyńska 2007: 91). Because of the fact that dyslexia is more and more often diagnosed among the Polish school students, it was interesting to check if dyslectic students differ anyhow from their non-dyslectic classmates in a way of working with the same textbooks of English.

Developmental dyslexia (hereinafter referred to as dyslexia) is a specific as well as significant impairment in reading abilities that cannot be explained by any kind of deficit in general intelligence, learning opportunity, general motivation or sensory acuity (Habib 2000: 2374). Dyslexia often associates with deficits in related domains: oral language acquisition (dysphasia), writing abilities (dysgraphia and misspelling), mathematical abilities (dyscalculia), motor coordination (dyspraxia), postural stability and dexterity, temporal orientation (‘dyschronia’), visuospatial abilities (developmental right-hemisphere syndrome), and attentional abilities (hyperactivity and attention deficit disorder) (Habib 2000: 2374). In other words, dyslexia is an example of specific learning problems, i.e. specific problems with reading and writing (together with normal mental development) (Bogdanowicz, Adryjanek 2005: 24). What is important, dyslexia influences the way the student works and should not be treated as only a problem of an individual but also as a social problem (Bogdanowicz, Adryjanek, Rożyńska 2007: 87-88).

2. Research questions

On the basis of the author’s teaching experience and on the basis of the opinions of some other teachers of English a few questions arose: (1) Are the textbooks (i.e. English textbooks) equally useful for all the students?, (2) Is a visually very attractive textbook a really useful tool?, (3) Are there any aspects

of the glottodidactic materials that should be modified to make the process of teaching/learning more efficient?, (4) What criteria should the teacher take into consideration when choosing the textbook of English?

As a consequence, an eye-tracking experiment was conducted whose aim was to: (1) show the way the students work with the textbook material, (2) show the tendencies in their way of doing it, (3) check if there are any differences between the students working with the English textbooks and if yes (for example dyslectic and non-dyslectic students) – try to name it, characterize and draw the applicable conclusions.

3. Experiment

3.1. The aim of the research

When planning the experiment I assumed that the layouts of the textbook and workbook are important from the point of view of the visual attention of the students (the users). Because of this the aim of the research was to check in what way (i.e. how) the students work with the exemplary textbook and workbook material, especially to check on which parts of the materials they focus the most of their visual attention as well as to check if there are any differences between dyslectic and non-dyslectic students in the way of working with the textbook and workbook.

3.2. Scheme of the research

The research which was based on the eye-tracking methods let me analyse step by step the participants' eye movements during the process of completing the given tasks, i.e. during the process of working with the given part of the work- and textbook of English. The material was shown to the participants on the screen and recorded by the eye tracker. The recorded data was then analysed with the help of BeGaze 3.5 software. The detailed information on that is given in the following chapters.

It needs to be said that an important research tool except for the eye tracker was a paper questionnaire that was given to every participant after the tasks were completed. The aim of the questionnaire was to get additional information about the research and the perception of the presented material. There were 8 questions – 7 related to the layout of the materials and 1 open question devoted to the participant's opinion about the materials as well as the way the research had been conducted. Some of the participants' questionnaire answers will be shown below.

3.3. Eye-tracking method

Eye tracking allows to observe and analyse the way the person looks at the object, so it may be possible to see in details what is at the central direction of gaze as well as to follow along the path of the visual attention of the observer (Duchowski 2007: 3). Eye trackers are advanced physiological systems of measurements (Holmqvist et al. 2011: 11), they track and record the position of where the eye is looking at and in what order. That allows to identify the areas which are brought to the participant's attention. The eye tracker sends the processed images to a computer with which it is integrated, and the software analyses the data to present the results in an effective way (http://www.neurodevice.pl/en/services/eye-tracking, 21.10.2015). There are different ways of presenting the collected data – heat maps, gaze plots, areas of interests, statistic charts and graphs etc.

There is a wide range of eye-tracking devices application areas, including neuroscience, psychology, psychiatry and psycholinguistics, usability, human factors and ergonomics, market research, gaze based interaction etc. (http://www.smivision.com/en/gaze-and-eye-tracking-systems/products/red250-red-500.html, 21.10.2015; see more: Duchowski 2007). That is why it seems to be the best method to use in glottodidactics to check the way the (upper)secondary school students work with the textbook and workbook material.

3.4. Participants

The experiment was conducted in April 2015. The total number of the students whose recorded results were analysed was 21 (8 dyslectic – an opinion of psychological and pedagogical counseling centre; 13 non-dyslectic). The place of the experiment was the school (conducting the experiment at school made it be more natural because the students knew the place (school), the room conditions were similar to the ones on the lesson, they felt there more comfortable, were not tired yet as the experiment took place during the lessons). The students' fluency in English was on the Pre-Intermediate, Intermediate and Upper-Intermediate levels and they were the students of the I, II and III class of the (upper)secondary school.

3.5. Material

The materials the students worked with were showed on the computer screen and consisted of the black-and-white material being an example of the workbook, Reading part (the material was black-and-white, so hereinafter it is called *black-and-white material*; see Figure 1) and the colourful one being an example of the textbook (the material was colourful, so hereinafter it is called *colourful material*; see Figure 2). The questionnaire in the paper form was given after completing the previous tasks (a participant had a chance to write there

down his/her important opinions that could be helpful when analysing the research results). All the textbook and workbook examples were designed and prepared by the author of the experiment on the basis of the analysis of 13 textbooks of 3 publishing houses present on the Polish market that were accepted by the Ministry of National Education to be used on the lessons of English in the (upper)secondary schools. Because of a specific character of the following eye-tracking research, the prepared material included only one out of many parts of every unit, i.e. reading section, which is the most representative part of the student's book. As every student of the Polish (upper)secondary school regardless of what his/her level of fluency is at the very beginning of the school (I class) and at the end (III class – just before the Matura final exam) must take a foreign language Matura exam (basic level or extended one; the students who take the extended exam are obliged to take the basic one, too) the texts in the research material that was presented on the computer screen were on the level of basic Matura English exam texts and they were taken from *Oxford Excellence for Matura. New Exam Builder* by Oxford, accepted by the Ministry of National Education (in bibliography: Quintana et al. 2011). It should be emphasized that the graphic layout of the presented materials as well as the arrangement of the (glotto)didactic components, pictures etc. comply with the real student's book. The arrangement and layout were planned and made on the basis of the above-mentioned analysis of many (13) student's books of that type as to reflect the arrangement of the textbook/workbook elements in the most accurate way.

3.6. Data acquisition

The participants' eye movements were recorded with SMI RED 500 eye-tracking system with the sampling rate of 250 Hz. The participants sat in front of a 22-inch LCD monitor (equipped with the mini video camera (an eye tracker) placed just under it) at a distance of about 60 cm. The average tracking ratio (i.e. the proportion of time the eye-tracker recorded point of gaze coordinates over the entire task – Amso 2014 et al.: 2) was 96.3% for the whole experiment with standard deviation of 1.64%. The recorded data was analysed with the help of BeGaze 3.5 analysis software.

Some of the students who took part in the research had no experience with eye-tracking devices and that is why just before the beginning of the research every student was given the most important information about the eye tracker and the tasks related to the experiment. When calibration was completed, on the computer monitor the first material (black-and-white material, Figure 1) was displayed and the student heard the task which was said by me ('Complete task X. Give your answers loudly') and then started completing it (s/he was to read the text and then decide if the given sentences are true or false – exercise 2 p. 31; the second task was to complete the gaps in the given sentences with the verbs in bold in the text – exercise 3 p. 32). When the tasks in the black-and-white material were completed (there was no time limit) the student could see

the colourful material on the monitor and heard the task which was said by me ('Complete task Y. Give your answers loudly') and then started completing it. In the colourful material the tasks were to read the text and then decide if the given sentences are true or false – exercise 2 p. 11; and to match the definitions to the words given in bold in the text – exercise 3 p. 12; Figure 2; there was no time limit, too. At the end of the experiment the participants were asked to fill in the questionnaire related to the experiment.

4. Results

The following section is devoted to the results of the experiment. The results will be presented according to a few key parameters and will be analysed in relation to the black-and-white and the colourful materials. First of all, the percentage of participants looking at the particular parts of the material (Areas of Interest) and the number of revisits (i.e. more than one glance of a participant) in the particular parts will be shown. Next, two parameters related to fixations (i.e. moments when an eye remains still) will be presented. Finally, the results coming out from the paper questionnaire will be summed up.

As it was mentioned before, the aim of the research was to check how the students work with the exemplary textbook and workbook material. Because of this I decided to omit the parameter of correctness of the given answers (the aim of the research was not to check the level of perception or retention of the information) and I chose to concentrate on the following parameters: subject hit count, revisits average, fixation count average, fixation time average (separate sub-chapters are devoted to each of them). All the above parameters were analysed from the point of view of potential differences occurring between dyslectic (8 students) and non-dyslectic students (13) who took part in the experiment.

For both black-and-white and colourful materials I chose a few Areas of Interest (AOIs), i.e. the regions in the stimulus that the researcher is especially interested in gathering data about (Holmqvist et al. 2011: 187); as such they are chosen by the researcher. In the black-and-white material (Figure 1) there were 17 AOIs. In the colourful material (Figure 2) there were 20 Areas of Interest. The reason for choosing these particular sets of AOIs was the fact that they are the graphic elements of the layout. I wanted to check how much they influence the visual attention of the student and how they influence the process of completing the given tasks (i.e. if they help or disturb the student).

The above Areas of Interest in every material can be divided into two groups: the areas related to the given tasks and the areas not related to the given tasks. The areas of the first group are listed in the bar charts below (Figures 3-10) as the first ones, i.e. in the black-and-white material (Figures 3, 5, 7, 9) they start from "Left photo" and end with "Hurry back", in the colourful material (Figures 4, 6, 8, 10) they start from "Photo 1 (text)" and end with "Wordbox (extra)". The areas of the second group (in the bar charts below are listed as the second ones)

are the ones that it is not necessary to look at to be able to complete the task. In the black-and-white material they start from “Page number (left)” and end with “Unit name and number”, in the colourful material they start from “Page number (left)” and end with “Section name”.

Figure 1. Areas of interest (17) in the black-and-white material

Figure 2. Areas of interest (20) in the colourful material

4.1. Subject hit count

The charts given below show the percentage of participants who visited (i.e. looked at) the particular AOIs in both materials.

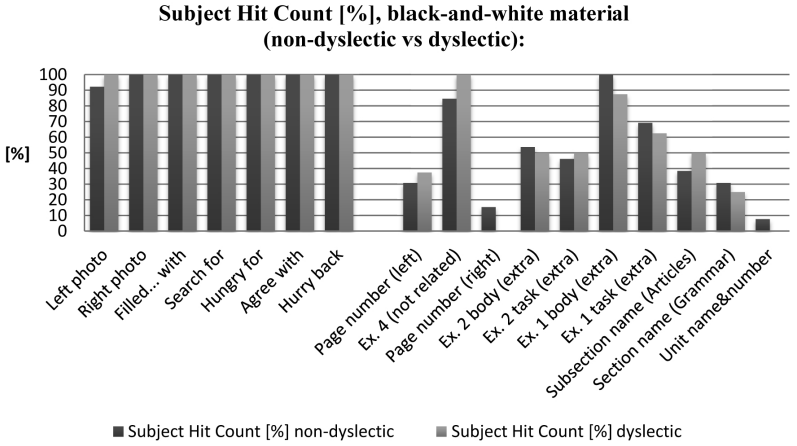

Figure 3. Percentage of participants who visited (looked at) the AOIs [%], black-and-white material

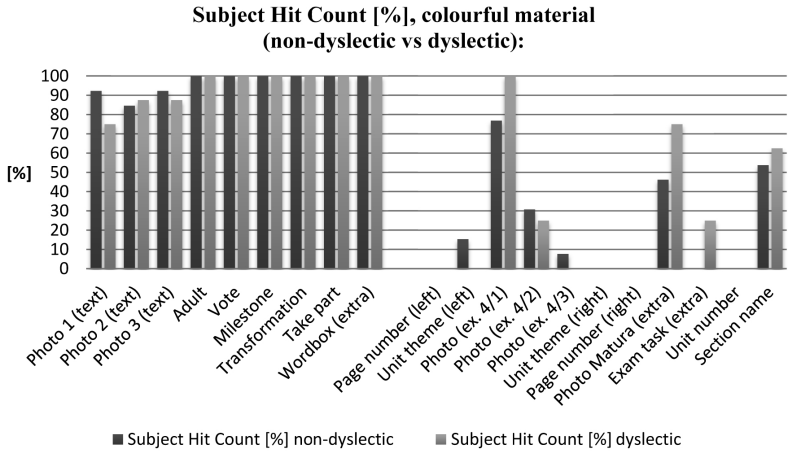

Figure 4. Percentage of participants who visited (looked at) the AOIs [%], colourful material

In the group of (upper)secondary school students who took part in the experiment (21 students, including 13 non-dyslectic and 8 dyslectic ones) it can be noticed that in case of the black-and-white material all the students (i.e. both non-dyslectic and dyslectic) looked at 6 out of 7 AOIs that were related to the tasks (including all of the verbs in bold in the text). The only difference can be seen in case of the left picture which was looked at by all the dyslectic participants and not all of the non-dyslectic ones (92.3%). All of the AOIs that were not related to the given tasks were looked at by the participants. All of the dyslectic students (and 84.6% of non-dyslectic ones) looked at Exercise 4 p. 32 (any part of it) and all of the non-dyslectic ones (and 87.5% of dyslectic ones) looked at the body of exercise 1 p. 32. A possible reason of that is that both AOIs are situated close to the *working area*, i.e. the part of the material that needs the focus of one's visual attention because of the process of reading. Two AOIs ("Page number (right)" and "Unit name&number" did not draw the visual attention of any of the dyslectic students (15.4% and 7.7% of non-dyslectic students, respectively). It can be noticed that the rest of the AOIs (the ones situated not close to the main *working area* and the graphic elements being the part of the layout (upper margin) were less interesting for the participants, both non-dyslectic and dyslectic.

In case of the colourful material not every AOI was hit. 100% hit count for both non-dyslectic and dyslectic students was noticed for all the verbs given in bold in the text as well as for the wordbox below the text. The wordbox which in fact was not related to the given tasks was misleading for many of the participants who analysed it as if it was a crucial part of the material. The 3 photos above the text were looked at by the majority of participants although non-dyslectic ones seemed to be more interested in it. In case of the AOIs not related to the text there occurred a group of the ones that were not hit at all by any of the participants. The reason for that might be the fact they were situated not so close to the *working area*. All 3 photos in exercise 4 p. 32 (not related to the text) were hit, but it should be noticed that the closer to the *working area*, the bigger number of hits, i.e. the upper photo, i.e. "Photo (ex. 4/1)", was hit by all the dyslectic students and 76.9% of non-dyslectic ones, photo 2, i.e. "Photo (ex. 4/2)", by 25% of dyslectic and 30.8% of non-dyslectic ones, photo 3, i.e. "Photo (ex. 4/3)", by 7.7% of non-dyslectic ones and none of the dyslectic students. The big, not related photo in exercise 5 p. 32, i.e. "Photo Matura (extra)", was hit by 75% of dyslectic and 46.2% of non-dyslectic students. The photo was situated close to the *working area* (true/false statements box). The section name which took a big part of the upper margin was also hit by 62.5% of dyslectic and 53.8% of non-dyslectic students. "Exam task (extra)" headline drew the visual attention of some of the dyslectic students and none of the non-dyslectic ones; "Unit theme (left)" was looked at only by a few of the non-dyslectic participants.

4.2. Revisits average

Revisits average parameter is the information about the number of glances divided by selected subjects with at least one visit (http://twiki.cis.rit.edu/twiki/pub/MVRL/SmiTracker/begaze2.pdf, accessed 29.12.2015) in the particular AOI. The data for both materials is presented below:

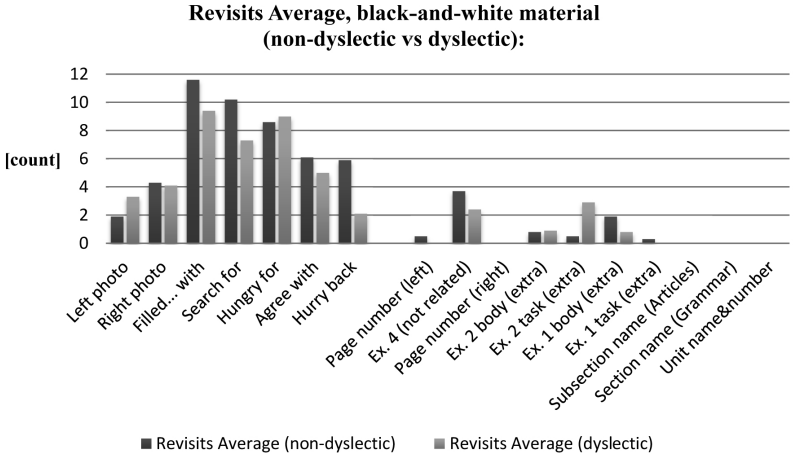

Figure 5. Revisits Average, black-and-white material

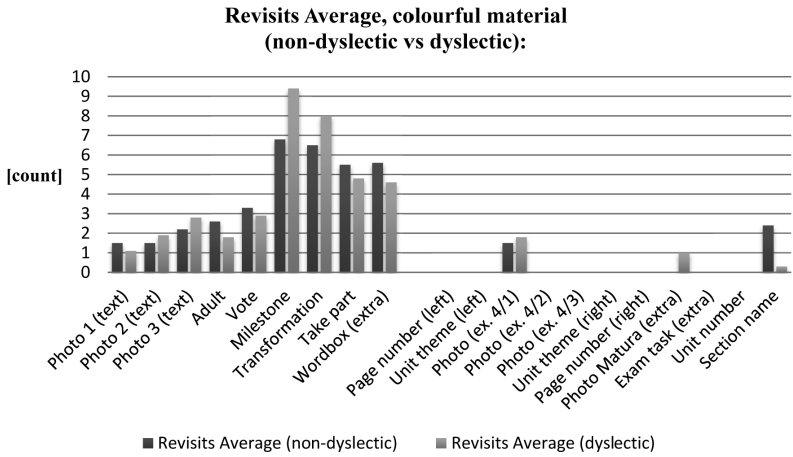

Figure 6. Revisits Average, colourful material

In the black-and-white material the highest number of revisits (average) was noticed on the verbs (in bold) in the text that were the part of the second task. The value of the parameter for the right photo (above the text) was 4.1 for dyslectic and 4.3 for non-dyslectic students, for the left one, however, it was in favour of the dyslectic ones (3.3 and 1.9 for the non-dyslectic). Exercise 4 (i.e. the one not related to the tasks but situated very close to the *working area*) had the value of 2.4 for the dyslectic and 3.7 for non-dyslectic students. Similarly located body of exercise 1 had the values of 0.8 for dyslectic and 1.9 for non-dyslectic participants and the task of exercise 2 – 2.9 for dyslectic and 0.5 for non-dyslectic ones.

In the colourful material two words in bold (milestone, transformation) received the highest value of the parameter and it was especially high for dyslectic students (9.4 vs 6.8 and 8 vs 6.5, respectively). "Photo 3 (text)" values of the parameter were high (2.8 for dyslectic and 2.2 for non-dyslectic students) and up to some extent it can be explained by the fact that the photo was interesting and was strictly related to the part of the text (it was noticed that some of the participants looked at it when reading that particular part of the text). The neighbouring AOIs got the following values: wordbox – 4.6 (dyslectic) and 5.6 (non-dyslectic); the upper photo in exercise 4 – 1.8 (dyslectic) and 1.5 (non-dyslectic); "Photo Matura (extra)" – 1 (dyslectic) and none for non-dyslectic.

The results show the bigger number of revisits (average) on the parts of the materials that were neighbouring the *working area*.

4.3. Fixation count average

A fixation is an event when the eye remains still over a period of time, usually from some tens of milliseconds up to several seconds (for example on a word during reading; fixation is considered to be a measure of visual attention to the particular position although exceptions to that exist) (Holmqvist et al. 2011: 21-22). An average number of fixations on a particular part of the stimulus allows the researcher to find the areas of interests the participants paid more visual attention to during the process of completing the task. The data on fixation count average for both materials is as follows:

In both materials it can be noticed that the fixation count average on the set of AOIs related to the tasks is bigger than on the AOIs not related to it. What is more, in case of the colourful material some of the AOIs of the second group were completely omitted (that not happened in the case of the black-and-white material). In the black-and-white material both photos above the text drew the visual attention of the participants, but the left photo was visited much more by dyslectic students whereas the right one was visited a bit more by dyslectic students. Non-dyslectic participants were concentrating more of their visual attention on the verbs in bold in the text in case of 4 out of 5 such verbs. In the group of AOIs not related to the task it can be seen, however, that the ones situated close to the *working area* (Exercise 4, Exercise 2 body and task, Exercise 1

body) have the fixation count average parameter definitely higher than the rest. The value of the parameter for Exercise 2 (task and body) is higher and that can be explained to some extent by the fact that in the material the same number of exercise was used twice for two different tasks (exercise 2 p. 31 and exercise 2 p. 32) which was misleading to some of the students.

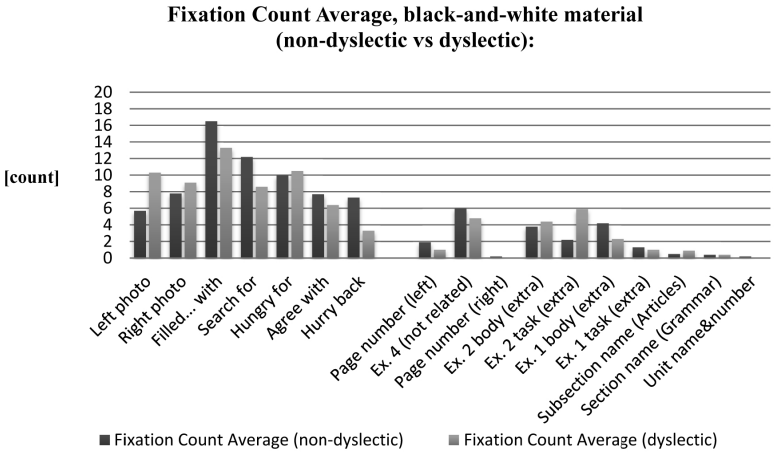

Figure 7. Fixation count average on AOIs, black-and-white material

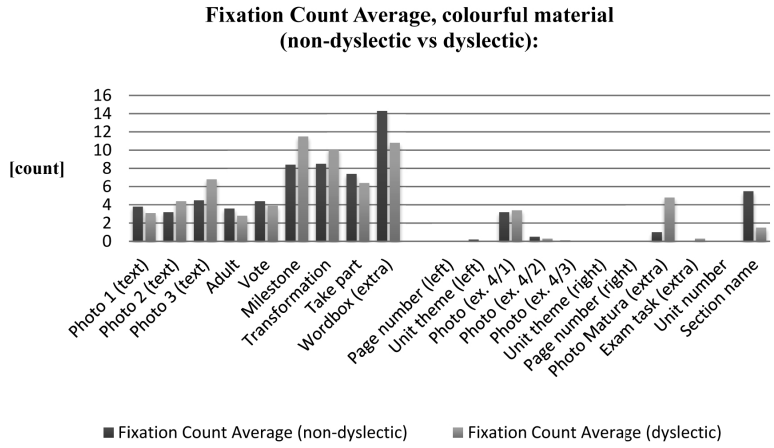

Figure 8. Fixation count average on AOIs, colourful material

In the colourful material there is a big difference between the values of the parameter for the AOIs of both groups. In case of a few AOIs (i.e. photos 2 and 3, “milestone” and “transformation” words in bold in the text) the fixa-

tion count average is higher for dyslectic students than non-dyslectic ones (it can be explained to some extent by the fact that these two nouns were difficult to pronounce and that is why they needed more cognitive effort of some of the students), but in case of the rest of AOIs in this group it is higher for non-dyslectic ones. In the group of the AOIs not related to the task, however, 5 out of 11 AOIs were omitted and there were no fixations (although there were some visitors – see 4.1). These were the graphic elements situated on the margins – i.e. page numbers and unit themes at the bottom of the pages, the lowest (i.e. the furthest from the *working area*) picture in exercise 4 and the unit number in the upper right corner. A similar value of the parameter for both dyslectic and non-dyslectic students was noticed for the first (i.e. the closest to the *working area*) and the second photos in ex. 4 (although the value of the parameter is definitely higher for the first photo). The parameter is significantly higher among dyslectic students for the Matura exam photo in ex. 5 p. 12 and is significantly higher for non-dyslectic students for the "Section name" AOI situated on the upper left margin.

4.4. Fixation time average

Fixation time average is a sum of fixation durations of all subjects divided by the number of the subjects (http://twiki.cis.rit.edu/twiki/pub/MVRL/Smi-Tracker/begaze2.pdf, accessed 29.12.2015) and is shown below:

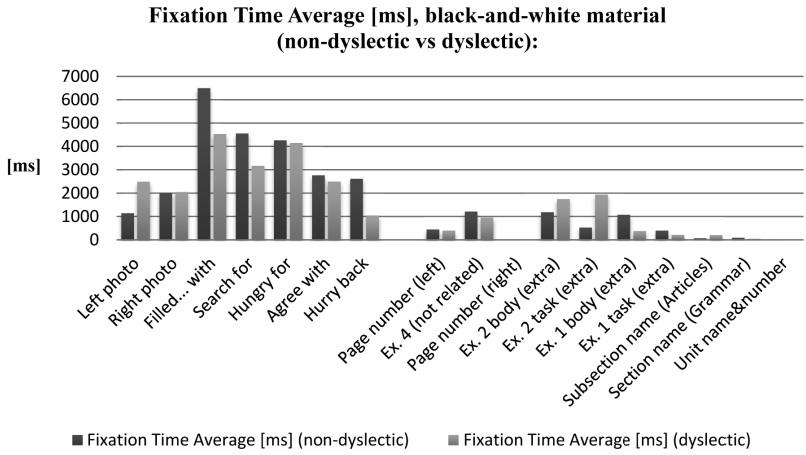

Figure 9. Fixation Time Average on AOIs [ms], black-and-white material

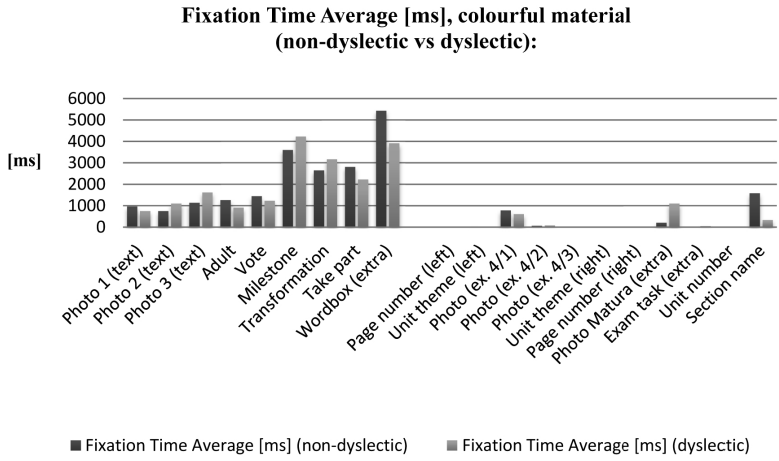

Figure 10. Fixation Time Average on AOIs [ms], colourful material

According to the fixation time average parameter it can be noticed that in the group of AOIs related to the tasks in the black-and-white material the value of the parameter was higher or much higher (verbs "filled with", "hurry back") for non-dyslectic students. The fixation time was longer for dyslectic students only in case of the left photo. In the group of AOIs not related to the tasks 2 of them were of no interest to any of the participants. Dyslectic students' fixation time was longer on the body and task of the second exercise but to some extent it can be explained by the misleading way of numbering the exercises (see 4.3). Exercise 4 and the task and body of exercise 1 drew more visual attention of the non-dyslectic students.

In the colourful material the longest fixation time was noticed for the words in bold in the text and the wordbox situated just below the text, at the end of it (the fixation time in here is longer for non-dyslectic students). In case of the AOIs not related to the tasks the fixation time average is longer for non-dyslectic students on the upper photo in exercise 4 and the section name on the upper left margin; the parameter is bigger in case of dyslectic students on the Matura photo in exercise 5, situated close to the *working area*.

4.5. Questionnaire results

In case of the questionnaire results it needs to be said that the total number of the students who took part in the experiment was 28 (10 dyslectic, 18 non-dyslectic) and 28 participants filled in the questionnaires. Because of the incorrect recording 7 results were rejected, so the number of the analysed results was 21 (8 dyslectic, 13 non-dyslectic). However, incorrect recording did not influence the questionnaire results and that is why 28 questionnaires were analysed.

The conclusions based on the answers given by the students in the paper questionnaire show (question: What way of marking the words or the parts of sentences in the text do you prefer?; possible answers: in bold, highlighted, underlined, in italics; more than one answer was possible) that the declared preferred way of marking the parts of text (i.e. words, sentences) is putting them **in bold** (100% of both dyslectic and non-dyslectic students declared it). 33.3% of students (37.5% of dyslectic students, 30% of non-dyslectic ones) opted for underlining the parts of texts, 28.5% – for highlighting (50% of dyslectic students, 15% of non-dyslectic ones) and 23.8% preferred marking the parts of the text *in italics* (12.5% of dyslectic students, 30.7% of non-dyslectic ones).

In the questionnaire the students were asked to list the most disturbing aspects (factors) of the materials from the experiment. Among these factors the following were listed: the face of the man (i.e. Dorian Gray; probably because the faces and the eyes draw more visual attention) in the picture (dyslectic students), colours (both dyslectic and non-dyslectic students), difficulty with finding the words in the texts (dyslectic students; the words were given in bold – compare the questionnaire results above), too many irrelevant things in the materials (non-dyslectic students), line numbers (non-dyslectic students), length of text – too long (non-dyslectic students), nothing (both dyslectic and non-dyslectic students).

An important aspect of the materials was the colour of the background of the text the students worked with. There were the following answers given to the question "Did the text background colour influence your comfort of working with the text? Choose a proper answer: yes, it did in a positive way; yes, it did in a negative way; no, it did not" (the answers were given separately for the black-and-white and colourful materials). According to the questionnaire the text background in the black-and-white material (gray colour, black font) helped the process of reading and completing the task of 63.6% of all the students, including 55.5% of dyslectic and 69.2% of non-dyslectic students. Whereas it disturbed the total of 9%, including 11.1% of dyslectic and 7.6% of non-dyslectic students. In case of the text background in the colourful material, the yellow-cream colour (black font) helped 36.3% of students, including 11.1% of dyslectic and 53.8% of non-dyslectic ones. It disturbed, however, 45.4% of all the students, including 44.4% of dyslectic and 46.1% of non-dyslectic ones.

It can be said that in the questionnaire the black-and-white material was declared by the participants to be less disturbing. It can also be noticed that the black-and-white material was declared by both groups of students (dyslectic and non-dyslectic) to be better from the point of view of general perception of the material and its influence on the process of working with the material (the black-and-white material was less detailed from the graphic point of view).

Another important question was related to the general clearness of the layout of the materials ("How do you mark the layout of the materials from the point of view of their graphic clarity: A – black-and-white, B – colourful? Give 1, 2 or 3 points, where 1 is for graphically unclear material, 3 for the clear

material, 2 for the material that is in the middle from that point of view"). The answers given to the above question show that the layout of the black-and-white material was clear for 75% of the students, including 60% of dyslectic and 83% of non-dyslectic ones. The colourful one was clear for the total of 50%, including 40% of dyslectic and 55% of non-dyslectic students.

From the point of view of similarities and differences between the materials (they were described above) it seems that the following aspects might have played an important role: the text background colour, font shape and its colour, the way of marking the parts of the text (i.e. sentences, words), the layout (graphics) and the location of the elements.

5. Discussion

The experiment was based on the assumption that a group of upper(secondary) school students is not homogenous and that may influence the way of working with the school materials as all these diverse students use the same (glotto) didactic materials.

The most important results (made on the basis of data analysis by means of the areas of interest but also heat maps and scan paths that were not presented in the article) of the experiment are as follows: (1) it turned out that the *working area* was mainly the same as the *task area* but in both materials it expanded a bit to the right (some of the students concentrated their visual attention not only on the task but also on the exercises or their parts on the right hand-side of the materials); (2) non-dyslectic students paid more visual attention to the parts of the text and questions to the text in both materials; (3) every dyslectic student and almost every non-dyslectic student watched the pictures from the black-and-white text. Whereas not every dyslectic and not every non-dyslectic student watched the pictures in the colourful material, (4) the picture of man's face in the black-and-white material (the right photo) attracted more attention, (5) exercise numbers misled a few students, both dyslectic and non-dyslectic, in the black-and-white material (i.e. some students found and started working with exercise 2 on page 32 instead of exercise 2 on page 31), (6) more dyslectic than non-dyslectic students were interested in the right side of the materials, (7) words in bold in the texts of both materials were difficult to find.

It also turned out that: some group of the students does not read the task – it could have been observed in 34% of cases (4.7% of dyslectic students cases and 30% of non-dyslectic students cases); sometimes the students do not understand the task and they do not ask for explanation; the students have different strategies of completing the reading activity (it seems that in this particular experiment group dyslectic students were more chaotic); students are sometimes misled by the exercise numbers (if in the materials there are exercises numbered in the same way); students are tempted to rely on their knowledge if they know the topic (that happened in case of the black-and-white material – the text was

devoted to the Dorian Gray story by Oscar Wilde and those who knew the plot asked if they can complete the exercise relying on their memory of the book instead of reading the text; such a decision may influence the final results of the student).

The eye-tracking methods used in the experiments show that in the analysed group there occurred some differences between non-dyslectic and dyslectic participants, although they were not as significant as it had been thought. They also confirm that from the point of view of the efficiency of work it is important what the layout of the textbook/workbook is, as well as where and how the particular elements of the layout are located. If the authors of the textbooks were aware of that, they would locate the (glotto)didactic components in a way that would help the process of learning.

6. Conclusions

The above experiments show that there are some differences in the way of working with the experiment materials between the students in general, as well as between dyslectic and non-dyslectic ones. However, it is too early to say that they are characteristic features of both groups of students. To check it more experiments will be conducted as well as the materials will be rotated. What is more, a good idea will be to have a pre-questionnaire filled in by the students. The pre-questionnaire would specify some problems (i.e. sight problems) that would exclude the student from the experiment before it started (and this would save a lot of research time).

References

Amso, D., S. Haas and J. Markant 2014. An eye tracking investigation of developmental change in bottom-up attention orienting to faces in cluttered natural scenes. *Plos One* 9: 1-7. Retrieved from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0085701 (30.12.2015).

Bogdanowicz, M., and A. Adryjanek 2005. *Uczeń z dysleksją w szkole – poradnik nie tylko dla polonistów*. Gdynia: Operon.

Bogdanowicz, M., A. Adryjanek and M. Rożyńska 2007. *Uczeń z dysleksją w domu. Poradnik nie tylko dla rodziców*. Gdynia: Operon.

Duchowski, A. 2007. *Eye tracking methodology.* Clemson: Springer**.**

Habib, M. 2000. The neurological basis of developmental dyslexia. An overview and working hypothesis. *Brain* 123: 2373-2399. Retrieved from: http://brain.oxfordjournals.org/content/brain/123/12/2373.full.pdf (25.10.2015).

Homlqvist, K., M. Nyström, R. Andersson, R. Dewhurst, H. Jarodzka and J. van de Weijer 2011. *Eye tracking. A comprehensive guide to methods and measures.* New York: Oxford University Press.

Pfeiffer, W. 1975. *Teoretyczne podstawy preparacji materiałów glottodydaktycznych.* Poznań: Wydawnictwo Naukowe UAM.

Pfeiffer, W. 2001. *Nauka języków obcych. Od praktyki do praktyki.* Poznań: Wagros.

Quintana, J., J. Sosnowska and D. Gryca 2011. *Oxford excellence for matura. New exam builder.* Oxford: Oxford University Press.

Styszyński, J.C. 1993. Rola i funkcje podręcznika w nauczaniu języka obcego. *Zeszyty naukowe Uniwersytetu Szczecińskiego* 2: 55-74. Retrieved from: http://www.ackj.usz.edu.pl/attachments/article/240/podrecznik.pdf (02.07.2015).

Internet sources

http://www.neurodevice.pl/en/services/eye-tracking (21.10.2015).

http://www.smivision.com/en/gaze-and-eye-tracking-systems/products/red250--red-500.html (21.10.2015).

http://twiki.cis.rit.edu/twiki/pub/MVRL/SmiTracker/begaze2.pdf (29.12.2015).