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9. КОНФЕРЕНЦИЈА „ИКТ У ОБРАЗОВАЊУ”

ПРОМЕНА ПАРАДИГМЕ
У ОБРАЗОВАЊУ И НАУЦИ

9. IKT AZ OKTATÁSBAN KONFERENCIA

PARADIGMAVÁLTÁS
AZ OKTATÁSBAN ÉS A TUDOMÁNYBAN

9. KONFERENCIJA „IKT U OBRAZOVANJU”

PROMENA PARADIGME
U OBRAZOVANJU I NAUCI

9th ICT IN EDUCATION CONFERENCE

CHANGING PARADIGMS
IN EDUCATION AND SCIENCE

УНИВЕРЗИТЕТ У НОВОМ САДУ УЧИТЕЉСКИ ФАКУЛТЕТ НА МАЂАРСКОМ НАСТАВНОМ ЈЕЗИКУ У СУБОТИЦИ
ÚJVIDÉKI EGYETEM MAGYAR TANNYELVŰ TANÍTÓKÉPZŐ KAR, SZABADKA
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Зборник радова

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Paradigmaváltás az oktatásban és a tudományban

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SUPPORTING DYSLEXIC STUDENTS WITH ONLINE EDUCATIONAL MATERIALS IN HIGHER EDUCATION

Abstract

Nowadays, the central question is how the learning methodology of dyslexic students is supported in higher education, and according to which methodology this help can take place within the framework of distance learning. Starting from the University of Pannonia, an inter-institutional research group was organized in 2022 on the issue. The aim of the research is to develop learning methodological support for dyslexic students in higher education within the framework of distance learning. We implement all this with a learning methodology educational material created in the Moodle framework. In the course of the research, we mapped the online educational materials that support the more effective learning of dyslexic students. Knowing the appropriate learning methodology techniques for dyslexic students, we list the appropriate task types that can be implemented on the online interface, as we apply these types within the framework of the forthcoming Learning Methodology distance learning course.

Keywords: *dyslexia, distance learning, learning methodology, effective learning*

1. Introduction

Education faces many important challenges these days. One such challenge is to support the learning methodologies of dyslexic students in higher education, and how this support is realized within the frameworks of distance learning. This issue is especially intriguing as in distance learning the settings enable students to rely on their ability to study independently, yet they are not left without help, as a wide range of technical and human support is available for them.

At the Institute for Digital Methodology of Pannon University, the practice of our distance learning methodology (supporting online learning environment, interactive learning materials, productive learning tasks, support of learning methodology, mentoring, regular feedback and assessment) is based on several years of experience and quality of education of the MA and graduate courses at the faculty for distance learning. Our system for distance learning meets the standards of the Hungarian Accreditation Committee (MAB) for distance learning courses at MA level, as well as the criteria for quality assurance.

In the light of these our basic question was how the „Learning methodology in distance learning" course, currently run by the Institute for Digital Methodology at Pannon University, could be improved in such a way that it may effectively support the learning processes of dyslexic students. Furthermore, based on our experience, how we should alter the learning materials for distance learning, developed at the Institute so far, so that dyslexic students could make good use of them.

As a result of this research and development, our goal is to elaborate a distance learning methodology learning material, which enables dyslexic students to be active and successful participants of distance learning. This should make such distance learning materials available for dyslexic students that assist them and make their learning effective, their education more personalized, the range of courses available for them wider, thus opening the door for them to aquire new qualifications. By doing so, the research contributes to improving the accessibility of equal opportunities for dyslexic students in higher education.

It is important to note that the issue of supporting dyslexic students in higher education is not an isolated case of the individual institutes, but concerns higher education as a whole. Therefore, on the

long run, an inter-institutional and international research is to be realized. Thus, it is inevitable that employees in higher education (educators, master teachers, educational managers, administrators, etc.) cooperate with each other in issues concerning all institutes involved, which may contribute to the improved learning opportunities of dyslexic students.

2. Theoretical background of the research

There is a wide choice of literature available in the subject of dyslexia. The present research aims to focus on those antecedents which could assist us in selecting methodology when developing learning materials that support the efficient learning of dyslexic students in higher education.

Éva Gyarmathy's work Dyslexia in higher education (2010) serves as a guideline for our research, as it offers specific ideas and suggestions for developing learning materials, with respect to both typography and structure. She points out the significance of the genre of texts that students have to read and process through related tasks. Students in higher education, including the ones with dyslexia, need to be able to express themselves in various genres, both in speaking and writing. It is important to note whether the genre is oral or written. This could serve as a starting point in finding the possible alternatives along which dyslexic students are able to meet the requirements of the university courses.

In the context of preparing learning materials, Éva Gyarmathy describes different ways (paper-based learning materials: books, tests, prints, handouts), and also touches upon the topic of lectures, seminar learning materials and instructions prepared by means of computer programs. Our present study seeks solutions in the form of distance learning, with special focus on typography (font, font size, font colour, background colour) and learning material structures (length of text, text-to-image ratio, text-to-audio ratio) that are efficient also for dyslexic students. Experience in the field of paper-based learning materials could serve as a good starting point.

2.1. Conceptual framework

The present study does not aim at summarizing all existing conceptual approaches of dyslexia, since „The difficulty of understanding the complexity and comprehensiveness of dyslexia is reflected in the diversity of its definitions. To date, there is no uniform, exclusive definition describing the phenomenon, which the experts of dyslexia would use by mutual agreement." (Gátas-Aubelj, 2019. 13.). However, it is important to note what framework the research uses when examining the context of dyslexia.

Dyslexia is not an isolated phenomenon in itself, it is not merely a deficit related to reading and comprehension. It is connected to language, speech, the process of learning to read, and thus to reading comprehension as well. This complex approach is found in Valéria Csépe's chapter on *Reading disorders and dyslexia* (2014): „Due to this complexity, dyslexia cannot be described as merely a reading and/or spelling disorder…" (Csépe, 2014. 1359.)

With respect to distance learning – when creating the learning environment, developing the learning material and related exercises, and deciding on the methods of assessment – we need to take this complexity into consideration. The wide range of educational opportunities for distance learning materials provide us with the freedom „not to emphasize the lack in the case of dyslexic students" (*Dávid*, 2015. 80.).

2.2. Font, font size, font colour

We should facilitate and support the processing of texts for dyslexic students with the choice of typography (font, font size, and font colour). In the course of distance learning the significance of font colour and background colour increases, since students need to be able to read instructions and information on the screen of a computer, tablet, or even phone.

Undeniably there are several special, exquisite fonts available. However, in case of a learning material made also for dyslexic students, the choice of font matching the content of text should inevitably be overruled. When choosing fonts for dyslexic students, we must pay attention that the width should be the same for each letter. Therefore, Arial, or even ComicSans could be suitable fonts for dyslexic students. Some fonts (e.g. Times) become broken on the screen, making reading significantly more difficult (*Gyarmathy*, 2010).

It is worth mentioning some font types which were specifically developed for dyslexic students: Sylexiad, Dyslexie, Read Regular, and the open source OpenDyslexic (a specific Chrome extension enables displaying the text even in OpenDyslexic) https://s-e-o.org/which-font-is-best-for-dyslexic-

users-the-science-reviewed). However, it has been proven to date that these special fonts do not increase reading efficiency for dyslexic students. In 2013, researchers at the University of Michigan attempted to objectively measure the interference between reading performance of people with dyslexia and the choice of special fonts developed for them. No connection was found (*Rello and Baeza-Yates*, 2013). A study published in 2018 arrived at a similar conclusion. This study also examined whether the font Dyslexic facilitates reading with dyslexic or non-dyslexic people. "The font Dyslexie was favored the least by children with and without dyslexia at the word level. … We found no effect of reading a text or words in the preferred font on reading performances for dyslexic children or for children without dyslexia." (*Kuster, Weerdenburg, Gompel és Bosman*, 2018).

According to the recommendations by the British Dyslexia Association, learning materials for people with dyslexia should primarily use the following fonts: Arial, ComicSans, whereas the following may also be suitable: Verdana, Tahoma, CenturyGothic, Trebuchet (Dyslexiafriendlystyleguide).

Besides font type, the choice of suitable font colour and background colour needs to be emphasized when developing learning materials for dyslexic students, as they have a high contrast sensitivity. Therefore it is practical to avoid white background, beige is preferred instead (*Gyarmathy*, 2010).

With respect to font size it is important that it should not be too small. A minimum of 12 pt font size is required so that the learning of dyslexic students is not hindered. „The question of font size is not of paramount importance, even though several dyslexic students state that at least a font size of 12 pt is recommended on paper-based documents. Regrettably, books often use a smaller font size for economic reasons." (*Gyarmathy*, 2010. 54.) It is beneficial to choose a font size even bigger than 12 pt. We also need to note that these days several magnifier programs are available for screen display, which may bridge over this difficulty.

In our present study we put special emphasis on using those font types, font colours and sizes for distance learning materials which are proven to be efficient for students with dyslexia.

2.3 The structure of the learning material

When planning and developing learning material for distance learning, we must be aware of the special needs and difficulties of the target group – in this case, the students in higher education – in order to be able to prepare personalized, efficient learning material.

It could be a good starting point to take into consideration the characteristics of brain dominance of the target group. Research shows that in case of dyslexic students right-brain dominance is stronger, whereas left-brain dominance is stronger in the majority of society. As a result, the strategies of dyslexic students for processing information are different (*Gyarmathy*, 2007).

Table 1. *Text structure and brain dominance*

Left-brain dominance	**Right-brain dominance**
sequential approach	visuality, spacial abilities
step-by-step progress	emotions, sense of humour, love of music
good handling of connections	wholeness
analyzing	no analyzing

It shows clearly that distance learning materials for dyslexic students need to be structured along different methodology. Based on the literature concerning dyslexia, we may conclude that when preparing distance learning materials, it is practical to start each chapter with a summary or abstract, which enables the students to see the topic as a whole. It is important to place the individual topics on one page each, with as many interactive exercises as possible, to facilitate processing. It is equally important that instructions should be clear and accurate, as this will enable individual learning for students. For an online learning material it is inevitable to be simple, logical and clear. In such a case, the main aspect is usefulness much more than design. The legibility of the learning material needs to be examined from this aspect, and has to be harmonized with the range of abilities of the target audience.

In order to ensure legibility, the length of sentences should be fixed at 15-20 words. The text should be concise, with simple but not condescending vocabulary. It is practical to use bullet points, the passive voice must be avoided, and introduction of new concepts should only be allowed after previous concepts have been explained adequately (*Gyarmathy*, 2010).

We must be aware that the target group may have a slower reading pace, and the speed of reading may not be adequate for the given pace either; they may understand and remember what they have read to varying degrees, they could have problems with skimming for gist, or building new words into their active vocabulary and connecting them to prior learning, while reading for an extended time may also be problematic (*Dávid*, 2015).

The surface for distance learning may provide developers with the opportunity to work with a wide ranging symbol system, which may greatly support the individual learning of dyslexic students, as they build on the strengths of exactly those areas of the brain (the right side) that is dominant in dyslexic students. These symbols should be applied in a creative, yet clear way. „We can apply symbols and images to facilitate the student in understanding written instructions, and assessing their level of difficulty" (*Fekete-Darmos and Radics*, 2018. 13.).

3. Research methods and research patterns

In the course of research we apply the agile methodology for learning material editing. We believe this method is suitable for avoiding the inconvenient situation that by the time the distance learning material is finished, it turns out that both the content and the means are different from what the client had in mind. In case of learning content made for dyslexic students it is specifically important that there is continuous communication and feedback between the developers and the target group. Developers need to be aware whether the surfaces, exercises, the learning material structure, as well as the symbol system they are preparing is suitable for the target group. They need to be flexible and, if justified, change the direction of development based on the feedback from the target group, trying to find solutions for the problems that emerge. „(we value) responding to change over following a plan" (https://agilemanifesto.org/iso/de/manifesto.html).

The target group of the present research are the dyslexic students in higher education. Keeping in line with the laws for personal data protection, we contacted students via an online form. It is important to note that the contact form included a video in which both the research group and the goal of the research were briefly introduced. The significance of this step is that, working with dyslexic students, spoken communication is preferred in the course of research. It follows from the above that structured interview with open-ended and yes-no questions serves as the basis for our research methodology. Moreover, we are planning to test the learning material we are currently developing in a focus laboratory at Pannon University, therefore the observance will appear among the research methods. In the focus laboratory accessible for us we have the opportunity to examine eye-movements, which enables us to study the level of alertness of the students, and the methodology they use when doing the various tasks. We must also emphasize that the eye-movement examination enables us to measure the time students spend reading and solving the individual tasks. Based on these observations even more personalized reading comprehension tasks could be integrated into the distance learning materials.

4. Connecting research and development

The processes of research and development are strongly connected in our work. Research work has been and continues to be conducted with the methods described above.

As part of our researh, we wish to give account of the exact number of dyslexic students (those who hold an official document of their dyslexia) currently studying in higher education. Considering that our research is both inter-institutional and international, we trust that the data will be as accurate and differentiated as possible (broken down between institutes, faculties, and majors). The learning techniques of dyslexic students have already been researched, however, the focus of our present study is the dyslexic students in higher education, and our goal is to draw an accurate map, and a thematic list of their learning techniques. This is all the more necessary since the distance learning material in progress is being developed primarily in the subject of learning techniques. In our opinion, it is inevitable to explore the types of exercises and typographical solutions which enhance the learning efficiency of dyslexic students. It is among our plans to create a „map of student demands" – showing how students imagine the suitable distance learning material.

We wish to highlight that following the agile methodology with respect to development is essential for us, therefore we put great emphasis on giving continuous feedback to the developers of the distance learning materials, based on the findings of research. We also examine the effectiveness of the learning technique and distance learning materials (available in Hungarian), created in the course of the development process. In the light of the results we are to decide whether to create the learning materials in foreign languages as well. Furthermore, we look into possible ways of including these experiences in the current distance learning materials, which could increase the efficiency of the learning process of dyslexic students.

5. Ideas for learning techniques materials in progress

We have not found any Hungarian learning material specifically designed for distance learning which is also suitable for dyslexic students, but the existing platforms where we can create exercises that could facilitate the learning process of dyslexic students may serve as a good basis.

While the material on learning techniques is being developed, the following softwares are recommended:

Software for creating word clouds, e.g. Wordart, Wordclouds, Tagxedo, and WordItOut. The latter has a great advantage of connecting the word cloud function with the emoji function.

Different programs for creating puzzles can play an important role in learning. One such example is the Discovery Education Puzzlemaker. This surface offers various excellent opportunities for users to create and edit exercises for learning new materials. "The program is suitable for improving the following skills and competences, inevitable for learning: visual attention, perception, orientation, mother tongue competence, shape constancy, digital competence, grouping, assessment, classification, generalization, highlighting gist, analysis and synthesis, general knowledge, spacial orientation. This application could be useful at dyslexia prevention and re-educational sessions. Use it to create crossword puzzles, labyrinths, word search and maths exercises. It could also be used for processing a given text, for example: discussing characters, objects, and events with the help of a riddle. Crossword puzzles make students search for words, or create words from jumbled letters."
(https://www.oktatas.hu/pub_bin/dload/kozoktatas/tavoktatas/Modszertani_gyujtemeny_01_08_compressed.pdf).

It is important to mention Riddle, a surface for creating tests, quizzes, questionnaires. We can attach images, videos, and articles to the tests, which could be specifically important for dyslexic students in higher education. Images and videos help clarify the tasks, or make them easier to understand, since we can build on the right-brain dominance when designing these exercises.

Wordwall has various types of exercises with a wide range of use to choose from. This page is worth visiting as it has an exercise bank with several exercises that offer help specifically for dyslexic students, but also provides the user with the opportunity to create new ones. Event though the use of this page is less widespread in higher education, it is worth gathering ideas from the types of exercises and the solutions it offers.

It is a curiosity, and definitely an important experience to get to know those websites and programs which show us what it is like to read as a dyslexic person. These surfaces are actually dyslexia simulators: https://tll.gse.harvard.edu/dyslexia-simulator orhttps://edition.cnn.com/2016/03/05/health/dyslexia-simulation/index.html or https://www.sldread.org/dyslexia-simulator/. These surfaces may serve as resources for various methodological ideas, as we can see and experience how the flow of letters appears in front of our eyes if we read like people with dyslexia do.

6. The proposed structure of the learning techniques material in progress

The learning material on learning techniques is being developed within the framework of Moodle, version 4. It is inevitable that students participating in distance learning should be familiar with this framework, as they will only be able to use it efficiently if they start the learning process by familiarizing themselves with their learning environment and the technical solutions it has to offer.

First we need to fix the meaning of those symbols which the students may encounter within the framework of distance learning courses. The system of these symbols must be clear and transparent, as this is a basic requirement in a learning setting such as the one we prepare for dyslexic students.

The distance learning material currently in progress will consist of eight modules. The first module facilitates students of higher education, despite distance learning, in connecting with their fellow

students, whether simultaneously or not. This is of great importance: even though we are dealing with distance learning, cooperating with fellow students and solving tasks together could be effective. This module may also be helpful in introducing students to other online surfaces required for making appointments.

The second module supports students in examining what they expect from the course they appliedto. They are given a task to record their ideas - and they may do this in different forms, if they choose to: mindmap, chart, voice recording, or any alternative solution which can substitute written feedback.

The third module is an "exercise within the exercise": students have to find content elements in a learning material connected to learning techniques, and create a list which offers advice to fellow students on how to study efficiently in an online environment. It must be mentioned that this learning material is also available in audio format, and the completed task has to be uploaded to a database shared with fellow students. Similarly to the previous ones, this exercise may also be realized using various techniques (mindmap, voice recording, collage, list, etc.). The fifth module is also listed within this context: fellow students can edit a glossary together. The seventh module is similar: after watching a video about learning techniques students have to prepare an outline of the video in a google drive document, which may be edited by all participants. This way students learn how to study non-simultaneously, but still together.

The fourth module offers points of reference for assessment and recording answers.

The sixth and eighth modules leave space for self-reflection. In chapter six students have to plan their own time schedule. This is one of the most important factors within the framework of distance learning, as it requires students to plan ahead accurately in order to be able to study on their own, effectively, and manage their time. Chapter eight provides an opportunity for reflection, as students are given time to consider, in the light of what they read or heard, what plan they would like to follow, and how they will start individual studying among distance learning settings.

The final task of the learning techniques material deserves special attention. We ask students for feedback along the line of some questions which facilitate reflection: how useful they found the course, how much the learning material helped them overcome their learning difficulties and increase their self-confidence. Bearing in mind that the course was made also for dyslexic students, answers may be submitted in a form of their choice (preferably audio or video). We will find these reflective answers especially useful when working on further improvement and refining of the course, emphasizing, again, the agile methodology and continuous feedback.

7. Summary

We look forward to the research, since its result could be significant in the context of dyslexia and distance learning. The importance of the research should be emphasized for several reasons:

1. It is going to provide us with accurate data and give account of the number of dyslexic students at the institutes of higher education participating in the present research, and the majors these students attend.
2. It is going to result in a thematic list of learning techniques that dyslexic students participating in the research apply in the course of their learning process, and show us the extent to which this is in line with the directions described in the literature.
3. Our further aim is to create a typology of exercises for dyslexic students in order to make learning more efficient for them in distance learning settings. A map of demands is to be realized, revealing how dyslexic students participating in the research imagine a distance learning material which is useful and efficient for them. The learning material for techniques in distance learning is to be developed in the light of these experiences.

The research has significant social-economic added value. Through the development of the learning material, dyslexic students will have access to such distance learning materials which will enable them to learn more efficiently, have more personalized education, thus widening their range of training and opening up opportunities for them to acquire new qualifications. All these could have great significance with respect to equal opportunities and also from the aspect of schooling.

We trust that our learning material for distance learning methodology, created as a result of research and development, will fill a void, as it enables dyslexic students to participate in a form of education where they have had less opportunities to join previously in the light of efficient learning.

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