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Teacher Training for Developing of Supportive Environment through Computer Technology for Prevention of Early School Drop Out

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Abstract

Educational reasons are some of the most common causes for early school drop out and are directly linked to the professional competencies of educators and their role in the educational processes. Solving those issues is possible and meaningful for the establishment of supportive environment which allows equal access to education to all and is the basis of preventative measures against early drop out. Informational technologies could be helpful to create a supportive environment in schools by improving education and easing the learning process, knowledge acquiring process and creating opportunities for students to achieve more by developing their intellectual qualities.

The article presents a model of in-service post-graduate teacher training for enriching knowledge and skills, development of digital supportive environment for prevention of early school dropout especially when working with students with low motivation and difficulties in learning. The training was implemented among in-service teachers as well as in the bachelor's and master's program for students in pedagogical majors. The following methods for teacher training for working in a supportive environment are explored:

- visualization of educational content through multi-media presentational learning materials
- visualization of educational content through mind maps
- digital games for cognitive development
- applied programs for cognitive development

Key concepts related to ideas for the development of didactical materials for visualization of educational content applicable for the general education. Development of skills of trainees during the practical training is a prerequisite for applying elements of supportive educational environment for students at risk of early drop out.

Keywords: informational technologies, electronic resources, supportive environment.

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Introduction

Today's generation of students is born, growing up and learning in a highly technological environment which changes both the relations between all participants in the educational process and the requirements toward the professional pedagogical competencies of their teachers. On one hand -the high expectations toward digital technology for positive influence on the educational quality and achievements is inevitable. On the other hand-there is the negative and troubling phenomenon like early school dropout related to lack of motivation and learning difficulties. The National "Strategy for reducing the share of early school drop out (2013-2020)" outlines the main reasons for dropping out from schools: economic, social, educational, ethno-cultural, institutional, as well as health-related reasons. In a study entitled "Reasons for dropping out of school" conducted by Vitosha Research, together with the Ministry of Education and Science in 2006, one of the groups of causes in this negative process is pedagogical and they are manifested in different directions. The same study show that although two-thirds of dropouts felt that they liked going to school, 47% said the study material was very difficult for them, and 30% did not understand what they were taught. Around 41% of drop-outs said they were not interested in school and were bored. (www.nccedi.government.bg/upload/docs/Broshura_otpadasti_ot_uchiliste.pdf). The analysis of collected data during the study, highlighted "objective aspects of the school environment that influence the risk of dropping out of school – the effectiveness of pre-school preparation, the quality and complexity of the curriculum, the qualification of the teachers".

Problem Statement

The very same processes directly related to the professional competence of teachers and their immediate role in school are the educational reasons outlined in the "Strategy for reducing the share of early school drop out (2013-2020)" as "including a wide range of problems: difficulties in comprehension of learning content, poor teaching methodology and in the organization of training ".The educational reasons outlined by the same Strategy also include "how to evaluate, teacher qualifications, learning habits, teachers' negative attitude and lack of motivation, the quality of textbooks." Plausible solutions to preventing dropping out consist of proper teacher qualification to provide a supportive environment with equal access to education facilitates learning and positively affects the motivation to stay longer in school.

In a broad sense, the supporting environment includes appropriate infrastructure, proper living conditions, different technological equipment, appropriate didactic materials and teaching aids, the environment in which all children live, learn and develop their potential. If we look at the environment in a much more narrower sense, from a pedagogical point of view, depending on which key concept the study is focused, the concepts of "learning environment", "learning environment", "pedagogical environment" "Learning environment", "learning environments", "interactive environment", "virtual environment", etc are introduced. (Branekova, 2010; Zhuk & Sirenko, 2011; Zaharova, 2008). Informational technology improves access to education for learners of all ages, facilitates the perception of knowledge, fosters confidence, and empowers students with learning difficulties to develop their intellectual qualities with less effort. By doing so information technologies can help turning schools into a supportive environment for each child and for each student. The teachers' qualification in the field of information technology is among the main factors to turn this opportunity a reality.

On the other hand, the modern reality of globalization and dynamic changes requires both teachers and current and future pedagogues students to acquire knowledge and develop skills needed for economic and social success in the 21st century. Parallel to this, the high-tech environment we live in requires specific

skills that highlight digital competence. The digital skills needed in the economy and business field are very expert-based, the digital skills in the education sphere are universal, with a high degree of sustainability.

Research Question

Interviews of teachers provided insides for what was the most needed in such training. Most of the participants agreed that having a positive attitude toward all the different components of digital educational environment is a start. Taking into consideration the preliminary research and practical experience the following needs are outlined:

- Mastering of methods and techniques for use of variety of electronic devices as components of supporting environment for students with low motivation and learning difficulties;
- Introducing positive aspects of educational space for development of supportive environment;
- Development of digital competencies for implementation and adaptation of adequate educational software and for individually preparation of electronic resources, which helps learning and increase motivation for learning.

Those needs have an impact on the content directions of the ICT discipline in learning and working in a digital environment. The training's main purpose to implement the theoretical and practical training for specialists in the structuring and building a supportive environment with application of computer technologies. The practical training is oriented towards mastering methods and techniques for using different digital environments and applications as components of the supporting environment.

Purpose of the Study

The study's aim is to present a model of teacher training for acquiring knowledge and skills for a digital supportive environment for preventing school dropouts in groups of students with low motivation and learning difficulties.

Research Methods

The following methods were used in the study: theoretical analysis, observation, questionnaire.

Main Content Aspects in the Training

1. A supportive environment through the visualization of the learning content through multimedia presentation materials

In studying participants attitudes on the matter, the topics of personally-developed electronic resources for visualization of educational content are among the most preferred, which is easily explained by their desire for the development of their digital competence. On the other hand, they emphasize the practical direction and relevance of such topics in the classroom.

Through the visualization of the educational content the basic didactic principles of visibility and accessibility are achieved; on the other hand, the visualization is the basis of the most commonly used training methods such as illustration, demonstration, modeling, etc. In his analysis of the principles of information visualization, Yanakiev (2014) systematized 7 attributes for explaining the facilitating image function in the perception of information, namely why the images make the text more concentrated and clear, more concise, more specific and real, understandable, more accessible.

To these characteristics the same writer adds that "images evoke motivation for reading, stimulate creative thinking, reduce confusion and forgetfulness, serve as a foundation for thought-based development, help to enrich the vocabulary and literacy of children" (Yanakiev, 2014, p. 48). These conclusions directly correspond to the opportunities for implementing a supportive environment to facilitate learning.

Digital technologies offer rich and diverse means of visualizing information in the form of multimedia content such as a collection of text, graphics, video and audio sounds. The most popular and most

accessible media content programs are presentation applications which makes them preferable and applicable for learning purposes. In the teacher training forms, as well as in the training of the student-educators, along with the formation on the skills for creating multimedia materials, the main emphasis is placed on the methodological preparation for the application of these materials. The learning module for visualizing the content through multimedia presentations is conceptually presented in Figure 01.

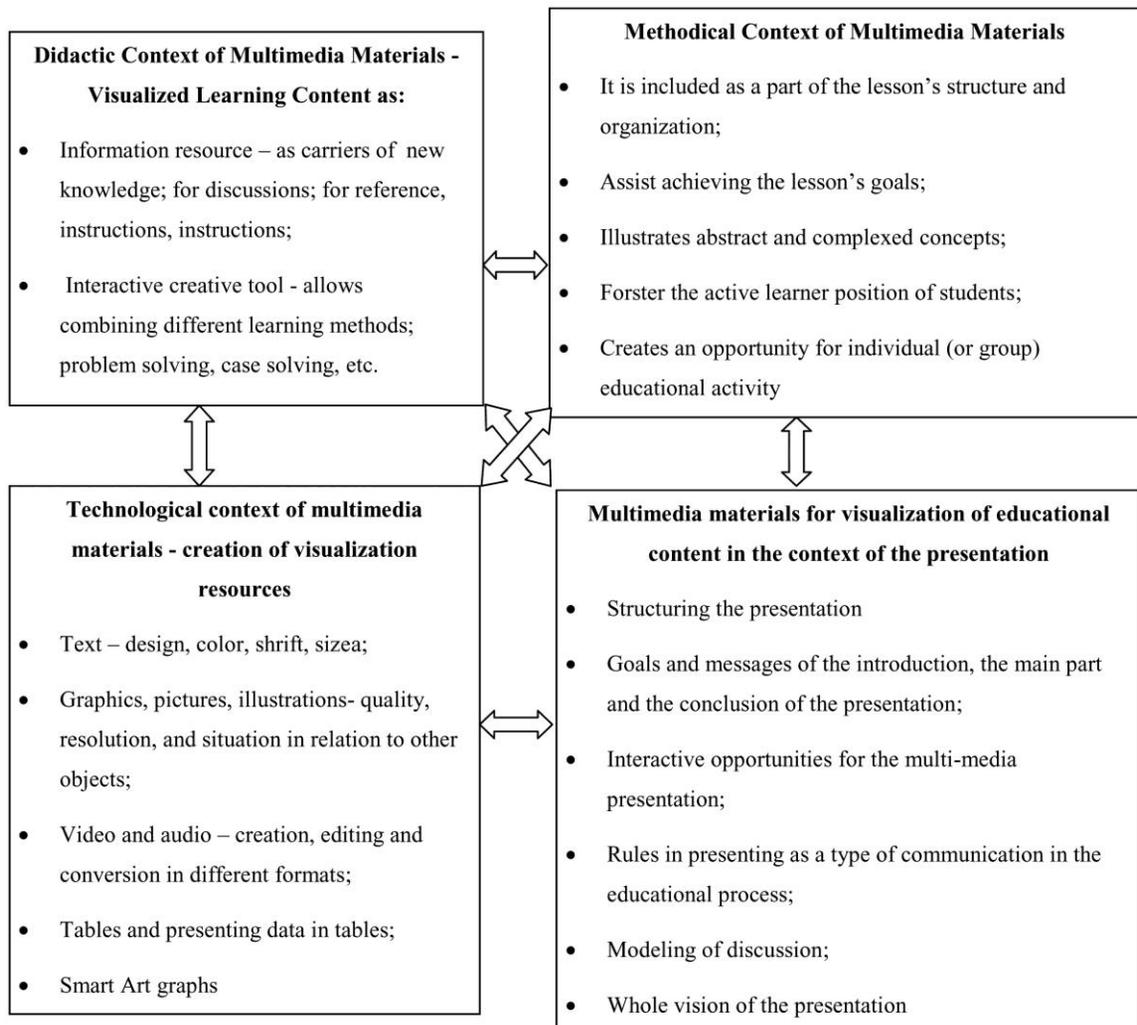


Figure 01. A model of a training module for visualization of the educational content through multimedia presentations

2. Supporting environment through visualization of learning content through mind maps

Scientific literature uses different terms for mental maps with: cognitive maps, heuristic schemes, intellectual maps. All of them define schemes that reflect the functioning of thought, help to emphasize the semantic links between concepts and information related to them. (Yanakiev, 2014, p. 119). Through these maps and on the basis of content analysis, a suitable method for structuring learning content around certain

concepts is obtained. Most commonly, the content analysis is defined as a method of researching large amounts of information. The essence of the visualization method through mind maps consists in: creating a graphic model underlying one or more central concepts - a nucleus or cores and related concepts and terms based on content analysis and associations. (Kostova, 1998). Depending on students' age and their intellectual and cognitive level, this map can be expanded and detailed with subsequent sub-concepts and terms. Such activity creates a complete picture of visualization of a particular concept, which facilitates its absorption and application in solving tasks.

Teacher training includes a module for mind mapping skills through the Mind Master program. It is available online in <https://www.mindmeister.com>. It was created in 2007 by Meister and is one of the most used mindset programs in the world. The basic version of the program is free, and "Personal", "Pro" and "Business" are paid. The baseline version offers up to 3 mind maps, community support, and real-time collaboration (Real-time collaboration).

The program is cloud-based, and users has 1 GB of disk space for storing their projects. It works with all web browsers for computers and mobile devices. In order to work with MindMaster, it is necessary for the user to register or to use already registered registration on Google or Facebook.

The MindMaster program has the following basic features:

- Real-time collaboration - when creating or working on a real-time map by multiple users (teachers and students), maps are updated in real time. This allows team members to work synchronously regardless of their location;
- Has built-in presentation mode for easier presentation of acquired knowledge;
- Mind maps can be exported as text files, PDFs, presentations and images and printed on a large scale (Figure 02);
- Spreadsheets, PDFs, images, charts, videos, and more can be attached to the mind maps.
- evaluations and comments - have built-in feedback functions.

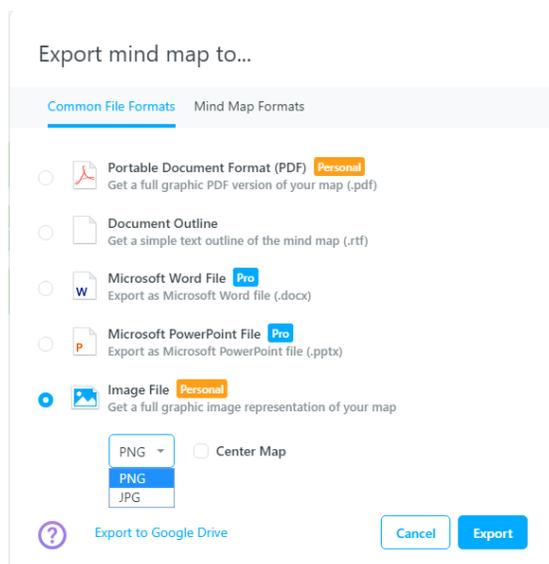


Figure 02. Export module

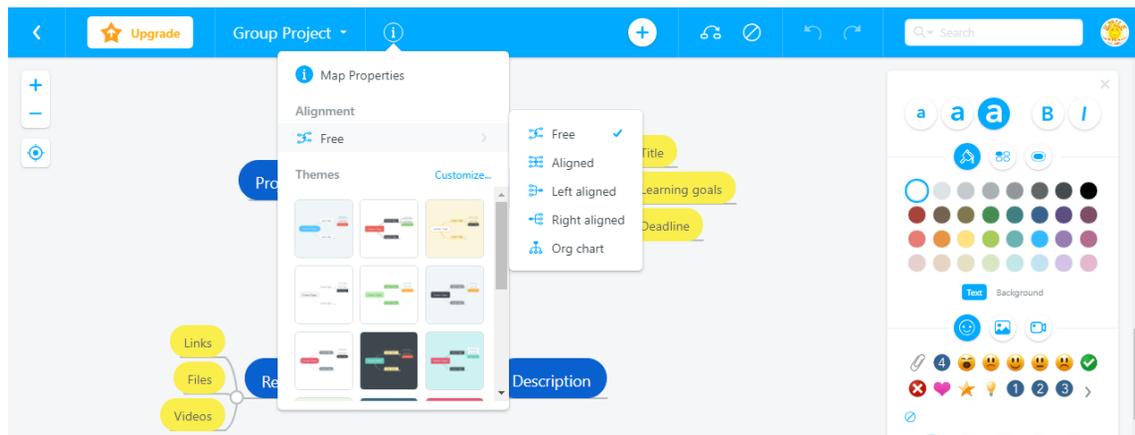


Figure 03. Changing the settings of mind-mapping

With MindMeister, a new mind map on a blank file could be created, or using a template from a finished template collection. When creating a new mind map, a “root” topic, a “child” topic, and “sibling” topics can be defined to add keywords and ideas. The user can change the layout and theme without changing its contents. The theme can be chosen from a premade card gallery or create a new one. (Figure 03)

Themes can be formatted by changing the font size, font color, or background color of the sidebar in the program panel (Figure 03). Any change to the theme color affects the text in it.

Images, icons and videos can be added to the themes using the ribbon to the right of the program panel

  . Icons are selected from a ready MindMeister icon gallery. An image can be selected from the finished gallery or added from the local disk of the computer, from the Internet or drawn with the MindMeister’ drawing editor, which is available only for paid versions of the program.

Any notes, comments and votes (evaluations), links to external websites, or other thought cards and attachments can be added to each of the themes in the thought card. A corresponding icon appears next to the topic in which information is added. By clicking on the icon, the added information is displayed on the screen.

Between the different ideas in the mind map, links can be added using arrows. Once the arrow is drawn, the user can change its shape, color, add a label, or delete it.

Mind maps can be shared by specifying user’s rights for sharing - viewing or editing. Sharing rights can change or be terminated. Sharing is by invitation via email or via a link which allows more than one person to work simultaneously on a mind map.

Mind maps are used in education to facilitate learning, increase the efficiency of the learning process, and enhance the achievements, engagement and fostering the students’creative potential. They are applicable to students of all ages. Through mind maps, concepts and relationships between them can be visualized, which facilitates the understanding of different processes and phenomena. Depending on the individual cognitive abilities of the students, the mind maps allow the presentation of concepts to a certain level in the hierarchy by links with other concepts and terms.

3. A supportive environment through digital games to develop thinking

In the National "Strategy for reducing the share of early school drop out (2013-2020)", primary attention is paid to the activities at primary school age. Motivation and interest in education are some of the factors for

keeping children in school. The presentation of learning content in a entertaining way and in the form of electronic resources - games helps to solve some of the main objectives of the training, including the development of logical and algorithmic thinking and the potential for creativity. This necessitates the need for teacher training and expanding the opportunities for implementing a supportive environment through digital technologies, through the inclusion of a module "Environment for block visual programming with game character".

Scottie Go! is an innovative block programming game for children to acquire basic programming skills. It consists of a desktop game and an application that can be installed on a mobile device (laptop, tablet, mobile phone, etc.) with a camera. The board game contains cardboard tiles with various commands to construct the game's character movement programs - Scottie. The application assigns a task to the students and scans the program that they have created, and is displayed on the device's display. The application is compatible with the most common operating systems for mobile devices - Windows, Andorid and iOS.

The game has several steps. The first step, the app offers a task for students who have to compile a sequence of actions to move Scottie along a trajectory, avoiding obstacles along the way. The second step is creating the sequentially arranging the blocks in the game, starting with the "Start" block and finishing with the "Finish" block. The third step requires scanning of the arranged blocks through the camera on the mobile device. The application then reads and executes it, and Scottie moves to the sequence of commands set by the students.

The game can be played alone or in groups of 2-4 students. It is constructed on levels with increasing difficulty. The game develops logical and algorithmic thinking in students, teaches problem solving, working in groups, and supports the development of competences in studying early stage programming.

Scottie Go! is suitable for children of 6 to 10 years old. The desktop game costs around 50 Euros, with a license key for activating the app on 3 mobile devices. Scottie Go! can be downloaded free of charge from the official game site (<https://scottiego.com>) or from mobile app downloads.

The game Scottie Go! includes all basic commands of programming - from basic blocks of motion and cycles to the introduction of conditions and variables. A single inconvenience when applying it in Bulgarian schools is that the game is only available in English.

4. Supporting environment through application programs for thought-process development

For the needs of the programming training in pre-school and elementary schools in Bulgaria, it is more convenient to use the Scratch visual programming program, which is available in more than 40 languages, including Bulgarian. The program was developed as a part of a project of the Lifelong Learning Group at MITMediaLab and is provided free of charge. The installation version can be found at <https://scratch.mit.edu/download>. When installing the program, the following steps are followed, taking into account the operating system of the computer or mobile device on which to install it. The on-line version is based on cloud technologies and is available at <https://scratch.mit.edu/>. In order to use the on-line version, it is necessary to create a user profile, with student profiles requiring confirmation of the parent / guardian registration.

The Scratch program has been specially developed for children aged 8 to 16 years. Throughout the world Scratch is used for students on all levels of education and in various disciplines such as mathematics, computer science, language arts, social sciences, and more. Teachers share stories, share resources, and ask questions on the ScratchEd website.

With Scratch, interactive stories, games and animations can be programmed and projects can be shared with other people in the online community. "Algorithmic, logical and creative thinking and basic

programming skills are formed in the students. You can develop skills for working together (teamwork). "(Kojuharova & Topalski, 2018). Scratch is a visual programming program. Algorithms are created by stacking blocks with commands. Each block has a specific command and a unique function. Each sprite in Scratch sets a separate program / algorithm that is executed when you set a command to start it.

Scratch's visual programming is simplified and allows students to quickly and easily navigate in the interface, helping to motivate students to participate in the learning process. The programming blocks are divided into groups according to their functionality. Thus students can easily find and download in the work field, the necessary block and assemble a program.

In addition to assigning blocks to commands, different program costumes can be set in the program, can add characters to the scene and set sceneries. The character in Scratch is called Sprite. In addition to a finished sprite collection, students can create their own characters and add images with their favorite characters as fairy tales and animations. The identification of students with the sprite influences positively their motivation to participate in the follow-up activities (Donev & Nikolov, 2016). Each of these elements can be animated separately or together, using different ways to sync the animation.

Animation in Scratch can be done in three ways - animating the movement, animating the costumes and animating the scenery. As animations for individual objects have to be synchronized so that the characters can perform their actions in sync at exactly the right time. The possibilities for animating objects in the program are shown in Figure 04. Modern Scratch extensions make it possible to connect Scratch projects with external hardware (such as LEGO WeDo or micro: bit) or web feeds (such as Google Translate and Amazon Text to Speech). They add a collection of command blocks and reporter blocks that can be used to interact with a specific device or data source. When the extension is enabled, its blocks appear in place with the same name as the extension.

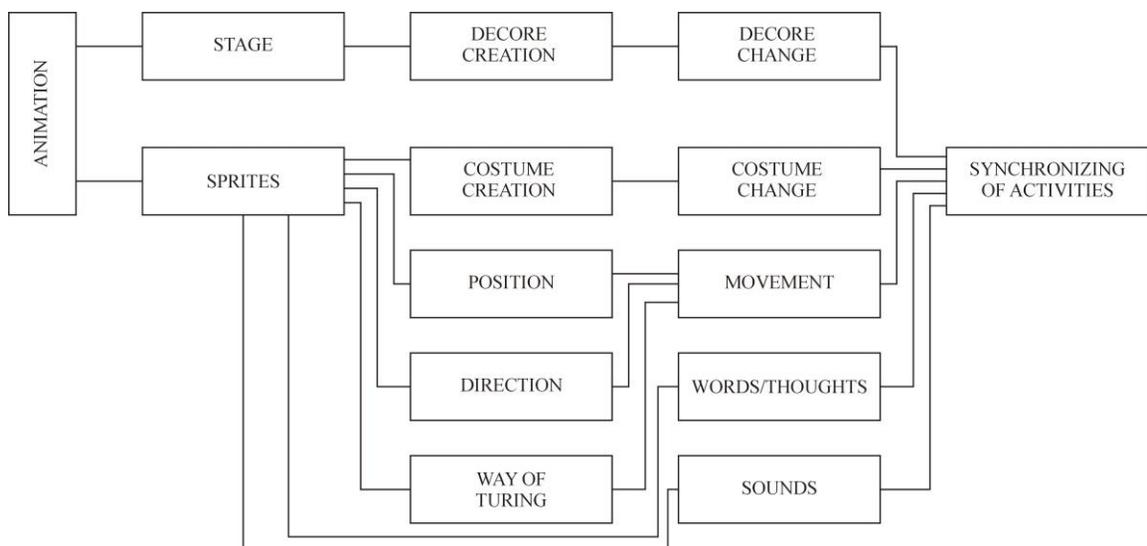


Figure 04. Creating animation in Scratch

Findings

Through the acquired knowledge and skills for working with different types of information technologies, teachers can build a supportive educational environment by creating and integrating into the learning

process interesting and accessible educational tools. These tools make learning easier, inspire students, decreases the amounts of efforts students need to complete the tasks and develop their intellectual qualities and motivate them to eventually stay in school.

Creating didactic tools to build a supportive learning environment is labor-intensive and time-consuming, but once created, they can be used in a variety of didactic situations and easily modified.

Based on the presented study, the following conclusions can be drawn:

1. The accredited training model is structured after a detailed review and analyzes of research on reasons for early drop out of school and based on observations in practice;
2. Through the survey, the interests of the teaching staff in the digital components of the educational environment was examined;
3. The skills developed for visualizing of content through various digital media is highly sustainable and universally applicable to the learning of all subjects and all ages;
4. In the course of their practical training through team-work teachers prepare collections of their own didactic materials to visualize the learning content to then use in their practice at school.
5. The next stage of the study is to conduct a pedagogical experiment with teachers, to implement a supportive educational environment in real school settings.

Conclusions

The presented training model which is a result of the research is open and updated according to the needs of the learners and by the constantly changing programming tools and technologies for working with different information objects. The training is based on building up the available knowledge and skills and practical experience in the field of digital technologies and especially with the willingness of the specialists to adapt the acquired methods, techniques and attitudes to support and to the individual needs of each student.

The creation and adaptation of electronic resources as components of supportive environment requires work and efforts but once they are created- the can easily be maintained and upgraded for different didactic tasks. All the work is worth in order to solve even a small issue that leads to early school dropout.

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