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EFFECTIVE DISTANCE LEARNING TOOLS FOR TEACHING COMPUTER SCIENCE IN INCLUSIVE EDUCATION

Currently, the country is paying more and more attention to the problem of informatization of Education, which it considers one of the most important strategic problems of the development of civilization. Therefore, at the present stage of reform and modernization of the domestic education system, information technologies are introduced as an effective teaching tool. One of the paradigms of the development of modern education is inclusive education. Further research on the optimal application of ICT for instructing children with special educational needs remains essential for the efficient structuring of the educational process in inclusive education. The article examines the influence of ICT on inclusive education, addressing both conventional teaching methods for children with special educational needs, including those with autism spectrum disorders, and distance learning, along with the most effective software tools employed therein. The study shows an effective form, considering optimal software products for use in traditional and distance learning formats for children with special education needs in computer science, in which digital resources and information technologies are continuously used, with special attention to inclusivity.

Keywords: inclusive education, children with ASD, distance learning, computer science, distance learning tools.

Introduction

Along with the traditional education system, Kazakhstan has established an inclusive education system for children with various mental or physical disabilities.

Inclusive education for children with special educational needs (SEN), including children with autistic spectrum disorders (ASD), is a fundamental and integral part of a child's education in the same way as their peers.

Teaching children with ASD in inclusive education requires research that examines relevant and effective teaching methods.

Pupils with ASD are more likely to participate actively in class and show interest in what they are learning if their teachers make their lessons more accessible and inclusive [1, P. 256–255]; [2, P. 26–28]; [3, P. 83–92].

Not all subjects taught at school may interest to a special child. However, education can be effective if taught using various digital resources and information technologies in working with children. Simultaneously, the subject of computer science (CS), which has a distinct function consistently uses computer technologies.

Initially, let's concentrate on the function of CS for pupils with ASD. Children with ASD outperform their peers in programming because they have exceptional coding skills [4, P. 55–67]. Children with ASD can succeed in programming because they like to think logically, make predictions, and learn best through demonstrations. Teaching computer programs to special children in an easy way, visually presenting them through various platforms increases their interest in the subject. This is because computer programs have a comprehensive effect of them (Figure 1).

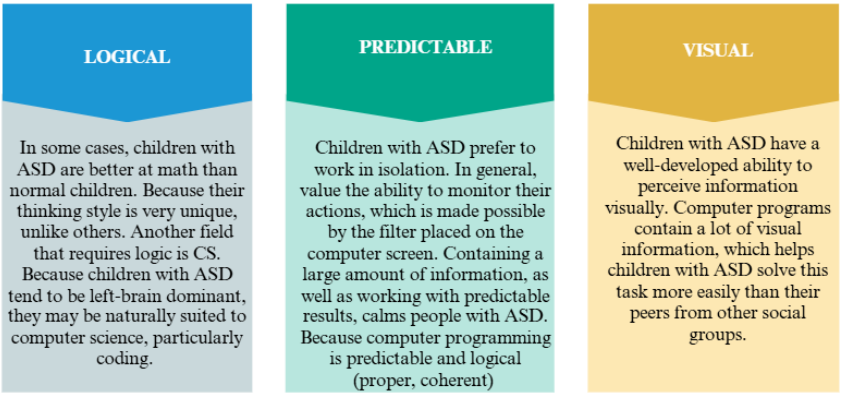


Figure 1 – Effects of computer programs on children with ASD

Researchers assert that computer technology can assist students with SEN in developing and attaining educational objectives, hence modernizing conventional teaching techniques [5, P. 4–21].

However, several challenges exist in integrating them into the instructional framework of special and general education institutions:

A limited selection of adaptive software designed for pupils with SEN;

Lack of affordable prices for currently available educational software packages;

Specialists in educational organizations do not know how to use software products;

The deficiency of software products for children with SEN in inclusion is also an issue in our country.

The purpose of our study is to research software products for traditional and distance learning of CS for children with SEN, especially children with ASD, in the context of inclusive education and offer effective and optimal solutions.

Materials and methods

In our research, special software, and platforms that are effective in the inclusive teaching of CS both in traditional and distance learning formats were considered, and a comparative analysis method was conducted. One of the forms of education that is the basis of research is distance education. That is education in the conditions of inclusion using distance education technologies. If children with SEN cannot go to school for a short or long time, it is necessary to create conditions for home education.

In a previous study, it was determined from the results of a survey of school teachers that there is not enough even no special platform for teaching CS in the context of inclusive education, that is, there is no program support [6, p. 233–243]. This problem has led to the study of suitable program environments in the context of inclusive education in distance education of children with SEN.

It is impossible to underestimate the effectiveness and benefits of CS in introducing computer technology into the lives of modern children, especially children with ASD [7, p. 1–16].

Based on the works of scientists, it has been written that digital technology plays a key role in the inclusive education of children with intellectual disability and/or ASD [8, p.224]. Therefore, taking into account the individual needs of special children, the subject teacher should be able to choose and use an effective and easy tool in the CS class, where software is regularly used in the classroom.

Research was conducted on several software products used in world educational practices. Because research software must carefully consider the unique learning styles, sensory sensitivities, and communication preferences of special children, several requirements were considered. They are presented in 2 pictures.

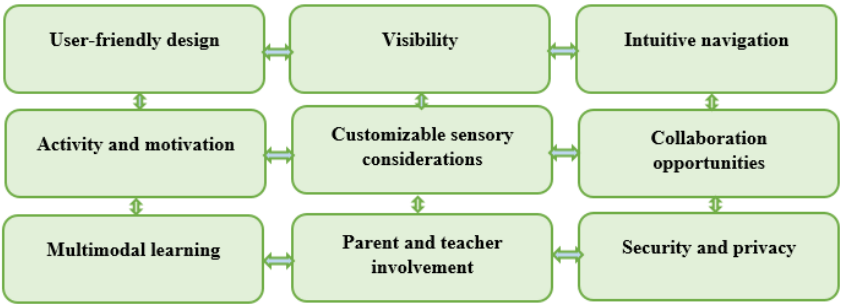


Figure 2 – Requirements for software products/tools for teaching with SEN

Keeping the aforementioned criteria in mind, we surveyed popular digital tools utilized in the classroom for teaching students with SEN. They are:

ASCmeIT is a mobile application that allows people with ASD and their family members, as well as autism specialists, teachers, and staff working with children with ASD to share their projects and ideas to make life and work easier for people with ASD.

«Look at Me» is an Android-based application for children with ASD that promotes eye contact and teaches children to recognize emotions and communicate with others. The software uses photos, games, and facial recognition techniques.

«Autism: Communication» program is a Russian language communication program that helps children with ASD develop independent speech skills and learn to communicate with people. The software is designed for children with autism, alalia, Down syndrome, and other developmental disabilities, including speech difficulties.

«Dar» Communicator – based on images of the company Velcom (for Android OS), designed to socialize people with health conditions. It helps children with ASD to express themselves, communicate, and understand others.

Govory Molcha program is an Indigo Kids program for children with speech problems (autism, aphasia, apraxia, alalia, Asperger's, or Down syndrome). It has high-quality graphics and allows you to select items, and create requests and messages.

The Sesame application is a convenient, simple alternative communication program for children with writing or speech disabilities. For convenience, icons are divided into thematic folders that are always visible on the display.

The Code.org platform is an interactive programming coding and STEM education environment for children with intellectual disabilities.

Studies have shown that there is almost no native Kazakh language software used in education in the context of inclusive education. There are additional educational Russian language programs for special children. However, most of these programs are not free.

Therefore, we tried to consider effective, high-quality, and free programs for special children.

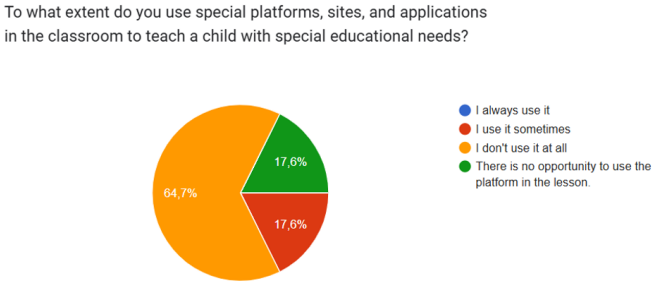
Researched software and digital applications are suitable for teachers with SEN in general, especially in theoretical and humanitarian subjects. Since our goal is distance learning of CS subject in inclusive education, it was to find and offer an optimal platform for distance learning of this particular subject.

Therefore, first of all, a survey was conducted for teachers who teach CS using software products. CS teachers of schools implementing inclusive education in Almaty region (4 schools) and Almaty city (5 schools) participated in the survey. The total is 21 teachers. These teachers teach in an inclusive classroom.

Results and discussion

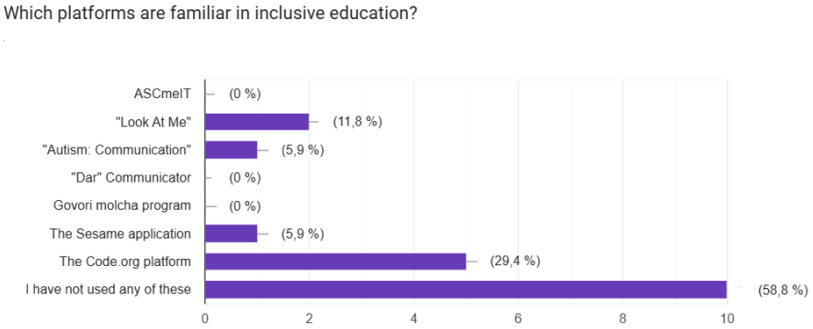
In the survey, «To what extent do you use special platforms, sites, and applications in the classroom to teach a child with special education needs?» 64.7 % answered «I don't use it all», 17.6 % «I use it sometimes», and 17.6 % answered, «There is no opportunity to use the platform».

Diagram 1



To the question «Which platforms are familiar in inclusive education?», 58.8 % of the teachers chose «I have not used any of these». 29.4 % chose «Code platform», and the rest partially chose «Autism: Communication», «Look at Me», and "The Sesame".

Diagram 2



To the open question «What is the effectiveness of the platform in the question you have chosen?» the teachers replayed: «The Code platform was interesting, the interface was clear to everyone», «The first is the language problem. Most of the sites are in Russian or English», «I have never used it», «I do not know», «I have used it 1-2 times. In fact, I cannot do it physically», «I do not use the platform, the app. The child does not have enough time to use it. I will give the same task as my peers», «I will connect the computer to the child, I will be with them until I have time, sometimes we will complete the task together», «I did not use it in class».

According to the results of the survey, it was observed that special digital resources (platform, services, site, mobile applications, etc.) are not always used, and only in some cases, traditional or distance education of children with SEN in the context of inclusive education. We did not even find an answer that it was used during distance learning.

After the survey, some of the above schools were visited and interviews were conducted with CS teachers. In the course of the interview, it can be observed that the teachers do not manage to prepare for the daily lesson, develop materials, and participate in additional «social» activities. It was also noticed that even during distance learning and quarantine, Zoom lessons were held with normal children, and even children with SEN were not given attention. Also, the teachers emphasized that the majority of quality electronic resources are in English, then in Russian. Maybe that's why it doesn't require a lot of resources.

There were only those who commented that the Code.org platform seems to be convenient for teaching CS in an inclusive environment. As a result, a complete review and test practices of the mentioned platform were made.

The Code.org platform is a universal environment with tasks for teaching special CS to special children.

Code.org is a non-profit organization and was founded by Hadi and Ali Patrovi. This is an educational website for school students specializing in CS.

The website features free audio-video coding lessons. This helps students write code freely. The initiative is also aimed at encouraging schools to include more CS lessons in their curriculum. The organization's first foray into school curriculum was to collaborate with the US school district to introduce computer programming as a curriculum. Most US schools did not have a CS course code, so schools were able to offer programming as a subject. After that, the next step was to create free online learning materials for schools to use in their CS classes.

A feature of the website is the ability to teach CS to children with SEN in traditional and distance learning formats. The platform is very convenient for the school association "Teacher-Student-Parent". The teacher determines the tasks and their duration in advance, depending on the individual characteristics of the special child. This platform demonstrates its applicability in the realm of distance education for CS within the context of inclusive education.

The provision of methodological support and the adjustment of program adaption in developing educational materials for teaching children with ASD plays a crucial role in the distance learning of the educational process.

Despite the availability of some resources, some issues need to be addressed to ensure the effectiveness of distance learning in inclusive education:

Digital necessity: The availability of technology and Internet access poses a considerable challenge for numerous students. Providing access to devices and high-speed Internet is essential for distance learning.

Teacher training: the transition to distance learning shows the need for comprehensive training of teachers. Many teachers are not yet fully prepared to use available digital tools and organize and design lessons in an inclusive classroom.

Activity and motivation of children with SEN: it can be difficult to engage children in virtual environments. Therefore, interactive and playful learning experiences along with constant feedback and stimulation are needed to keep students motivated.

Assessment and feedback: assessing student performance in a distance learning environment can be complex. Traditional assessments may not accurately reflect the abilities of children with SEN. For this, assessment methods are needed that take into account the individual learning needs of the child and provide timely feedback.

Conclusion

Teachers practicing inclusive education should make every student's needs a priority [9]. It is effective to use assistive technologies to supplement abilities with appropriate teaching strategies or to alleviate, or in some cases solve, challenges

faced by students [10]. It is crucial to carefully choose and deploy resources that address diverse learning requirements for distance learning in CS to be effective, particularly within the framework of inclusive education. Adaptable technologies, universal learning materials, optimal software products for distance learning, and continuous training of teachers will be important components of an inclusive distance learning environment. As educational institutions continue to embrace digital learning, it is critical to prioritize inclusivity to ensure that all students have the opportunity to achieve positive outcomes in their CS studies.

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ИНКЛЮЗИВТІ БІЛІМ БЕРУДЕ ИНФОРМАТИКАНЫ ҚАШЫҚТАН ОҚЫТУДЫҢ ТИІМДІ ҚҰРАЛДАРЫ

Қазіргі уақытта елімізде өркениетті дамытудың маңызды стратегиялық проблемаларының бірі ретінде қарастыратын білім беруді ақпараттандыру мәселесіне көбірек көңіл бөлуде. Сондықтан Отандық білім беру жүйесін реформалау мен ілгерілетудің қазіргі кезеңінде оқытудың тиімді құралы ретінде

ақпараттық-коммуникациялық технологияларды қарқынды түрде енгізу жүргізілуде. Заманауи білім беруді дамыту моделінің бірі – инклюзивті білім беру. Инклюзивті білім беру жағдайында оқыту процесін ұйымдастыруда зерттеулердің барына қарамастан, ерекше білім беру қажеттіліктері бар балаларға ақпараттық-коммуникациялық технологиялардың қолдануды тиімді ұйымдастыру әлі де зерттеулерді қажет етеді. Бұл мақалада инклюзивті білім беру жағдайында ерекше білім беру қажеттілігі бар, оның ішінде аутистік спектрінің бұзылуы бар балаларды оқытуда тек қана дәстүрлі жағдайда ғана емес, сонымен қатар қашықтан оқытуда ақпараттық-коммуникациялық технологиялардың қолданудың әсері және онда қолданылатын программалық құралдардың тиімділігі зерттелген. Зерттеу инклюзивтілікке ерекше назар аудара отырып, цифрлық ресурстар мен ақпараттық технологиялар үздіксіз пайдаланылатын информатика пәнін ерекше білім беруді қажет ететін балаларға дәстүрлі және қашықтан оқыту форматтарында пайдалануға оңтайлы программалық өнімдерді қарастырып, тиімді түрін көрсетеді.

Кілтті сөздер: инклюзивті білім беру, қашықтан оқыту, ерекше балалар, информатика, қашықтан оқытудың құралдары.

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ЭФФЕКТИВНЫЕ ИНСТРУМЕНТЫ ДИСТАНЦИОННОГО ОБУЧЕНИЯ ИНФОРМАТИКЕ В ИНКЛЮЗИВНОМ ОБРАЗОВАНИИ

В настоящее время в стране все больше внимания уделяется проблеме информатизации образования, которая рассматривается как одна из важнейших стратегических проблем развития цивилизации. Поэтому на современном этапе реформирования и модернизации отечественной системы образования происходит активное внедрение информационных технологий как эффективного инструмента обучения. Одной из парадигм развития современного

образования является инклюзивное образование. Несмотря на наличие исследований в организации процесса обучения в условиях инклюзивного образования, эффективная организация применения информационно-коммуникационных технологий для детей с особыми образовательными потребностями по-прежнему требует исследований. В данной статье исследуется влияние использования информационно-коммуникационных технологий в обучении детей с особыми образовательными потребностями в условиях инклюзивного образования, в том числе с расстройствами аутистического спектра, не только в традиционных условиях, но и в дистанционном обучении, а также эффективность применяемых в нем программных средств. Исследование демонстрирует эффективную форму, рассматривая программные продукты, оптимальные для использования в традиционных и дистанционных форматах обучения детей с особыми образовательными потребностями, с особым акцентом на инклюзивность, информатику, в которой постоянно используются цифровые ресурсы и информационные технологии.

Ключевые слова: инклюзивное образование, дистанционное обучение, особые дети, информатика, средства дистанционного обучения.

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