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ADAPTATION OF THE SCHOOL COMPUTER LAB TO THE CONDITIONS OF EDUCATING PERSONS WITH SPECIAL EDUCATIONAL NEEDS IN THE POLISH EDUCATIONAL SYSTEM – A CASE STUDY

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Purpose: The aim of the research was to develop a concept of adapting the working environment of a computer lab of a selected high school, to the individual developmental and educational needs and psychophysical capabilities of its students. The adaptation activities included the adaptation of the room and the equipment of the lab for conducting classes with young people with different educational needs.
Design/methodology/approach: Recognition in terms of the needs and opportunities of the young people was made on the basis of the experiences that the author of this article gained during independently conducted classes and through lesson observations. The study lasted 180 lesson periods. It covered only classes in the subject of computer science, which were held using the computer workstations of the school's computer lab. It was conducted in the 2021/22 school year on a representative sample of sixth class students for which the percentage of those with special educational needs (SEN) was at least 15%. The full spectrum of special education needs was achieved by including the following young people in the study: persons with vision impairment, hard-of-hearing students, students with mobility disability, particularly gifted students, students having learning difficulties and adaptation difficulties related to the change of educational environment, including previous education in Ukraine.
Findings: The author proposed that the modification of the educational process taking place in the computer lab of the selected school should include a change in organization by dedicating permanent workstations to selected students and improving the conditions for the implementation of education by retrofitting the lab with new teaching resources in the form of: additional screens and large scale projectors, dedicated software and by upgrading the lighting.
Research limitations/implications: It is advisable to re-diagnose the educational difficulties of the young people of the selected high school, carried out after the implementation of the proposed measures. This research will make it possible to confirm the effectiveness of the solutions applied and to identify new barriers that will accompany the next generation of the student community in the process of learning computer science.
Practical implications: The submitted proposal for change is a concept for the implementation of the authorization contained in the Education System Act, which obliges the teacher to undertake individualized pedagogical actions. This approach embodies the idea of making educational opportunities equal for young people and is an implementation of the principles of inclusive education.

Social implications: The targeting of adaptation measures is particularly important for those who have been diagnosed with developmental disorders and deviations or difficulties that make it impossible to meet the requirements of the general education core curriculum.
Originality/value: The approach presented in this article makes it possible to prevent secondary disorders of the emotional-motivational sphere of students.

Keywords: special educational needs, adaptation, computer lab.

Category of the paper: conceptual paper, case study.

1. Identification of the problem

The student body of the selected high school is characterized by diversity in terms of skills and psycho-physical predispositions related to the use of IT tools. In order to reveal the potential dormant in young people and to achieve harmony in their emotional development, it is required to provide various forms of student support during computer science lessons. In view of the above, the author of the study noted that it is required to adapt the interior architecture of the room in which the computer science lessons take place, and to prepare additional teaching resources that strengthen the activization of the interaction behaviors. These measures are particularly important for those who have been diagnosed with developmental disorders and deviations or difficulties that make it impossible to meet the requirements of the general education core curriculum. This approach embodies the idea of making educational opportunities equal for young people and is an implementation of the principles of inclusive education. It fosters the creation of a space around the student which integrates the school environment and shapes social awareness in terms of overcoming prejudice, discrimination, exclusion or segregation. It is the implementation of the authorization contained in Article 44b(8)(1) of the Act of 7 September 1991 on the educational system (Journal of Laws of 2020, item 1327, as amended), which was made more specific by the Regulation of the Minister of National Education of 22 February 2019 on the assessment, classification and promotion of pupils and students in public schools (Journal of Laws of 2019, item 373). It obliges the teacher to take individualized pedagogical measures that result from the diverse educational needs and psychophysical capabilities of students fulfilling schooling obligation during both compulsory and supplementary educational classes.

2. Genesis and dynamics of the phenomenon

As part of the professional work carried out by the author of the present study in a public high school, she was entrusted with tasks of conducting computer science classes as a computer

science teacher. She also undertook ad hoc substitutes, organized extra-curricular activities and supported other teachers in the use of multimedia and information technology. All teaching activities at this school were carried out by her using computer stations in the computer lab. In addition to conducting classes herself, she also supervised the lessons conducted by other teachers using the equipment of this lab. The experience gained both at the high school in question and during her earlier work enabled her to analyze and evaluate the factors shaping the student work environment in the computer lab of the selected high school.

The research in identifying the developmental and educational needs and psycho-physical abilities of the students was carried out in the school year 2021/22 on a selected sample of sixth class students for which the percentage of SEN students was at least 15%. The author ensured that the sample included not only representatives with a certificates of special education needs issued due to a disability or those at risk of social maladjustment. The full spectrum of special education needs taking place in this lab was achieved by including the following young people in the study: persons with vision impairment, hard-of-hearing students, students with mobility disability, particularly gifted students, students having learning difficulties and adaptation difficulties related to the change of educational environment, including previous education abroad, for example in Ukraine. The selected high school is not attended by individuals with developmental disorders in the form of deafness and blindness, and, therefore, the requirements taking into account these special educational needs will be omitted in the research conducted. However, it should be clearly emphasized that the list of young people's individual educational and developmental needs presented above is not closed. This is because in accordance with the Regulation of the Minister of National Education (Journal of Laws 2020, item 1280), psycho-logical and pedagogical assistance should be provided depending on the recognized needs of adolescents, and the changing socio-economic conditions may indicate the emergence of even other types of needs than those already listed (Rafał-Łuniewska, 2021c). In view of the above, adolescents who were in the process of an ongoing diagnosis of their situation or an ongoing diagnosis of potential, difficulties and interests were also surveyed (Knopik, 2018). In addition, students whose parents/legal guardians did not agree to provide their child with psychological and pedagogical assistance at school were examined. It should be mentioned that the forms of such assistance are, among others, didactic and compensatory classes, counseling and consultations, but also classes developing students' special talents (Jas and Jarosińska, 2015; Leśniewska et al., 2015).

The site of the observations and practical activities carried out was the computer lab of the selected public high school supervised by the Silesian Education Authority in Katowice. The lab is located in the basement of the building, right next to the school's technical rooms and the gym. It has a considerable floor space and a high ceiling. On one of its walls, which forms the south-eastern part of the building's façade, hinged basement windows have been installed and secured with a grate. Their lower edge is more than 2 meters from the ground. The windows face directly onto the pavement of a busy street and provide constant light to the

interior. As the sunlight penetrating through them heats the room intensively, horizontal blinds were installed on the windows. Unfortunately, these windows are not used to ventilate the lab due to the road noise coming from the outside.

The lab is equipped with computer workstations, each of which is a separate student workspace (Figure1). Each station has a desktop computer with a monitor, keyboard and mouse. The workstations are connected with Internet access network and equipped with teaching software enabling the implementation of the core curriculum. All workstations have been interconnected to form one large office area. This was achieved by arranging paired desks facing each other. When the students enter the classroom, they are seated along the two longer edges of the table. The free walking space runs along the walls. There is no furniture or fitted wall shelves behind the students' backs to obstruct access to the individual workstations. Structured cabling, including the power supply, is concealed under the top of the desks. A computer station dedicated to the teacher was placed at one end of the long table, right at the exit. It is connected to a multimedia projector, which provides an additional aid for presenting issues and teaching. A whiteboard was hung on the wall behind the teacher's back. A projector screen was placed on the opposite wall of the room. It is made of frosted glass; at the same time it is a partition wall in the server room. It houses, among others, sound equipment and a central unit for sharing data resources. Two types of fluorescent lamp lighting fixtures were used in the room: ceiling and wall-mounted ones. Both have moderate directionality and limited luminance. The wall-mounted ones were installed in the area opposite the windows and above the whiteboard. The lab does not have directional lighting aimed directly at the working surface of the desks.

In summary, the designed space of the school's computer lab allows each student to work independently at a separate workstation. It is also possible to maintain eye contact between peers, which encourages direct communication and, therefore, the exchange of information and the sharing of knowledge or ideas with others. The positioning of the individual computer workstations and the location of the furniture in the room make it possible to confirm that the free walking space in the room is ensured, as well as the free access to each of the workstations and the shared associated rooms is possible. It can also be concluded that the installation of structured cabling together with the power supply system of the computer room ensure the safe use of the connected equipment, and that the desks and chairs furnishing the lab are adapted to the anthropometric conditions of students and their needs resulting from disabilities (Journal of Laws of 1997 no. 129, item 844: § 24, Journal of Laws 2021, item 2088).

However, an element that needs improvement is the way in which the teacher communicates with the students, which includes both the presentation of issues using the projector and the teacher's supervision of the students' achievements.

It should be noted that the image projected on the projector screen is unreadable. This is due to the fact that the screen was created with decorative glass with a milky surface. It does not allow full color contrast and the images projected on it are blurred. The use of a glass

partition wall as a screen is an aesthetically pleasing solution, but not entirely practical. In addition, the positioning of the workstations means that the image is partially obscured for a large group of people. The projection area is obstructed both by monitors of other workstations and peers sitting closer to the screen. This is because the screening takes place from a side i.e. to the left or right of the workstation occupied by the student. The most limited visibility of the projector screen is for students sitting right next to the teacher's workstation, for whom it is at the other end of the room. Students occupying these workstations may also find it difficult to see the detail in the graphics displayed and to read the text in smaller font on the slides presented by the teacher. Particularly troublesome, however, is the concurrent student-teacher work carried out using the software functionality discussed during class. More often than not, it involves familiarizing the students with a particular way of doing things and with the appearance of the system windows. It forces the student to simultaneously undertake an activity connected with watching the shared screen and an independent activity within the application, being about repeating the tasks after the teacher. The current arrangement of the lab space is not conducive to this form of work. It restricts the student's ability to keep up with how difficult tasks are being solved and to constantly compare his or her progress with the teacher's operations being demonstrated. Although the demonstration is accompanied by an oral message in the form of the teacher's explanations, the lack of coupling of the verbal message with the graphic one slows down students' learning process. In addition, this situation lowers the level of focus of young people, often demotivates them and increases the variability of skills by excluding less skilled or more withdrawn learners from active participation. However, as there is a lot of free space in the classroom and the workstations are equipped with swivel chairs, when new content is presented, students can move freely while watching a film or animation, finding a space with a better view of the projector screen. Unfortunately, the lack of computer workstations located close to the teacher and with a good view of the projection screen area indicates that it is necessary to implement changes to the multi-format multimedia projection in this room. This is because maintaining eye contact with the teacher and free access to the graphical form of the content presented is particularly important for young people with special educational needs.

The second area for improvement is the way in which the teacher supervises the learning progress of their students. In order to increase the effectiveness of teaching, it is crucial that the teacher repeatedly verifies the correct understanding of the instructions given and tasks performed by the student. The arrangement of the classroom space allows the teacher to simultaneously supervise the behavior of all class participants, however, the view of the screens of individual workstations is significantly impeded. The monitors face the side walls and the image displayed on them is not visible from the teacher's workstation. Direct supervision of the student's work in terms of interaction with the application is, therefore, only possible when the teacher moves around the room. The significant size of the group limits the teacher's ability to react quickly and support several people at once without delay. The problem is often

compounded by the attitude of the young people, who do not always report to the teacher the need for support, but also do not have the opportunity to present their solutions to the other class participant (including the teacher) using the view of their screen. Thus, the provision of feedback concerning the learning process is hindered. In view of the above, it is assumed that the presented observations should be reflected in equipping the classroom with additional teaching aids to support the implementation of group activities.

What is more, the lighting requirements of the computer lab do not correspond to the needs of young people and the educational objectives of the learning process. The lighting level deviates from the requirements of the Polish standard PN-EN 12464-1:2022-01, according to which the intensity of lighting in a room intended for classes using computers should be at the level of at least 300 lux. The office area and the whiteboard are insufficiently illuminated. There is also a lack of additional directional lighting, which is dedicated to students with special educational needs. Therefore, it is necessary to ensure optimal technical conditions, including: lighting conditions, and to eliminate distractors, i.e. unwanted stimuli that distract teenagers.

3 Significance of the problem

According to the general education core curriculum (Journal of Laws 2018, item 467), teachers shall take measures aimed at individualized support for the development of each student, according to his or her needs and capabilities. In view of the above, teachers are faced with the task of both identifying the barriers present in the organization of the learning process and proposing solutions that take into account the adaptation of school conditions and educational requirements to the individual pace of development of each student's knowledge and skills. In an attempt to identify educational difficulties among students of the selected high school, the author of the study used a classification taking into account the type of dysfunction of a given student. This is because an assumption was made that effective equalization of educational opportunities and prevention of secondary disorders in the emotional-motivational sphere of students is possible by targeting activities whose method of adjustment takes into account a specific group of symptoms describing educational difficulties. By identifying the barriers resulting from the implementation of classes in the school's computer lab, the educational needs were differentiated for the following groups of students:

- students with vision impairment,
- hard-of-hearing students,
- students with mobility disability,
- particularly gifted students,

- students having learning difficulties,
- and students having adaptation difficulties related to the change of educational environment.

The different needs of students with vision impairment are due to the depth of their visual impairment, which is described, among others, by the visual acuity after vision enhancement procedure and the limitation of the visual field. A teacher working with a student with vision impairment has to take into account the student's irritability and their increased fatigue, which results from increased concentration on written text. It may require extending the working time and dividing the task into smaller parts of material. Students with visual impairment are also often characterized by reduced mobility and activity, which results from impaired orientation and spatial imagination. This translates into difficulties in performing everyday activities, but it also affects visual memory, which is manifested by impaired perception of details in diagrams, graphs or mathematical formulas. In some cases, continued learning at home may be required, enabling the barrier in using digital devices or using the functionality of computer software to be removed. Equally important is the mental preparation of the student environment to accept, welcome and provide support for a student with visual difficulties.

The implementation of the core curriculum in computer science by hard-of-hearing students is inextricably linked to the formation and improvement of linguistic competence and the functioning of communicative behavior. A hard-of-hearing adolescent may experience difficulties related to verbal interaction and emotional control, which translates into their social functioning. He or she also has difficulties in grasping abstract concepts, sequencing events and synthesizing facts. Hard-of-hearing students relatively often have difficulties in understanding temporal-spatial sequencing and cause-and-effect inference. In the context of computer science, these difficulties translate into problems in applying elements of algorithmization and are noticeable when solving tasks in the area of programming. These students also show a greater tendency to rearrange numbers and signs in algebraic operations.

Mobility disabilities are a manifestation of various medical conditions or random events, in which the type and severity of the damage determines the individual's independence (MEN, 2010). In most cases, young people who are affected by a mobility disability are characterized by one of the following conditions:

- contractures and ossifications,
- atrophy or paresis of limbs,
- and childhood aphasia with epileptic symptoms, commonly known as epilepsy.

Contractures and ossifications limit the performance of some motor tasks, while muscular atrophy can cause severe fatigue due to poor muscle tone and forced body positions at the computer workstation of the school lab. A person with a paresis often has impaired or nonexistent sensation in the paralyzed part of the body, so movements within the affected scope should not be required. In addition, students with mobility disabilities often have impaired spatial orientation and motor memory limitations.

Young people who are exceptionally gifted and talented in the field of IT are characterized by above-average developmental potential defined by perceptual sensitivity, but also by a high degree of creativity-related ability. Students' abilities vary, they stem from both predispositions and interests. It should be remembered, however, that work with a gifted student should not be limited to stimulating cognitive development, but should also include the emotional and social scope. A gifted student is eager to improvise, experiment and test unconventional solutions, but should be supported by the teacher in building social bonds, undertaking cooperation and developing the ability to organize their own work independently.

The group of students with learning difficulties includes those for whom it is a consequence of educational and environmental neglect, as well as those for whom it is the effect of disorders and diseases of the nervous system or other co-occurring dysfunctions. Common causes of learning disabilities include poor attention span, psychomotor hyperactivity or inactivity, fatigue, problematic behavior, communication problems resulting in inadequately low self-esteem, and also the impact of medication on mood or behavior. What is more, educational achievement may be limited by environmental and cultural conditions of development, which concern emigrants (Rafał-Łuniewska, 2022), young people from poor, pathological or educationally inefficient families. The symptoms of learning disabilities manifest themselves in isolated or combined forms. The most common learning disabilities are difficulties in mastering reading and writing correctly, referred to as developmental dyslexia (dyslexia, dysgraphia, dysorthography) and disorders of mathematical skills (dyscalculia) (Rafał-Łuniewska, 2021a). At the third stage of education, they have a significant impact on the student's mastery of algorithmization and the creation of implementations in the chosen programming language. The consequence of learning difficulties may be secondary disorders of the emotional-motivational sphere. These may take the form of neurotic reactions, with the adolescent reacting with excessive anxiety to stressful situations, nervous tics or stammering, and loss of appetite or, conversely, excessive overeating. Fearing rejection, ridicule or criticism, teenagers may become shyer and more withdrawn. They are often unable to show empathy (Jankowska, 2020), as they prefer to reject others rather than be rejected themselves. Another symptom of secondary disorders is hyperactivity and increased motor activity, which is characterized by violent reactions that are disproportionate to the situation. It is accompanied by irritability, impatience, impulsiveness and problems with concentration. It is also often manifested by anger, aggression (Węgrzynowska, 2021) and unrestrained anger (Zawisza-Mlost, 2021). The challenging behavior of adolescents at school is most often aimed at drowning out anxiety and temporarily improving the mood of an adolescent who is going through or has had a rough experience (Kluczyńska, Zabłocka-Żytka, 2020).

4. Proposals for a solution

As the primary goal of adaptation is to make the educational opportunities of adolescents equal and to prevent secondary disorders of the emotional-motivational sphere of students, it is proposed that the modification of the educational process taking place in the computer lab of the selected school will include a change in the organization of the process by dedicating permanent workstations to selected students and improving the conditions of teaching by retrofitting the lab with new teaching aids. These will be used:

- in the interior design of the computer room,
- to equip the lab with dedicated software,
- and to adapt selected workstations to the different learning needs of young people.

The most important improvement measure is a modification in the area of large scale projection. It is proposed to change the surface of the current projection screen, to install two additional screens and projectors and to upgrade the lighting in the lab. To this end, the following is planned:

- affixing protective self-adhesive film in mat white to the entire surface of the current projection screen,
- execution of the cabling installation and ceiling mounting of the second and third projector,
- installation of additional projection screens on the wall opposite to the windows, with the left and right edges 2 meters away from the corner of the room and the bottom edge 1.5 meter away from the floor,
- connection of a 2 HDMI switch splitter devices, which will enable the simultaneous connection of additional projection screens to the teacher's workstation,
- replacement of the fluorescent lamps in the ceiling lighting fixtures with sources giving a light intensity of at least 300 lux in the room and 500 lux at the students' workplaces (desks). In addition, lighting with a CRI higher than 80, a UGR lower than 19 and a neutral light color of between 3,400 and 5,300 K (PN-EN 12464-1:2022-01) is recommended,
- replacement of lighting fixtures above the whiteboard with a model having an adjustable light beam angle and ensuring uniformity of illumination over the entire surface of the board (PN-EN 12464-1:2022-01).

The light intensity has a major impact on the performance of students' tasks. It is particularly important when an adolescent's ability to see is poorer than normal, during extended activity times, when contrast is low or when increased accuracy is required. The Color Rendering Index (CRI) determines the color perception of illuminated objects. Its value is expressed on a scale from 0 for monochrome light to 100 for white light. The lower the CRI value, the more distorted and unnatural the colors are and the more strongly they affect working

comfort, eye condition and well-being of the student. The UGR value indicated above allows to avoid discomfort caused by uncontrolled excessive brightness in the field of vision and ensures uniformity of illumination of adjacent areas. The perceived color of a light source, on the other hand, is defined by its color temperature and is expressed in Kelvin (K). It indicates the sensation that is associated with the atmosphere of a room.

Following on from the argument presented earlier, it is also necessary to change the way in which the teacher supervises the learning progress made by students. Repeated verification the correctness of the understanding of the instructions given by the teacher and the tasks performed by the adolescents requires changes in the interior design of the computer lab and equipping it with additional teaching resources. In this area it is proposed to:

- install software on all the computer stations of the lab, which will make it possible to share the view of the screen to present solutions to other class participants,
- provide training for teachers who teach in the lab on how to enable students to share their screen and how to view multiple students' screens simultaneously from the teacher's station,
- decorate the surface of the side walls of the room with a mirror mosaic or pieces of mirrors several centimeters wide, made along the workstations at a height of 1.1m from the floor, which will cause the image from the students' monitors to be reflected and thus be visible from the place occupied by the teacher.

According to the core curriculum of general education for the third stage of education (Journal of Laws 2018, item 467), the school should create conditions for students to acquire the knowledge and skills needed, among others, to use new technologies critically and creatively and to actively use e-services. The regulation indicates that this is a necessary condition in preventing the risk of social exclusion, in bridging the generation barrier and in improving teacher-student communication. In view of the above, it is an extremely important task for the school to individualize teaching measures and dedicate them to students with special educational needs (Journal of Laws 2019, item 373, as amended). It is proposed to apply the following adaptation measures, which will constitute a form of assistance for the student of the school under examination:

- designating permanent workstations for young people with special educational needs (Figure 1) and retrofitting them with additional software dedicated to their needs,
- supplementing the equipment of several computer workstations with an additional source of directional lighting with the possibility of adjusting the light intensity and setting the directionality of the source,
- installing additional software dedicated to particularly gifted students at selected workstations (Figure 1).

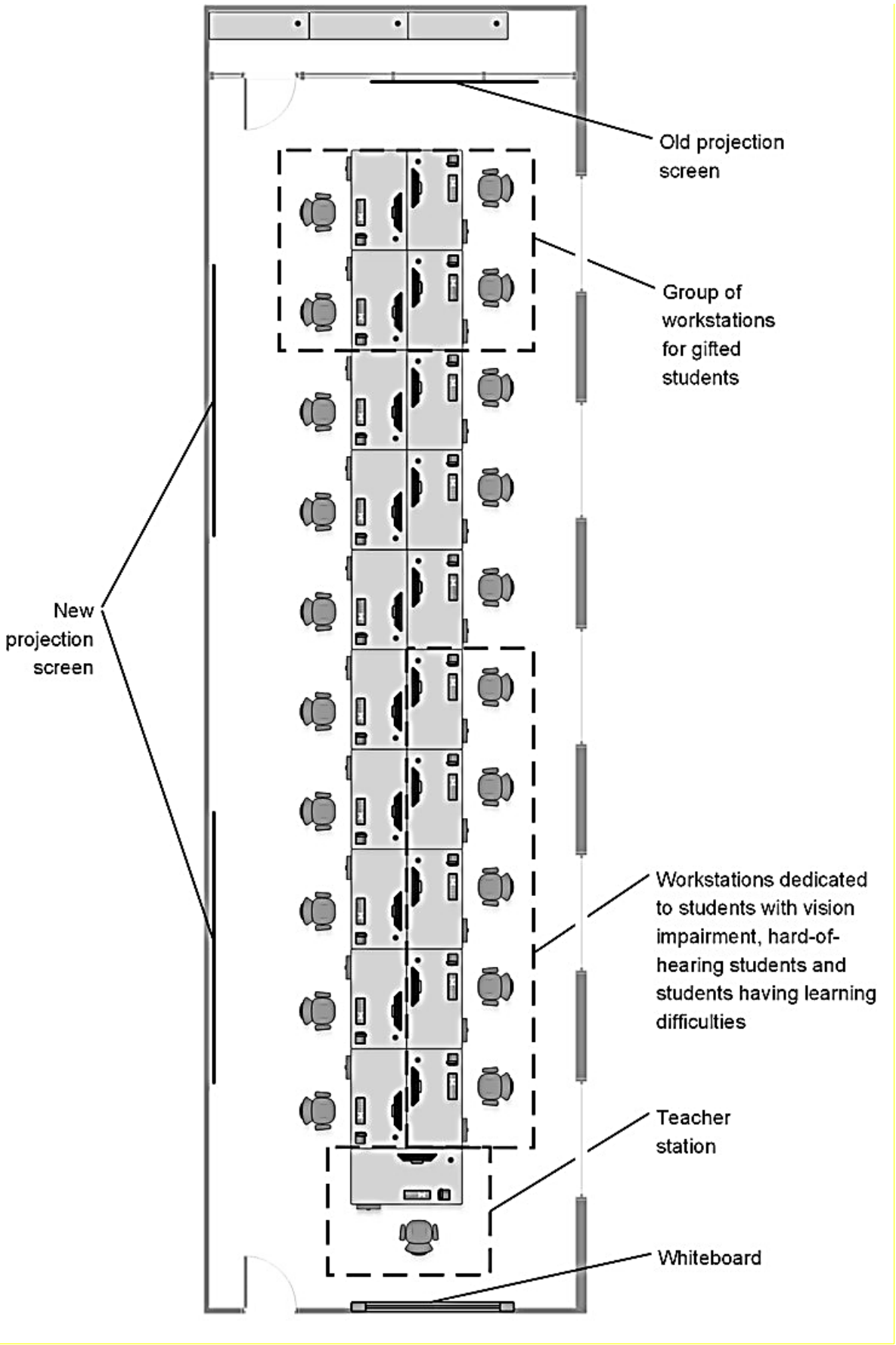

Figure 1. Interior design of the school's computer lab.

Source: own work.

The proposal to differentiate the equipment of the individual workstations stems from the diagnosis made of the school students participating in the described research. The workstations should particularly support the student in solving problems using logical thinking, using computer applications and basic digital devices, and teach him or her to independently find and process information obtained from various sources (Journal of Laws 2018, item 467). When selecting additional software for a student with learning difficulties, the teacher should take into account the activities that are undertaken by the teenager in their everyday life and make sure that they are reflected in the tasks assigned. On the other hand, in the case of a gifted student, it is advisable that the thematic scope of the IT training relates to the specific skills of that student and the tasks assigned represent the duties that the student will perform in their future career. The ways of adapting the working environment to the learner's varied psycho-physical needs are described in more detail below. The classification of special educational needs (Zaremba, 2014) was used for this purpose. Work with students with vision impairment, hard-of-hearing students, students with mobility disability, particularly gifted students, students having learning difficulties is described separately.

4.1. Students with vision impairment

In the computer lab, students with vision impairments should be seated closer to the projection screen and the teacher’s desk. It is important for them to have an uninterrupted view of the whole area of the projected image and to be able to report directly to the teacher their difficulties in adjusting the screen settings of their computer workstation to their abilities. Adapting the workspace of a student with vision impairment also includes equipping the workstation with additional lighting with adjustable light intensity and source directionality settings, also dedicated to students with photophobia. Do not forget about the possibility to darken the whole room using window blinds to reduce the sunlight on the monitors.

The performance of a task by a student with vision impairment may require an increased time limit necessary to locate the information presented on the screen in a large format as it demands scrolling of a longer text, as well as the concentration and cognitive effort of the student. Therefore, it is advisable to refrain from giving them complex tasks, from using multiple-choice tests when checking the student's knowledge and from using concepts in teaching materials that include the visual experience of perceiving the environment. In addition, the teacher’s instructions given to a student with vision impairment should not take the form of gestures or facial expressions when they are not accompanied by a verbal message at the same time, having in mind the proper reception of the message by the person concerned.

What is more, it is necessary to adapt the graphic elements of the presentation to the visual perception of the student. When it comes to requirements concerning material for students with vision impairment, they include the size and typeface of the font (non-serif), as well as the color contrast with the background, margins and spacing between characters and paragraphs.

4.2. Hard-of-hearing students

Among the people included in the observation were hard-of-hearing students who need direct contact with the speaker for visual support and auditory stimulation. Their understanding of what is being said requires that auditory perception be supplemented with content in graphic form or the presentation of practical proceedings. Considering the participation of hearing-impaired young people in the classroom, attention should be paid to the location of their workstations in the school's computer lab. The teacher should ensure that students with hearing or phonological impairments occupy computer workstations located close to each other and with a good view of the projection screen, allowing them to maintain eye contact with their interlocutors and to have free access to the content being presented.

In overcoming difficulties related to the understanding of temporal-spatial sequences and cause-effect reasoning, the teacher should be guided by the principle of using oral statements. It should be remembered that the third stage of education is a time inextricably linked to the improvement of linguistic and communicative competences. This means raising the requirements and expectations set by the school environment, also for hard-of-hearing students, in terms of using terminology and concepts from different areas of computer science, related sciences and applications when formulating statements and justifying opinions expressed. Hearing-impaired and hard-of-hearing students will require teacher support and guidance in acquiring the skills of ordering, valuing and arguing, as well as maintaining a clear layout, logical coherence and appropriate vocabulary of statements (Czechowska, Majkowska, 2020). In addition, articulation disorders will require the teacher to create an atmosphere of acceptance and understanding that fosters communicative relationships with hearing peers, and to extend the time limit for oral expression.

4.3. Students with mobility disability

In the context of computer science classes, where operation of the hardware and software of the school's computer workstation is required, the manual dexterity of the upper limbs is of primary importance. Depending on the degree of the impairment of movement coordination or due to a complete lack of ability to move the hands, limb movement can be assisted or replaced by using other parts of the body. It is the school's responsibility to adapt the working conditions to the student. Computer workstations can be equipped with additional devices to support cursor manipulation and to replace keyboard when typing. Alternative devices are used to this end, for example, in the form of specialized joysticks, larger controllers or software for transcription, i.e. speech-to-text converter or voice control. In addition, touchscreens, movable arm- and footrests or footstools can also be used as accessories to equip the workstation. When organizing the workspace, it is worth paying attention to securing the cabling of the computer hardware, which can restrict the space of people moving around with crutches or using a wheelchair, and the stable fixing of equipment elements by means of non-slip pads. It should not be

forgotten that mobility disabilities also require general adaptation of the school building to accommodate young people's mobility needs, as well as to meet their physiological needs. For students in wheelchairs, the teacher should designate computer workstations located right next to the main path of the lab, providing an unobstructed passage to his or her work area and ones that have unobstructed working space around the seat and peripherals. The teacher should also take care to ensure that the student adopts a correct sitting position during activities and that the wheelchair user's feet are supported on the footrest.

Another disorder of motor function is epileptic seizures, which are a symptom of brain damage. These can take the form of convulsions or silent seizures, which resemble unconsciousness with a clenched jaw. The teacher, in consultation with the parents, should exclude from the teaching process stimuli that trigger seizures. He or she should also eliminate the danger of hitting the head by properly organizing the space surrounding the student. The time of computer classes for people with epilepsy should be shortened. The accumulation of lessons in blocks is not advisable and individualization is needed in this respect.

4.4. Particularly gifted students

Gifted students are characterized by efficient information processing oriented cognitively. However, they require special attention on the part of teachers because of the long-term effort they put into independent work, which allows them to master selected topics. This is because they achieve outstanding results through perseverance in acquiring knowledge, responsibility for self-development and motivation. Gifted students require special care and assistance in solving tasks they cannot solve themselves. The teacher's role then boils down to pointing out an unfamiliar batch of material that the student should familiarize with or to supporting their engagement in conversations with other adolescents, thus increasing the group's involvement in a joint effort to improve skills (Woroniecka-Borowska, 2019).

When teaching gifted adolescents, giving ready-made solutions should be avoided; the teacher should take care of the creativity and independence of their work (Fazlagić, 2022; Janczak, Grześlak, 2020). The teacher should ensure an appropriate selection of tasks. He or she can make them available to students through a learning platform, which is not only a repository of teaching materials, but also a place for storing student work results from workshop activities, conducting tests and collecting feedback from students. It is advisable that it takes the form of the educational cloud, thanks to which teachers and students have remote access to materials regardless of where they access them from (Czechowska, Majkowska, 2020; Knopik, 2022).

Therefore, work with a gifted student should not be limited to stimulating cognitive development, but should also include the emotional and social scope. Through the selection of the scope and form of work, students should have the opportunity to improvise, experiment and test unconventional solutions, but also to build bonds, undertake cooperation and shape the ability to organize their own work independently. Hence it is important that computer

workstations, occupied by particularly gifted young people, are equipped with software that supports the development of their skills. This may include topics such as algorithmization, programming, database handling, digital image processing and the use of multimedia techniques, broadly understood hardware and network architecture or computer security. The most valuable ability in the field of computer science is a predisposition towards algorithmization and programming.

It should be borne in mind that the constant development of information technology means that teachers of computer science shall continue to educate themselves and improve their skills in order to support and assess students' abilities in a balanced way and to support the development of the most talented ones. This is because in addition to discovering students' unique talents, they shall create the conditions for their further development in their chosen field, which is determined by their competences (Szczepkowska, 2019a; Wójtowicz, 2021).

4.5. Students with learning difficulties

Planning individualized support measures requires identifying the areas of functioning in which each student experiences difficulties. Early identification and prompt support for an adolescent is extremely important in terms of the student's understanding of the content communicated to him or her, but also in terms of his or her construction of statements and argumentation of his or her own opinions. In all cases, it is necessary to get to know the student. Planning systematic and individualized support for the student and monitoring the results achieved by him or her, and – if necessary – modifying the methods and forms of his or her education, requires not only cooperation with parents, but also, just as often, an individual pedagogical and psychological diagnosis (Krakowiak, 2017).

In computer science lessons, teachers can support young people by using didactic means that enable multisensory cognition, differentiating written and oral instructions, using formative assessment and consolidating the material by carrying out tasks in the form of projects or teamwork. It is important to strive for harmony in the emotional and social development of young people, whose low self-esteem is eliminated by encouraging initiative and creative activities related to the student's area of interest.

Dyslexia deserves special attention in the context of computer science classes, as difficulties in reading often translate into problems with understanding the content of tasks. Supporting the student in this area will require the teacher to reinforce the message by supplementing or repeating the information in a different way, for example, by way of graphical depiction of the command or by way of verbal explanation. Another developmental disorder that is relevant to the assessment of student achievement is dyscalculia. This is because the tendency to rearrange the order of digits in numbers gives incorrect results from calculations (Rafał-Łuniewska, 2021a). In the case of computer science, the teacher should change the form of testing the student's knowledge by focusing his or her attention on following the reasoning behind the solution. Furthermore, students with learning disabilities may experience difficulties with

cause-effect inference, translating into problems with the application of algorithmic elements. The teacher should then support the adolescent in acquiring ordering and valuing skills through the use of formative assessment (Pintal, 2022).

Tasks given to students with learning difficulties should represent practical applications of the subject matter being discussed, which students encounter in everyday life (Fazlagić, 2022). Instructions should be given in short sentences that accurately capture the essence of the problem. When providing instructions in written form, the teacher should ensure that the text and graphic elements are prepared in accordance with the WCAG (Web Content Accessibility Guidelines) standards. In addition, he or she can extend the time limit to complete the tasks.

The educational environment is of great importance for the functioning of young people at school. The teacher should make use of the potential of the family, especially with regard to the independence and responsibility of the student, because together they can create the right educational atmosphere for dealing with learning and behavioral difficulties. Parents are a valuable source of information about the student (Mucha, 2018; Szczepkowska, 2019b). They can provide the teacher with information on their preferences and dislikes.

Summary

Work with modern technologies allows to conduct classes in varied ways, especially when it comes to the choice of tools, methods and intensity of work. This is because equipment can act as a bridge between the adolescent's world and the surrounding environment. However, each of the above-mentioned needs requires different adaptation measures. The lack of differentiation that equalizes students' educational opportunities may hinder a teenager's functioning in a group, lower his or her self-esteem and reduce his or her motivation to continue working (Dobrowolska, 2018). During adolescence it is of paramount importance to achieve social recognition among peers (Wachowiak & Rudnik, 2020) and to gain prospects for future professional work.

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