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ICT in special education

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Abstract. In recent years, worldwide and in our country, the view has been established that all students, regardless of any element of differentiation, special need or characteristic related to national, cultural or social identity, should have equal learning opportunities in one school for all. The use of Information and Communication Technologies (ICT) contributes significantly to the learning process. Especially for students with special educational needs, ICT provides rich educational experiences. The following work refers to ICT in the field of application of Special Education, in assistive technology, educational sortware, which provides opportunities to approach knowledge, socialization of individuals and removal of physical barriers to access to knowledge of students with special educational needs.

Keywords. Special Education, Education, ICT, Assistive Technology

1. Introduction

Information and Communication Technologies are now an essential tool in the educational process of learning the new methods of modern educational systems, as it is believed that technology is the guarantee for the active participation of the student in the learning process by transforming him from a passive receiver to an active participant, therefore more independent, autonomous and enables him to approach learning according to his own abilities and expectations.

It is generally accepted that in people with special educational needs New Technologies manage to overcome obstacles and alleviate the shortcomings and deficits of students, in order to approach knowledge but also to remove isolation by restoring social reality after giving them the opportunity to communicate. with its environment and its interaction with it [1].

Computers provide students with disabilities with what they really need: step-by-step instruction, a highly successful teaching strategy, especially for students with autism. It should be emphasized that a key factor influencing the proper use of a computer is human presence. The teacher is a companion , an animator and a guide. She is the one who designs and selects the tasks that the students will do on the computer, helps to understand the work, explains her educational goal, guides the process, supports the students when needed. It should also be noted that even with the use of the computer, the educational activity should be individualized, based on the needs, abilities and particularities of the student, have a specific goal and use appropriate digital educational material that will aim at acquisition of knowledge.

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Special Education includes a wide range of disabilities: sensory, physical, mental, developmental, learning difficulties, speech and language problems as well as behavioral problems.

ICT in the education of people with special educational needs is an important supportive tool in approaching the knowledge of people with disabilities and the use of software suitable for each disability adds value so that students have access to knowledge. There is software that is suitable for all students but also software that is used per category of student disability based on the characteristics and deficits of each disability. The aim is to present the knowledge to the student with Special Educational Needs in a way that helps him but also to be actively involved in learning, to use them as supportive tools to promote his learning and autonomy.

2. ICT and Special Education

The terminology "Information and Communication Technologies" refers to the processing, transmission of information through various forms of representation (image, sound, video, symbols) as they are the means of conveying these messages. As mentioned Tai [2] These include the interface human computer (human-of computer interface), the Internet, multimedia, the hypermedia and modern software, continuously they are very friendly to the user.

Information and Communication Technologies now play an important role in people's daily lives in many areas, including education, training and employment and are an important tool for people with disabilities and / or special educational needs with the main goal of improving the quality of life, reducing social exclusion and increasing the participation of people with disabilities or educational needs. In the field of education in particular, the aim of using ICT for students with disabilities and / or special educational needs is to give them equal educational opportunities, but also as a means to support these learning opportunities. Nevertheless, students with disabilities and / or special educational needs belong to the groups that face barriers to access and use [3]. As teaching with the help of technology is gaining more and more interest and ground in the educational community, it results in the development of a variety of learning educational activities and environments aimed at effective learning. The technologies used to support learning are referred to as "educational technology". Educational technology includes both electronic devices and ICT aimed at developing new cognitive skills [4]. For the integration, the use of any technology is foreseen with the main goal of supporting the student for the approach of knowledge. This technology may include popular technologies such as laptops, tablets, interactive whiteboards, mobile phones, etc. or more specialized assistive technologies that compensate for difficulties or limitations regarding the access of the student with special needs or special educational needs such as mobility devices, reading programs screen, alternative keyboards, assistive and alternative communication devices, etc.[3]. The rapidly evolving development and spread of telecommunications as well as computer hardware and software have played an important role in contributing to the integration of ICT into the various levels of education. The integration and consequently the use of ICT in education is due both to the evolution of the internet and the development of multimedia that have significantly differentiated the ways of representation (image, audio, video, text) as well as easy access to information (fast search, fast transmission and exchange). Also, informing society, with the increasing use of computers and networks in many areas of human activities of daily life (eg economy, public administration, entertainment, information, etc.) as well as exploring the role that should be school in the context of such a developing society are two other important parameters for the integration of ICT in the educational process. Finally, the

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important role played by the urgent need for lifelong learning and pedagogical renewal programs in the evolution of ICT use should be emphasized [2].

The use of ICT in the educational process follows the following models:

• subject (technocentric model)
• tool for teaching and learning (holistic model)
• combination of the two previous cases (factual model) [2].

Regarding the education of students with disabilities and / or special educational needs, the focus is on ICT as a tool for integration, so that everyone has equal opportunities in learning, accessibility of ICT, training in the use of general and specialized ICT as well as and monitoring their effectiveness. These are the factors that according to research findings ensure the success of strategy programs and initiatives. Although discussions focus on the use of ICT in integration, it is pointed out that they can be used just as well and with the same effectiveness in special education. The point is that the emphasis should be on the use of ICT that will lead learning through different paths and according to the capabilities, needs and the way it facilitates each student and not just be a few more tools in the different study frameworks [3].

Planning for the integration of technology in the education of students with special needs has three directions:

A) evaluation of the effectiveness of the use of ICT
B) planning of appropriate educational activities
C) emotional reaction of students and teachers [4].

Access to and proper use of ICT are necessary conditions to give the opportunity to all students with individualized learning opportunities and differentiated teaching by applying the universal design for learning (CSS) (universal design for learning), "learning for all" [3], [6]. The learning approach is based on the different needs of students through flexible objectives, methods, materials and assessment processes tailored to the specifics and needs of individuals, so that all students move forward on their own, from their own starting point and with their own pace to conquer knowledge [3]. According to KSM, information is presented in a variety of ways, while curricula, objectives, methods, materials and assessment procedures are designed to meet student diversity and be flexible in adaptation and digitization [6] . In particular, a variety of means of representation are provided so that students can choose different ways of acquiring knowledge. Also, multiple means of expression and means of engagement are offered in order to attract the students' interest and to create motivation for them to learn, but also to give them the opportunity to choose the way of presenting and capturing their knowledge in a European way [3].

Most important of all, however, is the application of the "design" accessibility principles, ie to take into account the particularities and needs of the users to whom it will be addressed when designing the hardware or software and not to adapt to an existing product, in later phase. Proper use of ICT in the short and long term requires the development of materials, software and teaching materials, in order to follow the accessibility criteria which are the following:

A. Accessibility issues need to be addressed from the outset of the hardware or software development;

B. All the dimensions of the design should be considered, giving priority to the needs of the use and

C. Supporting materials should provide the necessary information regarding accessibility characteristics and technical specifications [3], [5].

The integration of ICT in teaching should be achieved in order to promote the participation and cooperation of all students, with and without disabilities. Learning is a social

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activity, therefore the role of ICT is particularly important [4]. According to the European Commission, the ultimate goal is "All individuals to learn, Anywhere, Anytime through Any device, with the support of Anyone" [3].

The integration and use of ICT in inclusive education is generally recognized in terms of their contribution to the learning process and the ability they give to all students with or without disabilities to improve their performance and skills (mathematics, written comprehension). , etc as well as to develop all their skills in order to be transformed into skills [3], [4], [6].

ICT allows students to approach learning in their own way to move at their own pace. That is, they contribute to the self-regulation of learning, which includes: goal setting , learning planning strategies, ways of organizing, coding and storing the necessary information, monitoring and control of cognitive functions, time management, self- motivation, evaluation, reflection and satisfaction by the result. Self-regulation is extremely important for students with disabilities and / or special educational needs in their efforts to cope with various difficulties and to achieve independent and active learning. Therefore, ICT would be useful to be accessible to meet personal learning needs, as the student is required to be able to support and use ICT in the best way to serve their needs [3], [4].

At the classroom and school level, the integration and use of ICT can effectively support the integration of students with or without disabilities or educational needs, provided it provides equal opportunities. learning, promoting cooperation in teaching and problem solving and reduces inequalities and social and digital exclusion [3], [4], [6], [7].

ICT is considered as an alternative literacy tool and tool to create the right conditions for new learning environments that enhance creativity and motivation for learning in students who have difficulties with the conventional way of teaching. It should be emphasized that ICTs offer many options depending on the type of emergency the student, different representations of information, immediate feedback and the ability individualized learning and teaching [3], [4].

The integration of ICT in the learning process favors communication and the transfer of a wealth of information in multiple ways, while at the same time facilitating the exchange of views in communication between groups of students, parents and teachers [3], [6]. In terms of the use of ICT by students with or without disabilities or special educational needs, it may be the only way to access knowledge, information and the learning process, thus gaining the opportunity to do things that they could not or did not find difficult in the past [4], [6]. It is a fact that ICT removes inequalities, but if they are not used properly and by all students without discrimination, there is a risk that the opposite result will occur, ie to aggravate social inequalities and stylistic divisions [4], [6]. Inequalities in education also arise from the inadequate or limited ICT accessibility of some students with or without disabilities or special educational needs [3]. Inequalities are also created in the absence of cooperation between teachers and students with disabilities and / or special educational needs in order to effectively develop e-learning environments and support technology to support students in adapting teaching to their individual needs. The lack of valid research on the psychological effects of e-learning processes also contributes to this situation [4]. In response to the lack of research on the effectiveness of ICT in education, including inclusion, the European Agency for Development in Special Education [3] proposes that schools create good practice communities, ie to promote the informal exchange of different forms of knowledge had positive results in its implementation through a network. Practice communities bring together actors who share common interests and encourage the exchange of ideas, ways of working, teaching methods, but also the identification of common problems and concerns as well as the search for ways to

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address them. Through these communities, schools will have access to information on innovative uses of ICT aimed at the access and equality of students with disabilities and / or special educational needs, research and development activities, accessible learning materials, examples of good practice , etc.

The creation of practice communities by schools presupposes that the appropriate infrastructure is in place. The European Agency for Development in Special Education [3] argues that an important advantage of ICT inclusion and use is the reduction in costs for educational institutions and students, provided there is a continuing investment and upgrading of educational infrastructure at school level, in order to keep pace with the wider technological developments.

The potential benefits of the digital education revolution, including support for inclusion, are varied:

• easy search and acquisition of knowledge, new learning groups,

• Ability to plan teaching in collaboration with teachers and students from other countries.

These capabilities, in order to be truly effective and beneficial for students with disabilities and / or special educational needs, need to ensure the safe use of ICT by these students, as they are potentially more vulnerable to online harassment and abuse and have difficulty access to some form of help and support. Therefore, the use of ICT would be of added value to be accompanied by the teaching of emotional, social and digital knowledge of students from an early age 3]. As highlighted in research and according to the following models [8], [9], [10], [11]. ICT helps regulate and ascend to higher levels of better functioning of mental emotional functions.

It should also be noted that ICT is a tool such that parents of people with special educational needs can participate in the education of their children as their involvement is an important factor for their subsequent development [12].

3. Assistive Technology

"Any object , with part of equipment or production system that meters can anyone be purchased from the market , to adapt or build to order and which is used to increase or improve the functional capabilities of people with disabilities" (Νομοθεσία ΗΠΑ) ie all the technologies used to support the disabled are called "Support Technologies".

3.1. Assistive Technology - Categories

Assistive Technology [13] is distinguished:

A) in assistive technology devices and

B) in assistive technology services .

There are many definitions for Assistive Technology devices, some of which are listed below:

"Any product, instrument, equipment or technical system used by a person with a disability, specially manufactured or generally available, that prevents, repairs, alleviates or eliminates damage, disability or defect" [14].

Assistive Technology Service is defined as any service that helps a person with a disability to select, acquire, or use an assistive technology device. In order to obtain such a service, in order to be effective, the following [15], [16] must apply:

• assessment of the possibilities and difficulties of the person with a disability, ie how he works in an environment: home, school, work, in other places, etc.,

• knowledge of processes for obtaining the service: purchase or rent of appropriate devices,

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• design and creation of effective infrastructure so that there is an adaptation of the support devices to the personal needs of the person with a disability, as well as maintenance, repair and possible replacement of the devices in case of failure

• specifications for proper use in order to achieve mostly positive results

• education of family members and professionals who associate with the disabled person and play an important role in his life.

Support technologies are distinguished in high and low technological construction (high / low-tech). Low-tech devices are for example keyboards for the visually impaired as this technological equipment is simple, low cost and does not require training. High-tech devices are mainly mechanical and electrical devices, which require training, have high purchase costs and are usually related to computers.

Based on their functionality, they are classified as follows [17]:

• Cognitive or Educational devices: games controlled by switches, PC and software.

• Mobility devices: wheelchairs , scooters , uprights and any device that serves the mobility of the individual.

• Alternative communication devices: communication boards, electronic communication boards, hearing aids and anything that serves communication.

• Environmental control devices: autonomous living aids, communication aids, architectural modifications, entertainment technologies.

As we go through the age of technology explosion it is next to have a very large number of devices, from simple and low technology to complex and high technology, from the plethora of which we are called to choose taking into account those that best serve the individual needs and skills of the individual that they will support.

3.2 Assistive Technology Solutions

The Assistive Technology (PC) devices as well as the PC software available today to all categories of people with disabilities have been adapted to their special needs and needs.

particularities of each group to which they are addressed.

The following are some indicative examples of PC devices and software.

3.2.1 Mobility (Devices - Software)

• Motion detector

Motion detectors detect motion and can translate it into pointer movements on the computer screen by replacing the mouse, or the joystick serving people who can not use their upper limbs. Some motion and position detection systems monitor movement from a reflective sticker that is fixed to the user's forehead or through a pair of special glasses worn by the user.

• Gaze detectors (-eye tracking)

Eye detectors are advanced electronic systems that allow the computer to be managed through eye movement with the help of a specially integrated camera and with a complex program, which processes the eye movement and receives this movement as a movement of choice. In this way the eye movement replaces the classic manual pressing keyboard so that any person with mobility problems or cerebral palsy can write a text, use the phone, surf the internet, etc.

• Hand / foot switches - pneumatic switches

The hand / foot switches, usually a system of two separate switches, for the left and right "clicks" of the mouse, as they are its "replacements" and help people with disabilities to control the pointer on the screen, the "click" and other functions related to the use of the computer. Pneumatic switches help the user to control the functions of the computer or other devices by inhaling / exhaling.

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- Special keyboards

These can be small keyboards, for short range motion, large keyboards, for people without good and precise motion control, ergonomic or comfortable keyboards, usually consisting of from a different section for the alphabetical part and different for the movement arrows and numbers, and simplified keyboards, which have only the necessary keys.

The keyless keyboard (Orbi Touch) is also commercially available , designed to support people with upper extremity disabilities by eliminating finger movement and reducing wrist and palm movement during typing. The keyboard is a console that has two domes, two spherical knobs, where the student rests his palms and each dome can and does move in eight different directions facilitating the movements of the hands.

Also, the programmable keyboards with features of Intellikeys , of Intelli Tools , smart, practical and versatile keyboards whose operation is based on the application of a series of special and flexible overlays . They do not require any special software (software) and used in all word processor programs or software that receives data from the keyboard and allow mathites- disabilities to easily type in, introduce numbers, surf the internet etc.

The trackballs are used by people with mild motor disabilities of the upper extremities and have built-in three switches with a special design. Also, the joysticks are easy to use, incorporating two or more keys that replace the mouse key functions. Finally, the No hands Mouse devices work with the use of the feet, while there is also a mouse for handling the tongue, with magnetic sensors, suitable for people with mobility disabilities of the upper and lower limbs.

- Touch screens

Touch screens replace the well-known conventional mouse and with minimal pressure on the screen control not only the movement of the cursor but also other functions.

- Click facility (via software)

This special function is offered through programs that use techniques to allow users to make the appropriate click through switches or without them and with the standby technique, and depending on how long the cursor will remain at the target point will be executed and the corresponding function (click, double click, right click, press and hold, etc.).

- Virtual Keyboards

Keyboards that enable one or more users to run this software tailored to their needs on the same computer as they have configuration settings related to appearance, key size, typing mode, etc., typing any text using one or more and more switches.

3.2.2 Sight / Hearing (Devices - Software)

- Video Phones - Video Calls

The video made with smartphones and past the videophones are a useful aid to people with hearing problems, severe mental retardation, etc. aglossias [18] providing the possibility for individuals to be able to communicate with friends and relatives through sign language.

- Braille printers

Braille printers with suitable translation software print on special paper from conventional written text in Braille and vice versa, allowing the user to type and correct text in regular letters and produce a Braille print .

- CCTV Magnifiers – CCTV

The devices have a camera that connects to the computer screen to display the enlarged document or object, allowing the user to adjust the magnification of documents or objects each time, but also to enlarge the PC screen at the same time . so that the user can see the enlarged object or form in a separate area of the PC screen, and at the same time work in the PC interface.

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- Tactical Diagram Machines

These devices provide the ability to print embossed shapes and are an ideal aid for visually impaired people to understand shapes and devices.

- Braille screens

These are tactile readers that allow tactile access to Braille text in real time and can be connected to any PC or mobile device.

- Speech Recognition

These microphones allow the input of text into computers and mobile devices, enabling dual use of speech recognition; (a) dictation, where the user dictates and what is spoken is converted to text; and (b) the control of the computer or mobile device, where the user controls and guides the devices by giving verbal commands.

- Screen readers

Screen readers have the ability to locate all text formats (visible or not) in the graphical interface (icons, buttons, menus, dialog boxes, lists, message boxes) of a computer and transfer them to the Text-to-Speech Conversion system. so that the user can acoustically perceive the graphical environment, to be able to navigate audibly in it, to listen to the text (eg NVDA) and generally to perceive the environment through hearing. It is provided the possibility for some screen readers to be combined with Braille screens so that the information "takes" a tactile form.

- Text customization applications

In recent years, most applications have been developed for reading digital texts and web pages, allowing the screen to be adjusted according to the special needs of the user, such as adjusting the contrast between letters / background or changing the font size, etc.

- Screen magnifier

These are software with a magnifying glass function and are addressed to people with limited vision and color dysfunctions [19]. Using the software, all the elements of interest to the user are displayed on the computer screen in magnification: a text, an image or a small object as well as produce prints of text with enlarged characters.

- Translators Braille

Braille Translators are essential software for converting text and printing "in Braille format , automated or with user intervention in the processing of the text before" printing "in Braille . It should be emphasized that Braille translators support both the Greek language and the Greek Braille system .

- Visual Character Recognition

The reading printed text from the computer for a user with visual disabilities developed in three stages: a) digitizing of printed text using a scanner (scanner),

b) with the help of special software the digitized information is converted into electronic text of distinct characters, as a text file

c) the text is pronounced or presented on a Braille screen .

3.2.3 Alternative communication

- Alternative Communication Systems

These systems consist of software, touch screens or switches and help people with speech difficulties or mental problems by enabling them to type text, select real-world images or special symbols of a symbolic language of communication.

- Voice synthesizer (speech feature synthesizers)

These programs present the information they receive on the screen (letters, numbers, punctuation marks) by speech, enabling visually impaired users to receive feedback when entering data.

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3.2.4 Cognitive / Educational needs

• Alternative Browsers

People with disabilities: mental retardation, mobility impairment, vision / hearing impairment can use well-designed browsers that meet the specific needs of each disability such as: Browser Brookes Talk (for the visually impaired), Browser PW WebSpeak (for the disabled) with vision problems, dyslexia and learning difficulties), Browser MultiWeb (for people with multiple special needs) [20].

ZAC Browser (Zone for Autistic Children) is a web browser designed specifically for children and adolescents with autism spectrum disorders. An effective tool for children with low, medium and high functionality. The Zac Browser is a software that allows the child to have access to activities, many games of different interests that through video encourage the child to speak. All games, activities and videos are selected specifically for their positive effect on the characteristics of the disorder, such as problems in social interaction and communication, limited interests and repetitive behavior.

• Word prediction / spelling software

One form of word prediction is word completion as the author / user selects the first letter or letters of a word to predict the requested word and when it appears it is selected and inserted into the text. Also, another form of word prediction is word prediction that is likely to follow what has just been written, based on recent pairs of words that have already been used. Also, word prediction software often allows the user to enter their own words in word prediction dictionaries, either directly or through "learning" from the program of words being written.

• Text-to-speech converters

They are software applications that utter any text in real time using "Text-to-Speech" technology. They usually allow configuration: tone and rhythm of speech, while a corresponding set of voices is available for pronunciation that resembles the human voice. Today, text to Greek Speech Conversion software is also available for mobile devices, while there are applications that scan printed text and convert it to real-time speech.

• Digital talking books

Digital talking books give the user audio access to the contents of printed books, newspapers and magazines with the ability to interact with: contents, browsing, index, bookmarks, voice notes, etc. Talking digital books are available in various formats (cd , dvd or MP3 file).

4. Educational Software

According to modern educational policy, the use of New Technologies and especially ICT and specifically the computer is an integral tool of teaching in the field of education and in the context of the holistic approach and discovery of knowledge, giving full meaning to the term "e-learning" education. The new education is flexible both in terms of the form that can be changed depending on the requirements, the context, the aspirations, the effectiveness of the educational process within the educational community.

According to scientists, two main goals are pursued through the use of technology in education:

(a) One is the learning incentives given to students / behavior shows to increase their participation in learning and improve achievement of learning objectives. Such motivations can be: the sound, the image, the color that "helps" especially students with learning difficulties. The Papert [21] argues that the computer as a learning tool and as a cognitive tool offers an environment that transforms the learning process by boring and difficult, it takes a lot of effort and attention, in process of discovery, participation and enthusiasm.

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It transforms learning from passive to active, to all students, from all socio - economic-cultural strata with peculiarities and deficits or not. It emphasizes, at the same time, the importance of the human presence, of the teacher as a collaborator, supporter and guide throughout the process of approaching and discovering knowledge [21].

(b) The other goal concerns the form of "teleconferencing" as an educational learning process that is underway in all countries of the world with the active presence of the teacher as a guide.

Therefore, the computer is particularly useful because a flexible use and versatility , as long as supervisory means to use appropriately structured software to principles and pedagogical rules [22].

The characterization of a software as a teacher takes into account both the pedagogical and the technological dimension.

The educational software is considered to contain didactic objectives, complete scenarios, allegories of pedagogical significance and mainly brings specific teaching and learning results [22]. The educational software from a technical point of view is examined in terms of the quality of the interface environment , ergonomics, the type of interaction it allows with the user, the means used (image, sound, etc.) and its aesthetics.

Educational, encyclopedic and entertainment application packages are usually considered as educational software.

The purpose of the educational software is to be an auxiliary tool of the teacher for the quality upgrade of the teaching in the classroom, in the context of a student-centered education that favors the development of critical thinking and participatory-collaborative learning [23].

4.1. Categorizations of educational software

We can categorize the software:

A. Based on learning theory and underlying teaching approaches, in environments:

• guided teaching (drill and practice, tutorials, games, multimedia)

• anakalyptikis learning (discovery, exploratory learning)

• constructive expression, search and communication of information (netmeeting , portals , web games)

B. Based on development technologies, pedagogical theories and the computer in a role:

• teacher (behavior)

• learning tool (constructive)

• student (computer programming by the student)

4.2 Evaluation of Educational Software

The purpose of the evaluation is to investigate whether the special education educational software is governed by the following five basic principles [22].

These principles refer to:

1) educational objectives clearly categorized,

2) the appearance and aesthetics in the simplicity of graphics and the ease of use of the computer,

3) adaptability to the needs and capabilities of each student with multiple levels of assistance and the contribution to the active participation of students / three in the learning process, for the possibility of self-action [24].

4) possibility of generalization, transfer of knowledge from the computer screen to another medium, eg on the board, on paper

5) frequent application of the software in the classroom, users have the opportunity to study the curriculum as many times and as long as it is necessary for its consolidation, since in teaching with PC there are no time limits for achieving expected results [25].

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