

The role of digital technologies in development of 4cs competencies of learners

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Abstract

In today's digital world, people need new competencies that will allow them to be active and successful members of society. The key competencies of the 21st century, known as 4Cs – creativity, critical thinking, communication and collaboration, should be formed and developed in adolescents in schools and universities. They will help them integrate into a society characterized by the ubiquitous use of technologies. Information and communication technologies can support the development of these competencies, being used in training to stimulate students' creative and critical thinking, and to assist the process of collaboration and communication. The aim of the current work is to reveal the key role of technologies in the development of 4Cs competencies of digital generation learners.

Keywords: 4Cs competencies, Information and communication technologies, Digital learners

1 Introduction

Modern society, based on information and communication technologies and connected network of smart devices, strives to become a smart society. This direction of its development imposes new requirements on the education of adolescents so they can be fully integrated into it. The traditional approaches of memorizing content and known algorithms for solving problems are not enough today. There is a need to develop skills and competences to analyze and evaluate information, creative and critical thinking, ability to use the acquired knowledge in solving practical tasks and problems in real life. The basic competencies that must be mastered by learners, known as 3Rs (reading, writing, arithmetic), date from the early 19th century. The modern global community, the information society and the digital economy, dominated by technologies, are forming new basic competencies that people need to have in order to be successful. To be citizens of such a society, learners must also master the key competencies of the 21st century, known as 4Cs – critical thinking, creativity, collaboration and communication. Creativity and critical thinking are a prerequisite for generating innovative ideas in solving problems. Communication and collaboration ensure effective connectivity with other people. The four basic competencies can be formed and improved in classrooms, contrary to the common understanding that they are traits of human nature and it is not possible to be the subject of teaching and learning. The aim of the current work is to reveal the key role of information and communication technologies in the development of 4Cs competencies of digital generation learners.

2 4Cs Competences

The key competencies of the 21st century are critical thinking, creativity, collaboration and communication and they are known as 4Cs.

Critical thinking requires people to acquire, interpret, evaluate, and critically analyze large volumes of often contradictory information. It helps them solve problems by making informed and reasoned decisions and taking timely action based on evidence, knowledge and experience and using a variety of tools and resources (D'Addario, n.d.).

Creativity is the ability to think outside the generally accepted standards and frameworks. Creativity is to consider theories and concepts from different points of view, without imposing restrictions on existing norms. It is often associated with innovative ideas, approaches, and solutions. Without them, progress and development are not possible in any field (Kivunja, 2015).

Collaboration is the ability to work in teams to achieve a common goal, to learn from others and to contribute to the enrichment of their knowledge and development. To work with people from different cultures, resolve conflicts and make compromises has a crucial role. It is also includes taking responsibility for one's own and common actions. Collaboration expresses the role and strength of the collective intellect in the generation of ideas, content and knowledge.

Communication is the ability to express and convey ideas and thoughts so others can understand and perceive them (Stauffer, 2020). Communication also includes active listening, asking questions, and expressing opinions on discussed topics. Modern communication technologies guarantee the connection of people regardless of geographical location and time differences. To have effective communication with others, people have to know the features, advantages and limitations of the communication means and how to use them to present their ideas.

3 Development of 4Cs competencies of students

The potential of modern digital technologies has to be fully used to acquire the new basic competencies of the 21st century. The widespread integration of information and communication technologies in education and positioning students at the center of the learning activities, where they actively participate, cause positive changes in learning. Mobile and smart devices, smart technologies are an essential part of the everyday life of digital learners and should be incorporated into the educational process. Technologies provide innovative opportunities for educational organizations in terms of implementing new approaches and strategies in teaching and learning (Shoikova et al., 2017). They enable the necessary tools for creating an innovative and smart learning environment in which the development of 4Cs competencies is supported.

3.1 Critical thinking

The web space is a huge repository of information available to any learner. Students use the global information network when they are working on individual or group projects. Often they are tempted by the technique Copy/Paste, but the result is simply a way to present facts and information found on the web (Tech4Learning, n.d.). Learners need to be taught how to understand its meaning and interpret it in the context of the problem or task they are working on. Plagiarism checker software is a tool that can prevent the misconception of directly copying the information and indicating the source from which it was taken. The availability of many resources on the Internet is a great advantage, because on any topic can be found information. On the other hand, learners face problems related to the correctness and reliability of the information. Usually, students choose the first resource that comes out when searching in Google - in many cases Wikipedia. Learners should be informed that Wikipedia is a reliable source since the content is created as a result of the collective intelligence, but is not the only one that can be used. It is desirable to look for sources among articles in scientific and specialized journals, libraries and others. An important moment during the searching is the use of the accurate keywords, through which learners can find those sources that best match their information needs. Learners need to develop the ability to evaluate the information sources, to subject them to critical analysis, to synthesize and extract the important details. To do this, they need skills to build a system of criteria and use it to select the appropriate sources.

The next step after selecting the sources is to compare and evaluate facts and opinions, discover the links between them, extract the essential and important, summarize the common and different, play alternatives before making a final decision or taking concrete action (Tech4Learning, n.d.).

To develop critical thinking, learners have to be encouraged to design their own creation that solves a problem or task (Tech4Learning, n.d.). The process of creation demonstrates the application of acquired knowledge and skills in different contexts. The freedom to choose the tools to create and provide their own products is also a prerequisite for the formation and development of critical thinking. The variety of software tools will test learners' ability to choose the one that will strengthen the expression of their ideas and decisions. For example, the case of creating a presentation on a given topic. The learners can be provoked to create the presentation using cloud office package or web-based tools such as Prezi, Canva and others, not well known PowerPoint. Students should be encouraged to work with new and different tools, rather than relying on the comfort of the familiar. They have to use unfamiliar tools, so they need to explore and compare their features and capabilities to decide which one is more appropriate in the given case to express their ideas and to create a different and distinctive product. Practicing such an approach will give learners confidence that they are able to make the correct decisions and take the proper actions. The role of digital technologies in this process is as an object and at the same time tool to develop critical thinking.

3.2 Creativity

An important feature of any learning environment is to create conditions and prerequisites for active participation of students in the generation of new ideas, their improvement and subsequent implementation (Smit, 2016). Again, to successful development of creativity learners should be encouraged to produce their own creations – presentations, videos, projects, essays, lessons, stories, applications and others, not to copy good models and practices. This is the way to be actively involved in the learning process and turn from consumers of knowledge into creators of content. The manifestation of creativity in learners' products often excludes the precise instructions from teachers how to do something. Teachers should encourage diversity (Tech4Learning, n.d.) – the more diverse the learners' work, the more creativity they have shown. If all products are the same, it means too many instructions, directions, requirements and restrictions given by the teachers.

Modern information and communication technologies can support the realization of creative ideas of students. There are various tools for creating products in different forms and presenting and providing them to the others. Let's look again at the example of creating a presentation on a given topic or problem – one of the most commonly used approaches that teachers practice to observe students' work. Students can integrate multimedia elements and links to external sources; create effects, animation, and interactivity with all presentation products. These enriched possibilities of software support the realization of learners' creative ideas. Students can get the most out of the benefits of one or another tool and creatively use them. The tools can provoke innovative concepts and help students develop projects and assignments. Original ideas should guide the choice of presentation software, not its functionality. The lack or limited capabilities of a technology should not deter learners from realizing their ideas. They should be encouraged to look for ways to express their thoughts. Another technological mean for provoking the inventive performances of the learners and developing creativity is the use of Digital storytelling applications. The learners have the opportunity to tell a story that is a product of their imagination or reflects real situations. There are many tools for creating stories on the web, such as StoryKit, Story Creator, Storybird, Storyboard That, Tellagami, UtellStory and others. To enrich stories and reinforce them with facts, learners can search for information on the Internet, select the proper resources and synthesize the information they need. The presentation of story requires learners to choose approaches that are related to their communication skills, because storytelling is another way of communicating and transmitting ideas (Robin, 2006).

3.3 Collaboration

Collaboration includes teamwork, interaction with other team members, acquiring knowledge and skills from them, contributing to their training and development, giving their share to the collective creation of content and knowledge (D'Addario, n.d.). The distribution of tasks and activities between the participants in team working is important. It should allow each of them to show his strengths and at the same time to give the opportunity to improve weaknesses by interacting with others (Tech4Learning, n.d.). The allocation of tasks should not be imposed by the teachers. Learners are responsible to do this and during this process they are able to demonstrate their communication skills, critical appraisal and self-assessment. One significant problem in team working is the risk of not appreciating the contribution of each individual learner. It is possible one of the participants to hide behind the activities and achievements of others and to be without a real contribution to the final product. Such a situation affects the motivation of other learners. Digital technologies can help avoid such situations. There are many software tools that support and facilitate collaboration. Their most prominent representatives are the Wiki systems – the content and knowledge are created as a result of team working. Blogs, discussion forums, web conferencing tools, cloud office suites and services offer opportunities to create content collaboratively. They support also different means for synchronous and asynchronous communication. The advantage of the Social Web tools is the reporting of the individual contribution. The presence of a history of changes, versions of the created documents/pages/posts, comments and discussions on various issues ensures fair consideration of the contribution of each participant, which motivates learners to be active and creative.

Web conferencing software as a tool for synchronous communication, allow students to cooperate in real time. They enable participants to show presentations or other documents and use them to work together. It is possible to create shared notes on the presented documents, share screens and mutual assistance. Some of the software solutions provide additional opportunities for teamwork within the conferencing session through Breakout rooms. Small groups of learners can be formed to act as a team on a given task and then present the results to everyone. Cloud-based office suites provide shared spaces for collaboration on common projects in real-time and various connectivity channels. Each learner can perform his individual tasks on a group project, and the results are summarized in a common document. While working together, learners can appraise and edit the work of their colleagues, thus developing critical thinking, ability to analyze and evaluate, justify opinions, etc. Real-time work stimulates them to actively participate in executing tasks, since their actions and results are visible to others. The option to follow the work process on shared documents and establish the participation and contribution of each learner helps to impartially assess their knowledge and skills.

3.4 Communication

In the age of Internet of Things, all digital devices are connected and exchange data with each other. The next stage in the development of the global network is Internet of Everything where people and devices are connected. Digital smart devices can be used to ensure people's continuous connectivity. In a globalizing society, communication and work in international teams is common. Communication skills are of great importance for students. Learners have to be prepared to collaborate with people of different nationalities, with different views, ethnic and religious affiliations. They have to find the proper way to say, present and share their ideas, views or solutions to problems with others. Otherwise, no matter how creative and unique the ideas and solutions are, they will not be realized, especially in the case of team projects (Stauffer, 2020; Tech4Learning, n.d.). Communication, mediated by modern technologies, is possible and takes place through various channels. Connecting with other people is easier and faster than ever. To be effective and productive, students need to know the different tools and channels and make the most of their advantages in order to strengthen the presentation of their ideas. They should feel confident while using technologies as a communicating tool, because this will reflect on the

presentation of their thoughts. Software communication tools include audio-, video-, web conferencing, virtual classrooms, discussion forums, email, chat. They enable synchronous and asynchronous communication and some of them provide tools for collaboration. Preferred tools for collaboration in the learning process that support synchronous communication are web conferencing tools and virtual classrooms. They combine different types of communication channels. The combination of communication and collaborative tools allows the realization of the learning goals and support the development of relevant skills and competencies.

4 Examples of use of digital technologies for development of 4Cs competencies

This paper presents the practical implementation of the presented ideas for developing 4Cs competencies with the help of modern information and communication technologies. It is aimed at students of pedagogical specialties, who will work as teachers of information technologies after their graduation. In their future work as teachers, students will have to follow the curriculum provided by the Ministry of Education and Science and work on established and approved textbooks and manuals. Despite the imposed requirements, future teachers have the opportunity to show creativity and critical thinking in presenting learning content, preparing individual tasks, additional exercises, assignments for assessing pupils' knowledge and skills. They have to be able to apply their creative ideas even when there are limitations by the requirements of formal learning. Communication with students, collaborative work with them and other teachers are extremely important for creating a positive learning and work environment.

The example under consideration includes the following: Students are tasked to develop a lesson on a specific topic from IT courses. They can use a variety of resources – from textbooks and manuals to online video tutorials. Their choice is the result of careful study of available resources and the programs established by the Ministry of Education and Science. Their preliminary work includes researching the audience for which they are preparing the lesson. They need to take into account the needs and level of knowledge of pupils they will work with. Since there are many different learning materials, students have to extract, summarize or even change them according to the learning goals. They can create their own exercises, tasks, examples in different formats – text, graphics, audio, video. Students have to decide and choose the appropriate forms and tools for providing the learning content to pupils – presentation, video material, game, paper or electronic document, oral presentation, etc.

There are many software tools for the development of educational applications, including those with elements of gamification (for example, Learning Apps, Kahoot and others). They allow students to create projects for assessment of knowledge and skills. Despite the limitations of software tools to available templates, students can create projects that allows them to assess pupils' knowledge and at the same time assess their own teaching approaches and whether learning goals have been achieved.

Teachers have to limit the instructions given to students how to prepare the lesson in order to create conditions for developing of competencies such as creativity and critical thinking. The option of giving very precise instructions ensures that the learners will create the lesson properly, observing all the requirements. But the result is that all lessons are similar, because students do not have the opportunity to implement creative ideas if they follow precise and specific instructions to achieve the desired result. The advantage of this approach is that they will learn how to create a lesson according to the rules. The second option for completing the task is without giving detailed instructions, but only general guidelines. In this case, it is possible learners to skip some elements of the lesson, not to apply the proper approaches, go beyond the proper frameworks. But in this case, they will have the freedom to be creative. The teacher can discuss omissions or mistakes later with all students, demonstrate how it should be done to achieve the desired goals and results. The students will learn from the mistakes they had made.

Digital technologies assist students in completing the assignment and cover all developing stages – from providing new knowledge to assessing pupils' achievements. It is a matter of students' personal opinion and consideration which of them to use, how to implement them in a learning process to effectively realize their ideas. Technologies support the formation and improvement of competencies such as creativity and critical thinking.

Another example of practical implementation of digital technologies for development of 4Cs competencies is the collaborative work of students on a group project, the result of which is presented in a wiki system. Students create linked pages in a wiki system that summarize the results of team work. The collaborative work of students involves the distribution of tasks and discussions on the possible solution of each of them to avoid the duplication of content or present materials that are not related to the rest. Collaboration and communication in the entire process of completing the task have the crucial importance. Each student has to guarantee the quality of both the results of his own performance and a critical assessment of the work of the other members of the team. The final performance depends on the quality of all components. The contribution of each learner is clearly distinguishable, since wiki systems offer tools to report the personal participation of everyone – the content he has added, editions and comments he has made, a chronology of changes is also kept. Each student is evaluated on the basis of individual performance and contribution to the overall performance.

These two practical examples illustrate the potential of modern technologies in developing the competencies of the 21st century of digital learners.

5 Conclusion

Technologies are used in all spheres of life and today's society is being transformed into a digital society. It requires new competencies and skills in people. To be successful in their professional activities in both real and digital environments in the technological world, learners need its key competencies – critical thinking, creativity, collaboration and communication. Critical thinking and creativity are personal competencies, whose development can be enhanced by digital technologies. Communication and collaboration are competencies that help individuals integrate into society. They can be evolved in the digital environment and are vital for the inclusion of the individual in the society. 21st century competences can be develop through the whole life, but their formation in adolescents has to start in classrooms. Information and communication technologies help create favorable learning environment where the necessary skills and competencies can be developed.

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