

Educational Ventures

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WP2 - 2.1 RESEARCH

Immersive & collaborative learning: an analysis of educational practices in Poland

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1. INTRODUCTION

The aim of the study is to conduct a regulatory, didactic and technological review of:

- outdoor learning models,
- learning using the reticular activating system – RAS,
- meta-competencies and the impact of new learning methods on student motivation,
- using new technologies to support lifelong learning,
- the role of school in developing civic and social skills.

The review aims to finding theoretical foundations and a starting point for creating an innovative model of a cooperative school, through the development of transversal skills of students, increasing awareness of the cultural heritage of their territory.

1.1 Territory analysis to identify places of interest and topic to explore.

The CRAS Association operates in the Podkarpackie Voivodeship, which is located in the south-eastern part of Poland. Podkarpacie is a border area - it borders Ukraine to the east and Slovakia to the south. The capital of the Podkarpackie region is Rzeszów, a dynamically developing city with an area of 129.01 km² and inhabited by approximately 196,000 inhabitants. Rzeszów is not only the administrative center of the region, but also an important cultural, educational and economic center. It is the seat of many institutions, enterprises and educational establishments, including universities, polytechnics and other higher education institutions. The headquarters of the CRAS Association is located in Rzeszów, which is why this city was chosen as the main area of project activities.

The oldest archaeological materials from the area of today's Rzeszów (as well as its immediate vicinity) can be dated to the late Paleolithic period, i.e. the end of the Ice Age, i.e. the 9th millennium BC.

The city of Rzeszów was founded before 1340 and the oldest monuments in Rzeszów come from this period. In total, there are almost 190 historic buildings in the city - both individual monuments and buildings, as well as entire complexes. Moreover, Rzeszów has numerous meeting places and social and cultural events that are important for residents.

After the analysis, it was decided to select 2 places for the project that are important for residents and have the potential to be used as part of the project:

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1. Folwark Miłociński - a complex of buildings from the early 20th century with a park. It is a series of buildings of the former National Lower Agricultural School in Miłocin, which began operating in 1906. Since then, youth education has been continuously conducted in the buildings. Even the tragic events of World War I and II did not interrupt the school's activities. During its existence, the facility was reorganized many times. The types of schools and fields of education have changed, currently the Agribusiness School Complex operates in historic buildings. M. Copernicus. Around the building there is a garden and a park with several natural monuments that are over a hundred years old. It is a meeting place for young people and parents with children vacationing there. There is a playground in the park and a stud farm adjacent to the park. The city plans to create a brine graduation tower in the park. The Miłociński farm is the heart of the Miłocin estate in Rzeszów.
2. Sybirak Park - one of the most popular parks in the city. This is one of the larger green complexes in the city of Rzeszów. Its area covers approximately 8 ha, where adults and children spend their free time every day. It owes its popularity to its large area, lush vegetation on its territory, and social, sports and cultural events organized here. A characteristic element of the park is the Monument to the Siberians, depicting an exile crossing snowdrifts on weak legs, struggling to make his way against the wind, holding a rosary in his hand. It reminds us of the events during which Poles were sent to Siberia. The park is also a place for meetings expressing social involvement - meetings - both protests and rallies to discuss important social issues - take place here.

Both of the above-mentioned places are important for local communities, have a historical background and have excellent conditions for outdoor education.

1.2 Identification of target groups

The target groups of the non-formal learning model "Educational Ventures" are:

- pupils,
- teachers,
- educators,
- trainers in the field of pedagogy and education,
- staff of organizations participating in the project,
- decision-makers (at local, regional, national and community level).

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The end users of the project results are also:

- scientists,
- teachers and trainers in open-air museums,
- schools of all levels, public and private.

Here is a more detailed description of the benefits for each target group and end user of the project:

Benefits for target groups:

Pupils

- **Increasing engagement:** thanks to the knowledge of the functioning of the Reticular Activating System, the use of augmented and virtual reality and outdoor education, it will be possible to provide education that increases students' involvement in the learning process, and thus improves the acquisition of knowledge.
- **Development of meta-competencies:** new non-formal learning methods will help develop critical thinking, creativity, cooperation and independence skills, which are crucial for success in personal and professional life.
- **Participating in citizenship education:** thanks to civic education at school, students will be more aware of their cultural heritage related to the place where they live. They will also increase awareness of their rights and obligations as citizens, which may lead to greater social activity and involvement in public life.
- **Development of transdisciplinary skills:** students will gain an understanding of transdisciplinary, transversal skills such as analytical skills, critical thinking and teamwork, which will be crucial to their success in various areas of life, not just education.
- **Faster and more effective learning:** thanks to the use of outdoor education and modern teaching methods, students will acquire knowledge more easily and more effectively, which will translate into better learning results and, in the future, provide opportunities for better work and earnings.

Teachers

- **Support in everyday work:** teachers can take advantage of new technologies supporting lifelong learning, which will make it easier for them to personalize teaching and adapt it to the individual needs of students.

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- Increased motivation and commitment: by introducing new learning methods and integrating civic skills with technological competences, teachers can become more motivated and committed to their work.
- Integration of transdisciplinary skills: teachers can integrate transdisciplinary, transversal skills in their work, which will allow them to better understand the connections between different fields of knowledge and teach in a more coherent and comprehensive way.
- Promoting diversity of skills: teachers will be able to promote all the skills, abilities, mastery and talents that students bring to the task, encouraging both individual and group work. This approach can foster an atmosphere of cooperation and respect in the educational environment.

Educators and trainers in the field of pedagogy and education

- New tools and techniques: educators and trainers will have access to new tools and teaching techniques that they can use in their work, which will allow them to better adapt to the needs of their students.
- Professional development: by participating in the project, educators and trainers can also develop their skills and gain new experiences, which will have a positive impact on their professional development.
- Learning about innovative methods: educators and trainers can learn about innovative methods in the world of education. This will allow them to be more creative in their approach to teaching and develop innovative educational practices.

Staff of organizations participating in the project:

- Professional development: staff will be able to develop their pedagogical skills, learning new non-formal learning methods and using new technologies in the teaching process.
- Increased motivation: by participating in an innovative project, staff can become more motivated to work and expand their knowledge and experience in the field of education.
- Increased attractiveness of the organization: by participating in the project and creating an innovative model supporting science, the CRAS association will increase its prestige and recognition in the community. This will enable the organization to develop in the future.

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Benefits for end users:

Scientists

- New research perspectives: the project can provide new data and perspectives for research on the effectiveness of new learning methods and their impact on students' personal and social development.
- Cooperation with practitioners: Scientists can cooperate with teachers and trainers in the field of pedagogy and education, which will allow them to better understand the practical aspects of implementing new teaching methods.
- Development of interdisciplinary research: researchers can conduct research on the relationship between transdisciplinary transversal skills and the development of people, territories and cultural heritage. This may contribute to the development of interdisciplinary scientific approaches and new research directions.

Teachers and trainers in open-air museums

- Support in educational work: teachers and trainers in open-air museums will be able to use the project results to enrich their classes and provide students with unique educational experiences.
- Professional development: By participating in the project, teachers and trainers will be able to develop their skills and gain new experiences, which will have a positive impact on the quality of their work.
- Supporting diversity of talent: teachers and trainers in open-air museums will be able to promote all students' skills and talents, which may support students' development in various areas and build their self-esteem.

Schools of all levels, public and private:

- New teaching possibilities: thanks to the introduction of a new teaching model using non-formal learning, augmented and virtual reality, schools will have greater opportunities to personalize and adapt teaching to the individual needs of students.
- Improving the quality of teaching: the implementation of new technologies and teaching methods can contribute to increasing the quality of teaching and improving students' educational results.



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- Adaptation of curricula: by understanding transdisciplinary, transversal skills, schools can adapt their curricula to more effectively develop students' competencies in line with the needs of modern society.

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2. LITERATURE REVIEW RELATED TO OUTDOOR LEARNING MODELS

2.1 Exploring a new outdoor learning method

The concept of Outdoor Education (OE) is explained in many different ways in Poland. Most often in the literature you can find concepts such as adventure pedagogy, experience pedagogy, adventure education, environmental education, outdoor education, education outside the classroom, outdoor education, field activities or outdoor education.

Unfortunately, outdoor activities are most often used in primary education and concern nature and ecological education.

Over time, in higher grades, this method of education is limited, until it almost completely disappears at the secondary school level.

The educational paths introduced in the core curriculum in 1999 made it easier to implement issues covered by outdoor education. However, due to the low interest of teachers and pedagogues in this method of work, many paths were closed. Fortunately, modern didactics has recently introduced a new direction in pedagogical activities, concerning the creation of multi-faceted teaching and learning, which involves learning about reality by discovering, experiencing phenomena and acting in the human environment.

The main sources of knowledge about outdoor education are still English-language textbooks, and there are more small studies in Polish - leaflets, brochures. There is a lack of broader studies, e.g. scientific publications.

One of the most important studies introducing the issue of outdoor education and adventure education on Polish soil is the book „Education with Adventure" edited by Agnieszka Leśna and Ewa Palamer-Kabacińska from 2009. The publication aims to discuss issues that are relatively new and insufficiently researched in the Polish context. The authors point out that despite the existence of similar trends in Western pedagogy, in Poland adventure education and other forms of outdoor education are not widely recognized and used, especially in schools, although they are appreciated abroad as effective educational and upbringing tools.

The book contains various articles and research that present various aspects of adventure education, from active tourism to learning on training sailing ships, kayaking, survival and working with children and pedagogy students. This is the first Polish publication undertaking a broad analysis of these

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issues, which is an attempt to initiate discussion and develop interest in this area in the Polish scientific and educational community.

„Pedagogy of Experiences in Practice: Another Method of Group Work" is the second publication on this field in Polish literature. The book by Rafał Ryszka from 2017 presents important theoretical and practical aspects of OE. The author describes the basic assumptions of outdoor education and also provides ready-made solutions, with which the reader can use. This book is a valuable source of knowledge for teachers and pedagogues interested in the practical application of adventure education methods and searching for innovative ways of working with a group.

In the book „The Absence of Outdoor Education in School Education" (2019), authors Renata Michalak and Teresa Parczewska shed light on how many challenges face teachers who must change their thinking and approach to education to appreciate the value of outdoor education. outdoor education. At the same time, they try to present the topic of outdoor education as a pedagogical strategy that goes beyond school walls and engages students in authentic scientific experiences, confronting them with real challenges and problems through experimenting, independent acquisition of knowledge, experiencing and working using the project method. It is not only a set of theoretical considerations, but a practical tool that can change the way of thinking about education and open new opportunities for students taught in an inspiring and engaging way.

Ewa Palamer-Kabacińska in the article „Pedagogy of adventure - learning to be together, learning to act together" discusses the requirements of the modern labor market, in particular the importance of social competences at work. The author writes: 'it is expected that in the coming years, due to automation, some professions will disappear from the list of previously performed ones, and in turn, new ones will be created in work sectors offering previously unknown services. The development of technology will also result in other forms of employment and interactions between employers and employees. Lack of market stabilization will require a high level of soft skills, including social ones. Employees will be forced to change their attitude to work - flexibility, the ability to cooperate with different teams, solve problems and face new challenges will be valued. Project-based employment will be preferred - which, on the one hand, gives freedom of choice and decision regarding the type of work undertaken, but on the other - greater uncertainty about one's future. This type of employment requires resistance to stress, as well as the ability to plan various paths for your future. The labor market will value people who have the competences of e-leaders, i.e. people who can combine digital, business and management competences.

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One of the ways to shape the features desired by employers is the pedagogy of experiences.

The author presents the adventure pedagogy method and describes its elements in detail, as well as the adventure programs she developed and tested in 2015-2019.

Tips on how to conduct classes using outdoor education can also be found in such studies as: „Discover, experiment, investigate - about the discovery learning method" or in the „Outdoor Education in Polish" guide. Introducing outdoor education into the curriculum – kindergartens, primary and secondary schools.”

In turn, Małgorzata Jagodzińska and Anna Strumińska-Doktor in the publication „Outdoor education - strengthening the implementation of sustainable development" describe OA, mainly in the context of environmental education, which is its narrow use. However, they draw attention to gaps in the education system for teachers who have little knowledge of adventure pedagogy and are not prepared to use this method of working with students.

Environmental education can be used in various ways. Aneta Skuza, in the publication „Outdoor education in the process of developing social competences of maladjusted youth", describes the use of experiential pedagogy as a therapeutic and socialization method. It presents the use of OE in shaping social skills, which are extremely important in the process of resocialization of minors and are also necessary to cope with socially difficult situations.

Barbara Moraczewska focuses more on the pedagogy of place. In his work „Pedagogy of adventure and the effectiveness of field activities in the field of cognitive values of history, culture and tradition of the revitalization area on the example of Włocławek", he shows how activities outside the school walls can be combined with the development of cultural and historical identity. Outdoor education was described not only as a tool for building soft social skills, as in previous publications, but also for shaping local identity.

The use of place pedagogy is also described by Agnieszka Kruszwicka and Michał Klichowski in the scientific article „City-based learning - the concept of learning through the city. Theoretical background, basic assumptions, future contexts of development and implementation. The concept of city-based learning assumes that everything in the city space constitutes a unique learning environment. The city is therefore an educational resource in itself, and its cultural heritage is a history that can be read and explored. The authors describe modern educational methods combining outdoor learning with new, mobile technological tools and technologically innovative infrastructure. The study includes information about educational clouds and multimedia guides that will enable outdoor learning using city-based learning.

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The same authors in the study „Cyberparks as hybrid learning spaces: considerations on the margins of the COST1 project" present the concept of "double" use of urban park spaces. This concept fits into outdoor learning based on city-based learning and assumes adding an additional digital dimension to parks, and therefore converting these spaces into a hybrid form - combining nature and technology. Such solutions will increase the attractiveness and effectiveness of experience education - it is an attractive combination of nature education with cyber-spatial experience, which may be an additional element attracting young people.

As we can see, although there are not many books on outdoor education on the Polish market, you can find interesting publications describing both the theoretical basis of this teaching method and various ways of using it.

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2.2 Virtual technology paths to be taken into account in didactic planning

New generations are characterized by a predisposition to acquire skills through direct experience and exploring the world through the senses. Learning occurs through action and experimentation, making traditional educational tools that were limited to communicating academic concepts obsolete. In today's world, education is constantly changing, and young generations increasingly value learning through direct experiences. This change in perspective also requires the education system to adapt to better respond to students' needs and preferences. Faced with the changing needs and expectations of new generations of students, education must transform to better respond to their natural tendency to learn through direct experiences and experiments. The introduction of augmented reality (AR) and virtual reality (VR) technologies is becoming a key step in this transformation. AR, VR and educational virtual paths create amazing opportunities for teachers and students. By using them, you can create interactive and engaging lessons that allow students to explore the world with their senses and actions.

Personalizing learning experiences

Enriching classical education with outdoor learning, AR, VR and virtual educational paths can significantly improve the learning opportunities of young people, taking into account their predispositions to learn through direct experience and experiments. AR and VR technologies enable educational experiences to be tailored to students' individual needs and learning styles. For example, through interactive AR/VR scenarios, teachers can create lessons that are more engaging and tailored to each student's level of understanding.

Expanding the experience with virtual travel and exploration

Instead of just reading about distant countries or historical events, students can use virtual trips to explore different places and historical eras in a more interactive and accessible way.

Simulations of practical tasks and professions

Using virtual reality technology, students can practice various professional activities in a safe simulation environment, enabling them to acquire practical skills. Such simulations are particularly important in areas such as piloting aircraft, performing surgical operations or architectural design.

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Virtual laboratories

Virtual laboratories can be used to teach chemistry, physics, life sciences, and other fields where safety or cost may be an obstacle to conducting traditional experiments.

Global cooperation and interaction

These technologies can also be used to enable global collaboration and interaction between students from different parts of the world, allowing for cultural exchange and deepening understanding of diversity.

Creating virtual lessons and educational materials

Teachers can create virtual lessons, presentations and other educational materials that are more dynamic and interactive than traditional ones, which can increase student engagement and facilitate learning.

Real-time research and experimentation

Students can use AR technology to conduct research and experiments in real time, allowing for immediate analysis of results and a better understanding of scientific processes.

Development of soft skills

In addition to imparting academic knowledge, these technologies can be used to develop soft skills such as collaboration, problem solving, creativity and communication through simulations and interactive scenarios.

Outdoor education, which itself focuses on learning through experience, can be even further enriched by the use of AR, VR technologies and educational paths. Thanks to them, students have the opportunity to learn in an interactive and practical way, engaging in the exploration of the surrounding world at new levels. For example, during field trips, AR applications can act as virtual guides, providing additional information about the surrounding terrain. Students can scan various elements of the environment to learn more about local flora and fauna, the history of a place or the geography of the area. The use of VR technology allows you to create interactive maps of the area that students can explore in virtual reality. This allows you to learn terrain orientation, navigation and understanding of geography in a practical and interactive way. Simulations of natural processes in VR



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technology enable students to observe and understand the complexity of ecosystems and the human impact on the natural environment. They can also conduct field research in virtual reality, collecting data, analyzing the environment and drawing conclusions based on observations.

Interactive educational paths using AR are also a great way to encourage students to discover the world around them. Following the route, students can use AR applications to discover hidden puzzles, historical facts or solve interactive tasks, which further engages them in the learning process.

The integration of these technologies with outdoor learning opens up many new opportunities for teachers and students to learn and explore the world. This gives you the opportunity to develop practical and social skills such as cooperation, problem solving and creative thinking, while making learning even more exciting and interactive. As a result, combining outdoor education with VR, AR technologies and classic teaching methods can create a dynamic, engaging and effective educational environment that better responds to the needs and interests of modern students.

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3. THE INNOVATIVE IMPACT OF RETICULAR LEARNING

3.1 Study of the cognitive foundation of Reticular Activating System – RAS

Reticular Activating System - RAS is part of the reticular system located in the brainstem, which is a network of neurons. It participates in many important body functions, including the rhythm of sleep and wakefulness, breathing, heart function and motivation. It also plays a role in regulating sexual arousal, appetite, eliminating body secretions, maintaining consciousness and directing attention to certain things. The RAS functions as a network of neurons that run through the brainstem and connect with other parts of the brainstem. It is divided into the ascending system, which conducts impulses, among others, to the cerebral cortex, thalamus and hypothalamus, and the descending system, connecting with the cerebellum and the nerves responsible for various senses. At the same time, the RAS acts as a filter - thanks to appropriate selection, it decides which information from the environment will be noticed by our brain. It regulates sleep, rest and wakefulness, puts the brain in a state of stimulation and concentration, enabling learning and remembering. Periods of sleep are necessary for our survival - the brain needs periods of rest to be able to absorb knowledge better. The Reticular Activating System modulates, raises and lowers the response threshold of neurons. It transmits information about sensory stimuli affecting the body to appropriate areas of the central nervous system, stimulating us and preparing us to act and learn. It has extensive connections with the cerebral cortex. The reticular system is responsible for awareness of the environment, the ability to learn, think and act. Thought processes take place in the cerebral cortex, but the signal for their activity comes from the reticular system. Sensory impulses coming from the entire body are transmitted through the reticular system to the cerebral cortex, cerebral hemispheres, thalamus and cerebellum - the most important centers of sensory integration in the central nervous system.

Experimental studies have shown that the RAS also plays a role in the ability to sustain attention. Therefore, it plays a significant role in acquiring knowledge, solving tasks, and operating efficiently. In addition, it participates in modifying muscle movements, ensuring muscle readiness for activity, and even strengthening or weakening sensory responses.

The Reticular Activating System has the ability to "learn" stimuli important to the body. This has important adaptive significance. Due to the flexibility that allows us to remember

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information about the meaning of individual stimuli, the process of selecting the information we receive is improved.

Mastering the basic principles of RAS operation and the ability to deal with them are crucial to developing learning strategies that will optimize concentration and retention of information. Stimuli that evoke interest and emotional involvement promote the activation of the RAS. Integrating this knowledge into the educational field will lead to a more engaging and effective learning context. The use of natural RAS functions in the educational context can be significantly enhanced by modern technologies such as virtual reality, augmented reality, technological paths, as well as the use of outdoor learning.

3.2 Applications of RAS in teaching

The natural functions of the Reticular Activating System (RAS) can be used to develop a better teaching model. The RAS plays a key role in regulating arousal, attention and consciousness, which is important for learning and memory processes. New technologies such as virtual and augmented reality can play an important role in implementing this learning model. Thanks to VR and AR, it is possible to create interactive learning environments that can stimulate RAS activity and increase student engagement. For example, you can create 3D simulations that allow you to explore concepts in a more sensory and engaging way. Additionally, these technologies can be used to adapt learning content to students' individual preferences and level of advancement, which can contribute to more effective learning.

Grid learning is an innovative teaching method that moves away from traditional linear and sequential models, preferring an open and flexible approach to learning. In this learning method, students have the opportunity to personalize their educational path, which allows them to better adapt the learning process to their individual needs, skills and interests.

This method is based on the assumption that the learning process should not be limited to a rigid curriculum framework, but rather should be flexible and adapted to the needs of students. Thanks to mesh education, students have the opportunity to explore various topics, connect them with each other and create their own connections between different fields of knowledge. Understanding individual differences in the functioning of the RAS can help teachers tailor teaching strategies to each student's needs and preferences. Some students may respond better to specific teaching methods that take into account their individual biological rhythms and preferences.

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Understanding the functioning of the RAS can help optimize learning processes, personalize teaching, create stimulating learning environments, develop teaching strategies, and increase the effectiveness of educational therapies.

Nowadays, scientists and teachers are increasingly aware of the potential of understanding the RAS function. Thanks to this knowledge, teachers are able to adapt their teaching methods and the educational environment in such a way as to stimulate the activity of this system in their students. By varying teaching strategies, teachers can respond to individual differences in the level of RAS activity, which promotes better engagement and more effective knowledge acquisition.

Another aspect of using knowledge about RAS in education is the personalization of the teaching process. Understanding how RAS affects students' state of arousal allows you to tailor teaching methods to their individual needs and preferences. Thanks to this, students with different levels of RAS activity can use various forms of learning, which facilitates more effective knowledge acquisition. Additionally, knowledge about RAS can be used to design inspiring learning environments. Educators can use interactive learning tools and virtual reality technologies to create simulations and experiments that engage students' senses and enable them to explore concepts in a more interactive and sensory way. The RAS also plays an important role in the development of teaching strategies that take into account the natural mechanisms of regulation of brain activity. Teachers can use a variety of techniques to activate the RAS, such as short breaks during lessons, physical activity between classes, or various forms of sensory stimulation, to increase student engagement and improve their ability to absorb knowledge. Knowledge about the RAS is also important in the context of educational therapies. Teachers and therapists can adapt therapeutic strategies to stimulate RAS activity in people with various learning disabilities, which may help to improve their cognitive processes.

In summary, understanding the mechanisms of action of the reticular activating system can provide many benefits in the field of education. The use of this knowledge can lead to the creation of more personalized, engaging and effective teaching processes and educational therapies, which will contribute to better knowledge acquisition and educational success by students.

3.3 How can RAS have a positive impact on the creation of a new school model within the project

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As technology and science continue to evolve, we are increasingly paying attention to how we can use our understanding of the biological processes of the brain and the achievements of new technologies to improve educational systems.

One of the most important aspects of the new school model should be the ability to personalize the learning process for each student. Because the RAS regulates arousal and attention, teachers can use this knowledge to tailor the pace, teaching method, and classroom environment to students' individual needs and preferences. Students with different levels of RAS activity may benefit from a variety of teaching strategies, including: education that enhances experiences thanks to outdoor education and modern technologies, which leads to more effective learning and better educational results. Thanks to knowledge about the biological side of learning, the new education model can focus on creating an environment that stimulates learning. The use of VR, AR technologies and interactive educational tools will allow you to use the opportunities offered by technology to increase students' knowledge acquisition and increase their engagement and curiosity. Creating interactive lessons and simulations that engage students' senses stimulate their brains to process information more deeply.

The use of advanced technology and knowledge will create a model focused on the individual, taking into account the diversity of learning styles and encouraging active involvement of students. Scientific foundations and knowledge of how the learning process works will help create an education model that mobilizes students to actively participate in the learning process, supporting the development of skills based on cooperation and participation. This approach promotes the development of social skills, critical thinking and problem solving - all necessary to function effectively in today's changing world.

Thanks to this knowledge and the use of modern technologies, it is possible to create an education model that favors interaction and cooperation between students. By engaging students to actively participate in classes, teachers can promote experiential learning by supporting students' communication and interpersonal skills.

A model that takes into account the operation of the RAS at the neurological level may also influence students' ability to focus and concentrate on tasks, which is crucial for effective learning. Stimulating this system through a variety of teaching methods can increase students' engagement and encourage them to actively seek knowledge and develop skills needed to cope with the challenges of the modern world. Furthermore, the use of RAS in education can contribute to the development of transversal skills such as critical thinking, problem solving and decision-making.



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By engaging students in a variety of interactive and hands-on science experiences, teachers can support the development of the skills they need to function effectively.

As a result, the use of RAS in education can contribute to the creation of an environment that not only fosters active participation in the learning process, but also supports the development of comprehensive skills necessary to function effectively in today's global and changing environment.

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4. META-COMPETENCES AND THE IMPACT OF NEW LEARNING METHODS ON STUDENTS' MOTIVATION

4.1 The concept of meta-competence: Literature and theoretical foundations

As Stefan Kwiatkowski writes in the book "Competences of the Future", the education process is nowadays considered in the context of the idea of lifelong learning. It assumes the need, or even necessity, for learning both in school and academic institutions (formal education), as well as at various types and levels of courses, training, workshops (non-formal education) and during professional work and relationships with other people (informal education). The idea in question has been known for hundreds of years, but it has taken on a new meaning in today's times, characterized by an unprecedented acceleration of civilization, covering all spheres of modern man's life. Even the best education obtained as part of formal education requires reconstruction after a few years, consisting not only in updating the completed field of study, but also in integrating it with education previously assigned to other, not always related fields of study, and in the case of higher education - to scientific disciplines. The degree of complexity of social and professional problems is currently so high that it requires combining education in many fields.

We are currently observing the process of integrating formal education with non-formal and informal education supporting it. The learning outcomes in all the forms mentioned above are competencies, which include:

- knowledge, i.e. a set of facts, laws, theories, principles and experiences acquired or independently constructed,
- skills, i.e. the ability/readiness to use knowledge when carrying out various types of tasks,
- social competences, i.e. the ability to design and shape one's own development as well as autonomous and responsible participation in social and professional life.

Until recently, the concept of competences was defined as the scope of powers and authorizations granted on the basis of actual qualifications (Tadeusz Nowacki, "Leksycon of work pedagogy").

This approach, i.e. the superiority of competences over qualifications, is still valid in some professions. For example, in the legal professions, qualifications resulting from formal (academic) learning do not automatically entitle you to perform the functions of a lawyer or notary - you must undergo specific procedures thanks to which the authorization to perform these professions is granted. General competences are included in the basic learning outcomes of general education,

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which is implemented mainly in primary schools and general secondary schools. In vocational education - in technical schools and vocational schools - more attention is paid to professional competences, although general competences are also developed in schools of this type. However, they are not among the primary goals of education - for understandable reasons, they are professional competences. Professional competences are developed for more pragmatic purposes related to future professional work.

In practice, in the professional work process, general competences are the foundation of professional competences. They enable continuous learning in the area of profession, specialty and job position. It can therefore be said that general competences determine the actual development of professional competences. Looking from a different perspective, we can come to the conclusion that general competencies are of a supra-professional nature - they apply to all professions in various classifications, and above all in the real world of work. It can therefore be assumed that the basic components of general competences are:

- the ability to analyze factors influencing the variability of our environment - in the sphere of culture, science and education (orientation in the world) - and the ability to design and take appropriate actions,
- knowledge of worldview trends and value systems - which are their derivatives - and conduct in accordance with one's own value system.

They result in competencies that are more specific, but also of a general nature, such as:

- linguistic,
- social and civic,
- nature
- regarding:
 - self-knowledge and self-education,
 - interpersonal communication.

As Andrzej Bogaj points out in the book "General education in vocational schools", among the general competencies that are particularly important from the point of view of vocational education, we can distinguish those related to the work ethos, i.e. entrepreneurship, independence, responsibility, self-esteem, innovation and decision-making. .

Technological changes and processes related to globalization influence societies and economies in a way never seen before. These megatrends, together with demographic changes, changes in consumer values and preferences, influence quantitative and qualitative changes in available work,

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including how and by whom work is and will be performed. The determinant of the fourth industrial revolution is the exponential speed of changes, their scope and depth, as well as the transformation of economic and social systems. These processes are related to combining physical (e.g. 3D printing, autonomous vehicles, intelligent robots, graphene), digital (e.g. Internet of Things), biological (e.g. genetic engineering) technological factors, thanks to which virtual and physical production systems can be interconnected cooperate synergistically. In the era of the fourth digital revolution, many enterprises can deliver their products with zero marginal cost.

At the same time, with the dissemination of technological solutions of industry 4.0, the demand for transversal competences increases. Competency needs for the future can be considered in three categories relating to:

- subject and academic knowledge - most often related to a deep understanding of aspects of activity in a given field;
- professional and technical skills - related to performing specific tasks and roles;
- transversal competences - i.e. those that can be used in various situations, workplaces and throughout life, they are often also called soft competences.

The essence of this division is the separation of transversal competences as one of three key categories. It should be noted that this division is blurry - developing subject and academic knowledge is also building cognitive, problem-solving and learning skills, and professional and technical skills are inextricably linked to digital competences, management and leadership.

The need to develop transversal competences is emphasized in strategic documents of the European Union (including the Council Recommendation of 22 May 2018 on key competences in the lifelong learning process), documents of international organizations (including OECD and International Labor Organization – “Global Commission on the Future of Work, Skills policies and systems for a future workforce”, 2018.) and other organizations, including consulting companies. In this context, it should be emphasized that in European Union documents the scope of cross-cutting competences includes, among others: civic competences and those related to cultural expression, which are seen as crucial for the sustainable development of individuals and society.

From the point of view of economic development, the identification of general competences that are defined as entrepreneurial is of great importance. The so-called future competencies are

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divided into three categories including: action, resources and ideas and possibilities of their implementation.

Action inquires competences consisting in:

- taking the initiative,
- planning and management,
- dealing with ambiguity, uncertainty,
- working with others (team cooperation),
- continuous learning using experience.

In the resources category, we distinguish the following competencies:

- consolidation (of resources),
- self-awareness and self-efficacy,
- motivation and perseverance,
- mobilizing colleagues,
- conducting financial and economic analyses.

However, the following competencies are associated with ideas and the possibilities of their implementation:

- seeing opportunities,
- unleashing creativity,
- creating a vision,
- analysis and evaluation of ideas,
- ethics and complementary thinking.

In a broader sense, the general competences of employees and management staff in small and medium-sized enterprises (SMEs) are grouped into five categories:

- business competences (e.g. knowledge of the industry, diagnosing customer needs),
- corporate competences (e.g. cooperation with superiors, cooperation among employees, identification with the company, cooperation with external institutions),
- personal competences (e.g. perseverance and consistency, coping with stress),
- social competences (e.g. interpersonal communication, behavior in accordance with applicable norms),
- managerial competences of management staff, e.g. setting goals, creating teams, organizing, motivating, leading, courage, decision-making.

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In business practice, in real working conditions, general and professional competences interpenetrate and condition each other. Additionally, with the development of technique and technology, competencies that until recently were considered professional or even highly specialized are gradually becoming general in nature. We face such a situation, for example, in the case of IT or, more broadly speaking, information competences. The same happens with language competences - useful and even necessary in the implementation of increasingly complex professional tasks (analysis of literature and documentation, cooperation in multicultural teams, participation in international symposia, conferences and training).

Of the 8 key competences defined in the Recommendation of the Council of the European Union on key competences, the last four "meta" competences are included in the transversal competences, i.e.:

- personal, social and learning competences,
- civic competences,
- entrepreneurship competences,
- competences in cultural awareness and expression.

The topic is covered in a similar way by the ATC21S (Assessment and Teaching of Twenty-Century Skills) project, an international research project coordinated by the University of Melbourne with the participation of the largest technology companies, including: Cisco, Intel, Microsoft, which defines 10 competencies considered the most crucial from the perspective of the challenges of the 21st century. The increasing importance of transversal competences results, among other things, from the fact that they relate to performing tasks that are not satisfactorily performed by machines today and are more difficult to automate.

The increase in demand for transversal competences also results from changes in the organizational structures of enterprises. With the departure from the economic model in which the productivity of enterprises depended on the use of economies of scale and the standardization of the production process, the structure of enterprises became flatter. In the following decades of the 21st century, it is assumed that hierarchical, rigid organizational structures will continue to disappear in favor of flat network structures consisting of interdisciplinary project teams, in which individual team members, using complex forms of communication, will be able to cooperate to create knowledge and innovations. In almost all industries, work organization is moving away from rigidly defined scopes of employee responsibilities, which are focused on a narrow catalog of tasks. Modern forms of work organization are designed to support multitasking and interdisciplinary work of employees, primarily to benefit from complementarity between tasks performed in a given organizational structure.

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Performing tasks based on interaction and requiring social competences are a key area of activity of institutions in which machines cannot replace humans. The World Economic Forum report from 2016 also indicates that social competences related to persuasion, emotional intelligence and the ability to teach others will be more desirable than narrow specialist skills, even such as programming. New technologies will increase the demand for social and creative competences, also in professions that previously require only highly specialized technical knowledge. For example, in the healthcare sector, thanks to the use of technological innovations, it will be possible to automate patient diagnostics and individualize treatment. This may result in a redefinition of the nature of the work of medical staff - reducing the share of diagnosis and diagnosis in favor of interpretation, communication and explanation based on artificial intelligence diagnosis agencies.

There are many indications that the importance of transversal competences will increase, and education systems, including higher education and universities, should actively support their development in students. The challenge remains to identify and operationalize these competencies in such a way that they can be effectively implemented into teaching programs, and then to create tools and conditions for their development.

4.2 Implementing meta-competencies and transversal skills in the learning process

In 2006, the European Parliament and the Council of the European Union adopted recommendations on key competences in the lifelong learning process. The transversal competences identified in the Recommendation include:

- personal, social and learning competences,
- civic competences,
- entrepreneurship competences,
- competences in cultural awareness and expression

Transversal competences are those that apply in many contexts, including professional and personal, hence they are transversal. Regardless of what term is generally accepted, they intersect with specific work or work-related knowledge or competencies, and make people function better in any position, as well as in their private lives. The transversal competences include:

- critical thinking,
- innovative thinking,
- reflective thinking,

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- making justified decisions,
- communication skills – such as giving and receiving feedback, listening skills,
- cooperation, i.e. good performance as a team / in a team, where "good" means (a) efficiently, and (b) with a sense of satisfaction, cohesion and joy, joint resolution of crisis situations and leadership,
- internal motivation,
- persistence,
- diversity,
- intercultural understanding,
- respect for the environment.

Education, in its dual social and economic dimensions, has a crucial role to play in ensuring that European citizens acquire the key competences needed to enable them to flexibly adapt to such changes.

The European Union recommends to member states, among others:

- developing the offer of key competences for all as part of their lifelong learning strategies, including strategies to achieve universal literacy,
- education and training of all young people in order to develop key competences at a level that provides them with adequate preparation for adult life and constitutes a basis for further learning and professional life,
- enabling adults to develop and update key competences throughout their lives.

In the European Union countries, and in particular in Poland, the scale of skills mismatch and shortage of professional skills to those expected by employers is growing (Cedefop Skills Forecast). More than 30% of entrepreneurs have difficulty filling jobs due to the so-called competence gap. With the trend of population aging, the need to adapt to the requirements of the labor market becomes even more of a priority.

McKinsey Global Institute research from 2018 indicates a rapid decline in demand for employees with basic skills as their jobs become automated first. For example: by 2030 in Europe, automation will reduce the demand for basic data entry and processing skills by 23%. According to the same McKinsey Global Institute Report, European employers' demand for transversal employee competencies will increase by 22% by 2030, with an increase in demand for employee characteristics such as entrepreneurship and initiative-taking by 32%. Civilization changes, in particular ongoing digitalization, require greater social and emotional maturity from all of us.

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According to the Jobs of tomorrow report published by the World Economic Forum, transversal competences are currently more valued by employers than ICT skills as key to employment. Unfortunately, many people, including young people (both those studying and those looking for a job), have low awareness of the importance of these competences. Paradoxically, the Polish core curriculum in schools has neglected transversal competences for years.

Transversal competencies transcend specific work or work-related knowledge or competencies and make people function better individually, in society, and in any professional role. In addition, they form the basis for many subject skills and thematic competences. It is clear that as we change jobs and positions more often and routine tasks become more and more automated, higher cognitive abilities and human characteristics become more important because computers cannot perform them.

From an educational point of view, the question arises how and to what extent transversal skills develop naturally and how they can be enhanced or facilitated through educational intervention.

Strengthening transversal competences

The easiest way to support the development of transversal competences is to create and strengthen the natural conditions that nurture them. A range of innovative approaches to teaching and learning are particularly suitable for this purpose. For example, experiential learning makes specific and explicit use of multi-sensory experiences in real-world settings, thereby promoting:

- agency – and therefore motivation and self-education,
- risk management,
- Troubleshooting,
- decision-making,
- solving the conflict,
- self-management and positive self-awareness.

An experiential learning approach often goes hand in hand with outdoor learning, where wild and urban natural spaces are chosen as learning settings because they have been shown to be particularly conducive to the development of social and personal skills while enabling the effective implementation of the fundamentals program.

Some key factors of experiential education that can be easily implemented in schools and even higher education are:

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- **Engagement.** Students have some responsibility for what and how they learn, learning is driven by motivation and interest/curiosity,
- **Authenticity.** Learning is connected to real conditions or takes place in such situations to respond to the needs of the real world, and actions have real consequences,
- **Continuity.** Learning is combined with previously acquired knowledge and experiences and is aimed at further development and learning,
- **Emotional involvement.** (Positive) emotions are a key vehicle for learning, giving a sense of success in overcoming challenges,
- **Reflection.** Participants in the learning process critically analyze what went well and what did not (and their role in the process) and how and to what extent this reflection influences what they will do next,
- **Support.** Autonomous learning support is offered.

In situations where learning takes place in a group (whether as part of formal, non-formal or informal education, both in person and online), social and emotional bonds and a sense of cohesion in the group of students and teachers are important. It is valuable for the development of transversal competences

Recent research has shown that students need a "safe place" so that they can experiment freely and not fear failure. This task rests with teachers, who should take care to create such an atmosphere at school. Unfortunately, in reality, teachers rarely manage to create such a space during lessons.

It may be difficult to achieve all of these factors to perfectly support transversal competencies. However, as mentioned above, experiential learning and outdoor education have a long history of successfully achieving these goals.

Face-to-face interactions and shared physical experiences are crucial as a reliable and enabling ground for the development and training of transversal competences. Through writing, listening, watching previously recorded videos and other ways of learning without interaction, only their cognitive elements can be trained.

4.3 Transversal skills to achieve cross-curricular goals and stimulate self-confident lifelong learners

In the global perspective of the labor market, as well as in individual disciplines, there is general agreement that transversal competences are crucial for professional success

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(e.g. employability, effective group work, introducing changes in enterprises) and in private life (e.g. harmonious interpersonal relationships, solving family problems, consciously making life decisions, etc.). Educational institutions should recognize the key importance of transversal competences and prioritize them in every curriculum in both formal, informal and non-formal education.

Transversal skills are like keys that open the door to success in various areas of life. Skills such as interpersonal communication and teamwork are essential to interacting effectively with others, both on school projects and in later professional life. Knowledge about effective communication and the ability to listen and express one's thoughts and ideas influence the effectiveness of group work and the ability to solve problems.

Furthermore, critical thinking and analysis skills are crucial in achieving cross-curricular goals. Students who can critically analyze information, verify facts and come to their own conclusions are more likely to understand complex issues and make good decisions.

Increasing the self-confidence of lifelong learners is also linked to the development of transversal skills. Teaching skills such as problem solving, creativity and independence helps build self-esteem and self-confidence. When students see that they are able to deal with various situations on their own and take initiative, they become confident that they are capable of achieving success in various areas of life.

Finally, transversal skills support adaptation to changing living and working conditions. In today's world that is constantly evolving and requires flexibility, lifelong learning, flexibility, and openness to new ideas and technologies are crucial to staying competitive and successful in both your personal and professional lives.

As a result, the development of transversal skills not only helps students achieve cross-curricular goals at school, but also prepares them to function effectively in various areas of life and work, while strengthening their self-confidence and readiness for continuous development.

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5. HOW NEW TECHNOLOGIES CAN SUPPORT LIFELONG LEARNING

5.1 The importance of technological skills in the European context (DIGCOMP 2.2)

Digital skills for work and life are at the heart of the European policy agenda. The EU Digital Skills Strategy and related policy initiatives aim to enhance digital skills and competences for the digital transformation. The European Digital Skills Agenda, launched on 1 July 2020, aims to support everyone in developing digital skills, including achieving the goals of the Digital Education Action Plan. This plan focuses on two main aspects: increasing digital skills and competences for digital transformation while supporting the development of a high-performance digital education system. Initiatives such as the Digital Compass and Action Plan, which are part of the European Pillar of Social Rights, set ambitious policy goals such as ensuring that at least 80% of the population has basic digital skills and that 20 million ICT professionals are employed by 2030.

The Digital Competence Framework for Citizens, also known as DigComp, provides a common language for identifying and describing key areas of digital competence. It is an EU-wide tool for improving citizens' digital competences, helping decision-makers formulate policies to support the building of digital competences and planning education and training initiatives to improve the digital competences of specific target groups.

Digital competences include the confident, critical and responsible use of digital technologies and their application in learning, work and participation in society. These include:

- ability to use information and data,
- communication and cooperation,
- media literacy,
- creating digital content (including programming),
- security (including digital comfort and cybersecurity competences),
- intellectual property issues,
- problem solving and critical thinking.

Digital competences are part of the Key Competences Framework for Lifelong Learning and are linked to other competences. All key competencies complement each other and are interconnected. In other words, competencies necessary in one area support the development of competencies in another. This also applies to digital competences.

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In the European context, technological skills are a key factor in achieving the goals of the digital transformation of the economy and society. European Union member states and European institutions take a number of actions to promote and develop technological skills among their citizens. Educational programs, training initiatives and support for the ICT sector are elements of European strategies aimed at increasing society's digital competences.

Promoting technological skills in Europe aims not only to ensure that citizens can actively participate in the knowledge-based society, but also to increase the competitiveness of the European labor market by having an appropriately skilled workforce. Technological skills are crucial both in the Industrial Revolution 4.0 and in strengthening the European Union's competitiveness.

Industrial Revolution 4.0 is a term for a new phase of industrial development in which digital technologies, automation, artificial intelligence and the Internet of Things play a key role in production processes. Technology skills are necessary to operate and use these advanced technologies in various fields such as industry, manufacturing, logistics and operations management. People with technological skills are more flexible and ready to adapt to changing working conditions and to use modern tools and technological solutions to optimize production processes. Technological skills are a key element in building the European Union's competitive advantage in the international arena. In the face of global economic challenges, the EU aims to develop and promote modern technologies and innovations. Having a skilled workforce with technological skills will keep the EU at the forefront of global markets by innovating and developing competitive products and services. Moreover, investing in digital education and technological skills development contributes to increasing the EU's innovation potential and creating a favorable environment for entrepreneurship and economic development.

Therefore, technological skills are an important element of European policy and their development is key to achieving the goals of digital transformation, innovation and Europe's international competitiveness.

5.2 State of knowledge on the use of technological tools in various partner countries

According to the Capgemini eGovernment Benchmark report, Poland is among the fastest developing countries in terms of digitization of all key public sector services. Although the level of digitization of public services in Poland is higher than in many Central and Eastern European countries, the country should continue to strive to improve its results in the field of digital transformation.

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Digitization of public services

In Poland, 84% of all government services are now available online. This is exactly the European average. Secure and transparent services are the pillars of trustworthy e-government. A solution that guarantees users secure authentication is identification using a national electronic document. 70% of European government websites provide this option. Moreover, government websites are almost as likely (68%) to automatically fill in personal data when it is necessary to complete the service. Polish systems are above the European average: eID is available in 75% of cases, and automatic data filling in 78%. When it comes to e-government services, 63% of internet users used them in 2022. This is below the EU average of 74%. However, it was noticed that the mObywatel application is constantly being improved and is gaining popularity. It is estimated that it is used by over 10 million users (as of May 2023). The mObywatel service includes mID – an electronic identity document that allows you to confirm your identity when handling official matters. Fresh drivers, immediately after passing their driving test, automatically have access to a temporary electronic driving license, which authorizes them to drive a car. The application also includes the pensioner's mLegitymacja. The application also allows you to pay online for administrative services.

In terms of access to e-health documentation, Poland achieved 86 points in the “State of the Digital Decade” study, which is a much better result than the EU average (72 points in 2022). The Patient Portal offers increasingly advanced services, including e-prescriptions introduced in January 2020. Access to the Internet Patient Account (IKP) is possible via the mObywatel and mojaIKP applications.

Due to the changes caused by the Covid-19 pandemic, the use of e-government services has also increased among entrepreneurs. In January 2022, a new version of the Biznes.gov.pl portal was launched. The portal offers access to approximately 400 websites and over a thousand descriptions of various procedures. These services are widely popular, in particular the "Profil Zaufany" authentication service, which enables nearly 16.5 million people to identify and authenticate using a trusted signature on public websites and sign documents.

In terms of process transparency, Poland was also above the European average, achieving a score of 69%.

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The report also showed clear progress when it comes to mobile friendliness: more than nine in ten (94%) of all government websites are operated on mobile devices, up from just 60% in 2017. However, only six out of ten services (63%) can be provided on smartphones. Although navigating these websites on mobile devices is simple, there are still some barriers when more complex actions are required, such as eID authentication. In terms of the availability of services on mobile devices, Poland, with a score of 93%, is at a similar level to other European countries.

Community of services

Services provided online at the local level are not as well developed as those provided by central government organizations. Local and regional authorities often lack the technological infrastructure required to run high-quality services efficiently. It is necessary to fill the gap between the level of digitization of local and central institutions. Currently, 88% of central government services are available entirely online, compared to 76% of regional and 62% of local.

Cross-border services

Cross-border services, i.e. those available to citizens staying abroad, are a weak point of Polish digitalization. In this respect, we are well below the European average. In Poland, the level of availability of this type of services is 40%, and the possibility of authentication from another country is offered by 22% of government websites.

Digital infrastructure

When it comes to digital infrastructure, despite some positive developments, there is still significant room for improvement. In recent years, Poland has seen a steady increase in the percentage of households covered by a very high-capacity fixed-line network - 71% in 2022 compared to 65% in 2020. This result is almost equal to the EU average of 73%, but is also lower than the EU target for gigabit connectivity, which is to cover the entire country.

The situation is less favorable for mobile communications. In 2022, only 63% of households were covered by a 5G network, well below the EU average of 81%.

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Business digitization

60% of companies recognize the need for full digitization, while 38% only use basic digital tools. Micro-entrepreneurs are the group that takes advantage of the opportunities offered by digitalization the least.

Only 18% of SMEs sell online (EU average 22.9%), and 5% sell cross-border to other Member States. 60% of e-commerce companies sell via large sales platforms, and less than 80% use their own websites. In the EU, the proportions are different. On average, over 80% of companies sell via their website, and only slightly over 40% use e-commerce platforms.

Advanced technologies are slowly but steadily gaining popularity among Polish enterprises: 19% of Polish enterprises use cloud computing services (EU average: 34%), and electronic information exchange - 32% (EU average: 38%). However, only 18% of Polish enterprises actively use social media, and 3% incorporate AI technologies into their operations. Electronic invoices and big data are not yet widely used. On January 1, 2022, the National e-Invoice System (KSeF) was launched. KSeF, on a voluntary basis, enables taxpayers to issue, receive and store invoices. From July 1, 2024, entrepreneurs will be obliged to use the National e-Invoice System.

Digital skills

The latest data on basic digital skills places Poland below the EU average and shows a significant gap to the EU Digital Decade target of 80%. In 2021, 43% of people aged 16-74 had at least basic digital skills (EU: 54%), and 21% had post-basic digital skills (EU: 26%).

In the education system, information and telecommunications technologies (ICT) are constantly present in the curricula, and schools and other stakeholders receive funding to carry out activities in this area. In 2022, digital subjects were integrated into formal higher education. Universities are providing more and more courses focusing on or using technology, which has helped increase the number of ICT graduates. Currently, they constitute 4.1% of all graduates in Poland, which corresponds to the average in the EU.

In Poland, the share of ICT specialists in total employment is 3.6%, which is below the EU average of 4.6%. Moreover, the share of women among ICT professionals is 16.7%, which is also well below the EU average of 18.9%.

In 2022, the Digital Competence Development Program 2023-2030 was developed, which includes planned directions of activities in the area of digital competence development. It is assumed that this will improve the coordination of government policies in this area. It is a comprehensive,

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multi-year document containing both an overview of the situation in the field of digital skills in Poland and the government's action plan in this area. The budget for the program is expected to be approximately EUR 600 million. Poland also plans to develop a comprehensive education digitalization strategy that would focus on the effective and meaningful integration of digital technologies with teaching and assessment. This would include establishing minimum binding standards for equipping all schools with digital infrastructure to ensure equitable access to digital education.

5.3 New technological devices: AR –VR

Virtual and augmented reality are technologies that allow you to move into an artificially created environment or enrich reality with additional information.

VR (virtual reality) is virtual reality, i.e. a computer-generated three-dimensional world that can be viewed in 360 degrees. This requires special VR goggles that provide stereoscopic vision. Virtual reality allows us to completely immerse ourselves in the digital world

AR is an abbreviation for augmented reality. This is a different technology that involves "superimposing" in real time elements of the world created using a computer on the real world, seen using a camera. To use it, you need a smartphone, tablet or special glasses. Augmented reality allows you to see reality enriched with additional information or elements.

Both technologies are used in many branches of business and industry. Virtual reality allows you to create complex simulations used during training and exercises (for example, for the army or medical staff), while augmented reality allows you to display additional information (e.g. on the car window, thanks to which the driver drives the vehicle without taking his eyes off the road).

Virtual reality (VR)

VR already offers users unforgettable experiences, taking them to completely new virtual worlds. However, the future of VR is not limited to the worlds of video games or simulations. Virtual reality will soon become an integral part of education, therapy, medicine and even remote work. Companies are investing in the development of VR technology, striving to create more realistic and interactive virtual environments.

Although VR is not yet widespread in education, more and more training courses using it are appearing on the market.

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In the future, VR will become a key tool in the field of education. Virtual training will enable students to explore history, science and mathematics in ways never before possible. Students will be able to engage in interactive simulations, allowing them to immerse themselves in the topic and understand it on new levels. Virtual reality is also used in medicine. It is already used to treat fears, phobias and pain therapy. The future of this field will bring advanced surgical simulations, enabling doctors to improve their skills without having to engage with real patient cases.

Augmented Reality (AR)

Augmented reality (AR) is currently one of the most fascinating fields of technology, which not only introduces new dimensions of virtual reality, but also integrates with our everyday lives. AR, by combining the virtual world with reality, has the potential to revolutionize the way we perceive the space around us. Using smartphones, glasses or other devices, AR can provide us with contextual information about the world around us. For example, when visiting a city, AR can display historical information about a given place, providing us with interactive knowledge.

The future of AR is also a development in the field of commerce, where customers can try on virtual products before purchasing, which will certainly revolutionize the e-commerce industry.

The future of AR is full integration into our everyday lives. Smartphones, glasses and even contact lenses equipped with AR technology provide us with contextual information about the world around us. They will be able to identify objects, provide additional information about products or facilitate navigation around the city. AR will change the way we learn and acquire knowledge. Interactive maps, educational AR games and virtual laboratories will enable students to explore knowledge in a more engaging way.

In the future, AR will become an invaluable tool for remote workers. Virtual offices, interactive presentations and the ability to collaborate in a virtual environment will allow for effective work, despite physical distance.

Artificial Intelligence (AI)

Artificial intelligence is the heart of modern technology. Its presence is becoming more and more common and its applications are almost limitless. In the context of VR and AR, AI can deliver more realistic and intelligent experiences by responding to user behavior and adapting to their needs. Moreover, AI plays a key role in analyzing the huge amounts of data generated by these technologies, which allows personalization of user experiences and improvement of algorithms.

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Artificial intelligence (AI) is a field that has gained enormous popularity in recent years, and its development seems to be one of the key elements of the technological future. The future of artificial intelligence will focus on further improving machine learning algorithms. AI models will be more precise, faster and able to efficiently process huge amounts of data. This will open the door to even more advanced applications in various areas of life. This dynamically developing field of technology will revolutionize the way we function, work and interact.

The future of VR, AR and AI

The future of VR, AR and AI technologies is a rapidly changing and exciting field that promises even more advanced, interactive and personalized experiences. We are already seeing how these technologies are changing education, entertainment, medicine, and even the way we see the world. Innovation in these areas can bring new opportunities, a better understanding of the reality around us and an improvement in the quality of life. The future is becoming a reality today, and the development of these technologies is an undeniable step towards a modern society based on advanced virtual and real experiences.

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5.4 The importance of new technologies and their integration into students' experiences outside the school environment.

Modern education is constantly changing, and one of the main motives of this transformation are modern technologies. In particular, virtual reality (VR), augmented reality (AR) and artificial intelligence (AI) technologies are opening up new possibilities that are revolutionizing the way we learn and teach.

Using VR and AR technology, students have the opportunity to move into a completely new, virtual environment, which becomes an interactive learning space for them. They can explore historical places, feeling close to the past, or develop their practical skills in controlled simulations. This makes the learning process more engaging and effective.

Artificial intelligence also plays a key role by enabling personalization of the learning process. Artificial intelligence algorithms and adaptive learning systems can tailor training materials to each student, taking into account their specific learning style, strengths and weaknesses. Thanks to this, each student has the opportunity to develop in a way that is optimal for him, which may translate into better educational results and greater motivation to learn.

Another extraordinary advantage of VR, AR and AI technologies is their ability to support people with learning difficulties. Through alternative learning environments and interactive tools, students with learning disabilities can find new ways to understand difficult concepts and develop their skills.

Additionally, these technologies enable global collaboration and remote learning, which is particularly important in the face of contemporary social and cultural mobility. Students can participate in educational projects from around the world, sharing their experiences and learning about diverse perspectives.

VR, AR and AI technologies are not only transforming the way we learn and teach, but also opening up completely new opportunities in the field of education, encouraging us to explore, discover and think creatively.

In an era where technology is ubiquitous, its integration into classrooms has become paramount, offering countless benefits that go beyond traditional teaching methods. The combination of education and technology has the potential to transform educational experiences, equipping students with the skills they need to thrive in an ever-changing world. Increased engagement is one of the main benefits of using technology in the classroom. To create a dynamic and engaging learning environment, teachers can use interactive whiteboards, learning

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applications, WEB2.0 tools, artificial intelligence and multimedia presentations to capture students' attention and accommodate different learning styles. Participating in this event improves understanding, retention and overall academic achievement.

New technologies play a huge role not only in the school environment, but also outside of it, contributing to broadening students' horizons and experiences in many different areas. Integrating these technologies outside of school can have many meanings and benefits:

- education outside school walls - mobile technologies, online educational platforms and applications enable learning anywhere and anytime. Students can use educational resources while traveling, at home or during internships, which allows them to constantly expand their knowledge and skills;
- development of interests and passions - thanks to access to a variety of educational materials and tools, students can explore their interests and passions in a more interactive way. They can learn programming, develop artistic skills, explore issues related to science or technology using interactive online courses or applications;
- implementation of projects and professional internships - technologies support students in the implementation of practical projects, both as part of school classes and professional internships. They can use design applications, simulation tools or programs to create multimedia presentations, which enable them to develop practical skills related to their future professions;
- experiential learning - augmented reality and virtual reality technologies open up completely new opportunities for students to learn through experience. They can explore distant corners of the world, discover history or science through virtual journeys or simulations, which allows them to have more immersive and engaging educational experiences.
- development of digital skills - using new technologies outside of school allows students to develop digital skills that are necessary in today's world. Learning to use various tools, programs and applications useful in everyday and professional life is an important element of their education.
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Integrating new technologies into students' experiences outside the school environment brings numerous benefits, enabling them to develop personally, learn through experience, and expand their horizons in innovative and engaging ways.



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Despite so many benefits of new technologies and the enormous potential of VR, AI and AR, you should be aware of the risks associated with them, e.g. social isolation, addiction to technology, risk of violating the privacy and security of personal data, dissemination of false information and disinformation, loss of interpersonal skills or the emergence of digital inequalities.

It is worth conducting regular analyzes of the impact of these technologies on society and taking actions to minimize the risk of their occurrence and take preventive measures if potential negative effects are detected.

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6. CITIZENSHIP AND SOCIAL SKILLS

6.1 The role of the school in implementing the concept of "responsible citizenship"

The role of school in implementing the concept of "responsible citizenship" is crucial for shaping social, ethical and civic attitudes in students, because it is within school walls that young people not only acquire academic knowledge, but also learn the essence of community, understanding for diversity, and develop empathy. and the ability to cooperate.

School becomes a place where not only information is transferred, but also the character of an individual and his relationships with the surrounding world are shaped. Through education about civic responsibility, students learn that their decisions and actions impact not only their own lives, but also the lives of other people and the entire community. In this way, school plays an important role not only in preparing young people for their future careers, but also for active and conscious participation in social life, which is the foundation for building a better future for society. Several areas can be indicated for shaping civic attitudes at school.

Citizenship education

Citizenship education plays a key role in school, providing students not only with knowledge of their rights, duties and responsibilities as citizens, but also by promoting active involvement in social and political life. Through various forms of teaching, such as history lessons, social studies, celebrations of national holidays and discussions on political and social issues, the school enables students to better understand the structure of society, the principles of democracy and the consequences of their actions for the benefit of the community. Poland's rich history, including both ancient and contemporary events, provides numerous examples that illustrate the important role of active citizenship. Additionally, nowadays, citizenship education must also take into account issues related to global challenges such as environmental protection, human rights and tolerance, so that students become informed and engaged citizens not only on a local but also on a global scale.

Promoting social values: :

The school plays an important role in promoting values such as respect, tolerance, cooperation and justice. Through various initiatives, such as anti-discrimination programs, charity campaigns, volunteering and conflict resolution programs, the school actively shapes students' attitudes and teaches them how to be responsible members of society.

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In Poland, various social campaigns are organized every year, such as the Great Orchestra of Christmas Charity, Szlachetna Paczka, collections of bottle caps, which are then exchanged for rehabilitation equipment for children with disabilities, and food collections around the holidays. Young people also actively participate in some of these initiatives, which provides an excellent opportunity for educators to promote social responsibility among students.

Additionally, an important element is the fact that the outbreak of the war resulted in the inflow of a large number of citizens from Ukraine to Poland. Many of them, including children, attend Polish schools, which creates an excellent opportunity to learn about and understand different cultures and promotes the values of tolerance and integration. Thanks to the school's involvement, Polish children and youth have the opportunity to meet Ukrainian peers, which might not be possible under other circumstances.

Developing social skills

School can also help students develop social skills such as empathy, interpersonal communication, negotiation and problem solving. These skills are important for building healthy interpersonal relationships, collaborating with others, and engaging effectively in society. The Polish education system changes from year to year and tries to provide students with an increasingly wider range of classes that help develop social skills. Nevertheless, there is still much to be done to fully realize the potential of social education. Perhaps outdoor education, which is gaining popularity, will be an element of changing this state of affairs. Through outdoor activities, students not only develop interpersonal skills, but also learn cooperation, risk management and coping with various situations, which can contribute to strengthening society through better prepared individuals.

Shaping global awareness

Schools can play an important role in promoting global awareness by teaching students about cultural, social and economic differences around the world. Through intercultural education, learning about global problems and challenges, and promoting activities for sustainable development, the school prepares students for life in a global society.

In the era of an increasingly globalized world, the ability to understand and respect cultural diversity is becoming crucial. Therefore, school curricula may include classes devoted to the analysis of cultures, traditions and values of different nations, which will allow students to broaden their horizons and develop empathy and tolerance. Moreover, education about global issues such as

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climate change, poverty and social injustice enables young people to understand contemporary challenges and inspires them to take action to build a better, more just world.

Therefore, school can be a place where young people not only acquire academic knowledge, but also learn how to be responsible citizens of a global community.

6.2 Approaches to citizenship education in partner countries

According to the recommendation of the Council of the European Union, civic competences are "the ability to act as responsible citizens and participate fully in civic and social life, based on an understanding of social, economic, legal and political concepts and structures, as well as global events and sustainable development."

Citizenship education is widely recognized as an extremely important element of education. From the perspective of the functioning of a democratic state and the quality of democracy, it is important that citizens know and understand civic principles, values and institutions, as well as their rights and obligations. It is also important that they demonstrate civic attitudes and take an active part in civic and political life.

In the conditions of intense social changes and challenges that societies have been facing in recent years, the importance of civic competences is increasing.

In 2022, the 3rd edition of the International Civic and Citizenship Education Study, i.e. ICCS, was conducted. It is the largest international comparative study on citizenship education. 22 countries and two German states took part in it. The study involved students in the eighth year of school education, usually fourteen years old (in Poland these were eighth-grade primary school students), as well as teachers and school principals. As can be seen from the above Competence Research, Poland is among the countries where eighth-grade students achieved the highest results in terms of knowledge and understanding of civic issues. Polish eighth-graders achieved one of the highest results among the 20 countries included in the comparisons - 554 points. Only students from Taiwan (583 points) and Sweden (565 points) achieved higher results. There is relatively little variation in the results of Polish students compared to other countries. It is worth recalling that the study was conducted in Poland in the eighth grade, i.e. before students were divided between different types of secondary schools.

Compared to their peers from other countries, Polish students are distinguished by their great interest in political and social issues - 40% declare that they are very or quite interested in these

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issues. This is one of the highest percentages in the countries surveyed. Eighth-graders in Poland talk about political and social issues with their parents or friends relatively often, compared to students from other countries.

Even though 3 out of 4 students consider democracy to be the best form of government, they stand out among their peers from other countries because of their very critical attitude towards the political system and politicians.

Compared to students from other countries, Polish students are among the most distrustful of the parliament, government, political parties, but also courts and the police. Although the vast majority of students in Poland expect to vote in elections in the future, they rarely declare taking actions such as joining a political party or supporting a candidate's election campaign - in this respect, they are among the countries with the lowest percentage of responses.

The turnout in the local elections held in Poland on April 7, 2024 confirmed these sentiments.

The overall turnout was 51.9%, but only 38.6% of young people, i.e. aged 18-26, took part in the local elections. Most citizens aged 50-59 went to the polls - 62.4%. People aged 40-49 also voted in large numbers - 55.1% and people over 60 - 51.4%.

Numerous studies show that Poles are traditionally characterized by a low level of generalized trust and low trust in public institutions. Student responses in ICCS 2022 confirm this trend. Only just over a third of respondents believe that people can be trusted completely or to a great extent. Between 2009 and 2022, the number of these indications decreased by as much as 22 percentage points. from 58% to 36%. Students also have low trust in schools as institutions - 45% of students trust schools completely or to a great extent. This negatively distinguishes Polish students from their peers from other countries. It is worth adding that Polish students trust scientists the most (84% of students trust them completely or to a great extent).

Issues of equality, non-discrimination and human rights are important (and increasingly important) for young people. The majority of surveyed students support the principles of gender equality and rights for migrants (the results are higher than in 2009). Engagement in activities for human rights is most often indicated by young people from Poland as behavior required of a good citizen.

In Polish schools, the traditional didactic approach to teaching social studies prevails. The simpler varieties dominate among the activating methods used. Assessment is focused on mastery of subject knowledge rather than on students' skills and engagement.

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Polish youth are changing just like their peers in other countries: their political alienation is deepening, young people are quickly becoming secularized, and beliefs about equal rights of various social groups, including those at risk of exclusion, are becoming more widespread. School, as only one of many environments for the socialization of young people, is not able to reverse any of the negative trends of change on its own, and is probably not helped by the rigid core curriculum, which forces teachers to focus on discussing detailed content, leaving little time for practical forms of education.

6.3 Integration of civic and social skills and technological competences in the new cooperative school model.

In the face of a rapidly changing world, schools must constantly evolve to prepare students for success in life and work. In the new model, the cooperating school should integrate civic and social skills and technological competences, creating a comprehensive educational system that prepares students for the challenges of the 21st century.

The essence of this model should be a harmonious combination of three main areas of competence: civic, social and technological skills. Civic skills include understanding democracy, active participation in public life, and respect for civic rights and responsibilities. They are crucial for the functioning of a society based on democratic principles. Social competences include the skills of communication, cooperation, conflict resolution and building healthy interpersonal relationships. They are essential in both your personal and professional life, allowing you to interact effectively with other people in various situations. Technological competences are the ability to use modern technological tools and understand their applications in various areas of life. In the era of digital revolution, the ability to operate computers, programming or data analytics is becoming an essential element of social competences. In the new model of a cooperative school, these three areas of competence should be integrated in a natural and holistic way. Teaching should not be focused on homogeneous lessons in individual subjects, but based on interdisciplinary projects and tasks that engage students in working together to solve real problems. For example, a project related to environmental protection may require students not only to acquire knowledge in biology and chemistry, but also the ability to analyze data on pollution or communication skills to convey their conclusions to the local community. Additionally, the use of modern technological tools can facilitate the collection and processing of data and the presentation of project results.

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In the new cooperative school model, teachers should act as guides and mentors, supporting students in developing their skills and encouraging independent thinking and experimentation. An important part of this process should also be the integration of activities with the local community and business, which would allow for the practical application of the acquired knowledge and skills.

As a result, students emerging from this school model would not only have solid knowledge and technical skills, but also would be active citizens, ready to cooperate, dialogue and create positive changes in society. Thanks to a holistic approach to education, school could become a place where both the mind and the heart develop, preparing young people for life in a complex and dynamic world.

7. SUMMARY

In Polish schools, there is a lack of sufficient use of the potential of immersive learning and insufficient adaptation of the teaching methodology to the individual needs of students. Despite more and more knowledge about the operation of the Reticular Activating System (RAS) and its role in the learning process, traditional educational approaches still dominate in Polish schools. Although there are some initiatives, such as laboratories or experiments during lessons, these activities seem inadequate in the context of the current opportunities offered by modern science and technology.

In the face of this demand, the need to reevaluate the education model is becoming more and more urgent. The new approach must promote active student engagement through a variety of teaching methods that take into account individual differences and student preferences. A key issue is also adapting the teaching process to today's realities, using the potential of modern technologies.

In this context, educational methods such as outdoor education, the use of virtual reality (VR) and augmented reality (AR), or the creation of virtual educational paths are becoming more and more attractive and effective. These innovative approaches can not only stimulate students' curiosity and engagement, but also provide them with hands-on experiences that are closer to reality and better translate into skills that are useful in everyday life.

However, introducing changes requires systemic actions. It is necessary to invest in the development of teachers to enable them to effectively use new teaching methods. In addition, it is important to promote public awareness of the benefits of modern education and support



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initiatives that strive to create a new model of education, adapted to the needs of modern society and the labor market.

To sum up, Polish schools face the challenge of adapting to the changing needs and expectations of students and the dynamic environment. It is necessary to promote new educational approaches that will enable students to develop the competences necessary to function effectively in the 21st century.