European Teacher as the reflective practitioner 21st Century Skills in Education

Alena Jůvová, Ondřej Duda
Marjolein de Vos, Paul Stuit
Chantal Velthuis

WAVE-IT

European Teacher as the reflective practitioner
21st Century Skills in Education

Alena Jůvová, Ondřej Duda

Marjolein de Vos, Paul Stuit, Chantal Velthuis

Content

Introduction

Nowadays, the concept of education at all levels needs to correspond to the high demands that are required by serious changes and developments in society. Firstly, there is the retreating SARS-CoV-19 pandemic, and secondly, the war in Ukraine, which began in February 2022. Equally important is the issue of sustainable development and the emphasis on addressing the environmental problems resulting from climate change on Earth, both locally and globally.

Since these events affect the whole of society and significantly shape the educational process, it is necessary, among other things, to revise and redefine educational goals so that the young generation is prepared to face these changes and challenges.

In March 2020, when the SARS-CoV-19 pandemic began, schools around the world faced the daunting task of switching from face-to-face to distance/online teaching. Not everyone was prepared for this new situation, and schools at all levels, teachers, students, pupils and their families were forced to respond to this sudden change in a relatively short time in terms of staff and materials.

In addition to this situation, the participants of the educational process are confronted with the situation that arose in the spring of 2022 with the influx of refugees from Ukraine as a result of the outbreak of the war. Not only Czech schools, but also other European schools are receiving pupils who need to be integrated into the classroom. Often these are pupils with a shocking life experience of war, children who have been deeply affected psychologically.

However, in 2018 and 2019, when we were conceptualizing the WAVE-IT project, we were not aware of these events, so we found ourselves in a situation where we needed to react and adapt flexibly. We tried to incorporate the knowledge and experience of teachers from the time when schools were closed for long periods of time and online teaching took place into the issue of implementing 21st century skills into teaching. Similarly, we tried to find out how teachers, especially in the Czech Republic, reacted to the arrival of pupils from Ukraine from the end of February 2022.

1 Intensive 21st Century Skills development

Marjolein de Vos, Paul Stuit, Chantal Velthuis

In the last decade, intensive skills development for the 21st century has become an important part of teaching at all levels of schooling, not only in European countries. The WAVE-IT project focuses on the development of 21st century skills for primary and secondary school teachers and student teachers. In cooperation with partner universities in several European countries, primary school teachers and students were introduced to the concept of 21st century skills and worked in international teams to develop educational projects for primary and secondary school students. Examples of the projects developed and put into practice are given in the annexes of this publication. This publication gathers the steps to proceed with the generation of the Intellectual output 2.

IO2: *Adaptive teacher training material to support reflective practice through collaboration and communication between teachers, learners, and academics.*

Project objectives

The main objective of this part of the WAVE-IT project was to focus on the possibilities to develop the professional competencies of European teachers through the development of 21st century skills and to prepare them for the implementation of 21st century competencies and skills in school practice. We worked with the following four core 21st Century Skills: critical thinking, communication, collaboration and creativity. A methodology for developing 21st Century Skills was developed for two courses, which were organized for a target group of primary school teachers and for teaching and non-teaching education students. In the theoretical part, the concepts of skills for the 21st century and the methodology for preparing a school project were presented. In the practical part, the participants were tasked with forming international teams and developing a school project with an emphasis on skills development for the 21st century.

Sub-objectives

1. Define 4 essential skills for the 21st century (21st CS - Critical Thinking, Communication, Collaboration and Creativity) and apply them in the design of a school project.
2. Introduce the department - university/school and initiate collaboration between participants (future teachers and students who study other pedagogical programmes at a faculty of education, teachers, students and researchers).
3. In an international team, develop a school project proposal using 21st century skills.
4. Suggest integration options for pupils with increased learning support needs.

Design

IO2 design is based on the activities of "Teacher Design Teams", where: "Groups of at least two teachers (educators) from the same or related subjects who work together to design a curriculum change" (Handelzalts, 2019). The advantages of this way of working are the possibility to make teaching materials more aligned with teaching practice and the possibility of professional development for teachers (educators), see Figure 1.

Fig. 1: Collaboration in the creation of learning materials

Designteam with teacher educators and teachers

↓

design guidelines

Teacher training with students/ teachers

↓

learning materials

ANALYSIS/DESIGN:
1. Needs analysis: what are the needs of the target group (teachers and students)?
2. Knowledge base analysis: Are there good examples? What can be found in the literature as a foundation?

DEVELOPMENT:
Actual creation of learning materials (formats, learning activities etc.) based on the design guidelines.

IMPLEMENTATION:
Learning materials are used in practice.

Skills for the 21st century (Figure 2)

- Critical thinking teaches children to question claims and seek the truth.
- Creativity teaches children to think in a way that is unique to them.
- Working together teaches children that groups can create something bigger and better than they can do alone.
- Communication teaches children how to communicate ideas effectively.
- Together, these four skills allow children to become one-person think tanks. Then, when those kids come together, they can accomplish almost anything!
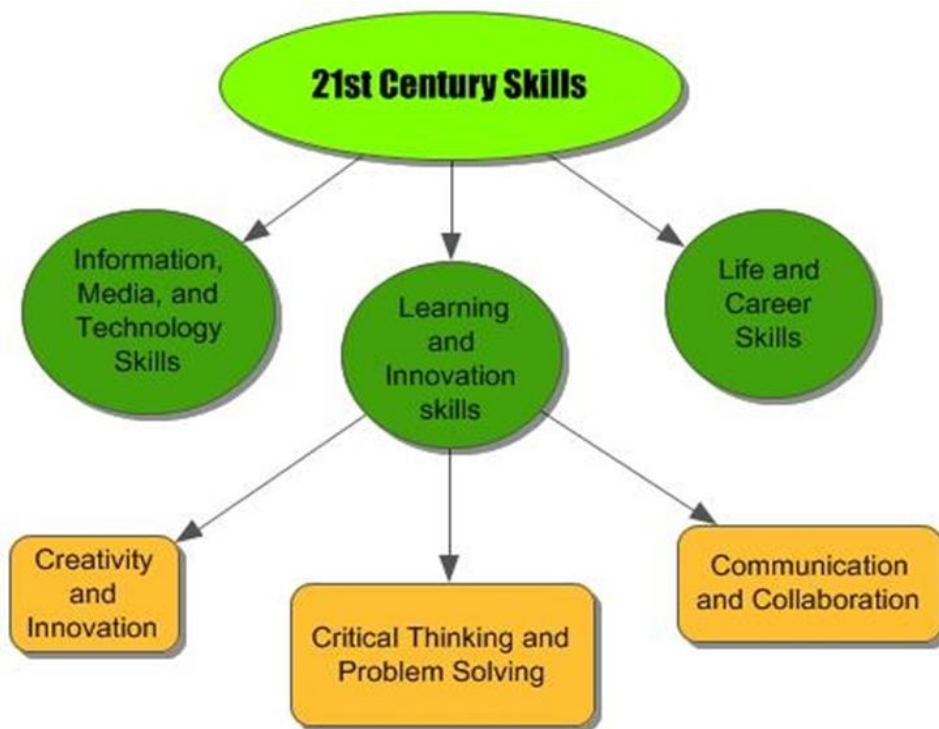
Guidelines for designing projects that incorporate 21st century skills

- The 4CS is being worked on integrally and across the board.
- The development of 4CS must be integrated into mainstream education.
- Poorly defined questions relevant to life are a good starting point (no fixed answers).
- For teachers: teach what you say (good example).

Examples of educational activities

1. ICE-breaker

Prepare photos and a presentation of your school. During the familiarization activity, introduce yourself and your school, your team of teachers and your pupils to the other participants. Also give examples of your school's activities and present your school practice.

2. Activity Jurassic Park (see Annex 1)

1. What does your dino need to survive?

2. Design a Jurassic Park for 5 dinosaurs.

3. Use of the 4CS in school practice

- Exchange of practices around the 4CS.
- Padlets with guiding questions to stimulate communication and collaboration.
- Preparing a school projects in collaboration with teachers from different countries.
- School visits.

Prerequisites for successful (intercultural) communication/cooperation?

- interest in each other, the desire to learn from each other,
- your own learning objectives should be at least partly in line with what the rest of the group wants to learn,
- to get to know each other personally and professionally to create a safe learning environment and to be able to use and share their expertise with each other,
- know different contexts and learn to understand each other (speak the "same" language),
- finding a shared task.

2 Skills for the 21st century in educational practice: theoretical framework

Alena Jůvová

The social and economic changes in society require that school education should include skills that will prepare pupils to enter active life and are considered essential for the individual's employment in society and the labour market. These skills are characterised as a set of social and cognitive skills that include critical thinking, creativity, collaboration, communication, use of ICT, self-directed learning, multicultural understanding (cf. *e-Pedagogium* II-2015, on-line available at: https://e-pedagogium.upol.cz/magno/epd/2015/mn2.php; Lamb, S.; Maire, Q. & Doecke, E., 2017, etc.).

Skills for the 21st century can be characterised as a set of skills or characteristics that directly develop individuals and increase their ability to integrate into society and its diverse structures, to enter the labour market and to face more complex situations. Emphasis is also placed on the ability to navigate in the digital environment, to think critically, i.e. to distinguish between true and false information. Curiosity in the positive sense of the word and the desire to get answers to questions, the ability to express oneself meaningfully, communicate and collaborate in problem solving, as well as creativity and innovative thinking are considered important (see also Binkley et al., 2010).

This concept has long been discussed at the level of the World Economic Forum, the OECD, and at the level of national governments and their educational policies, on various educational platforms, by lifelong learning organisations, schools and the professional community.

Skills for the 21st century have become part of the (key) competences defined in curriculum documents that correspond to the concept of EU and national education policies. They are conceptualised in different transdisciplinary contexts and in relation to the framework for which they are set. These are employment and labour market policy, education policy and the related paradigm shift in the concept of education and learning (cf. Bellanca, Brandt, 2010). There are several theoretical frameworks according to which these skills (21st century skills) can be defined (e.g. Wagner, 2008, Griffin, McGaw & Care, 2012, see also Hanover Research, 2011, P21 Framework for 21st Century Learning, 2019, Education & Training Quality Authority, 2018, Education Technology, 2019, etc.).

First and foremost, it is a *Framework for 21st Century Learning.* A unified vision for learning to ensure student success in a world where change is constant *and* learning never stops (https://static.battelleforkids.org/documents/p21/P21_Framework_Brief.pdf), which was introduced and is being updated over the long term by the US non-profit organisation Battelle for Kids (BFK), see Figure 3.

Fig. 3: A Framework for 21st century learning
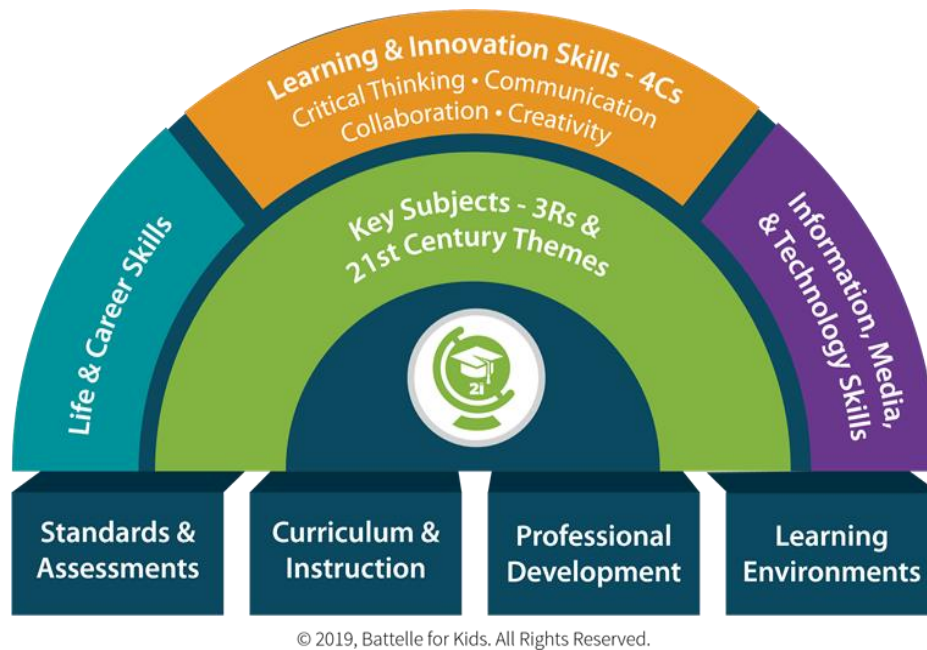
This framework was created for 21st century learning to *"...define and illustrate the skills, knowledge, expertise, and support systems students need to succeed in work, life, and citizenship"* (Battelle for Kids, 2019, online). Key 21st century subjects and themes, skills for learning and innovation, information, media and technology skills, and skills for successful careers and life are listed (cf. Battelle for Kids, 2019, online). In our project, we emphasize certain components of this framework, namely, skills for learning and innovation. These are creativity and innovation, critical thinking and problem solving, communication and collaboration.

In the WAVE-IT project, we focused primarily on teachers or student teachers and the possibilities of developing their professional competencies through 21st century skills. The mission and role not only of teachers but also of other educational staff (e.g. educators, social pedagogues) is undergoing a permanent, but in recent years significant change. The assumption is that teaching will no longer be a process of merely imparting knowledge and skills and then checking their acquisition by pupils. In practice, teachers become guides for pupils, find their own teaching style, use innovative methods and strive for a personal approach to pupils (cf. Sitná, 2009). However, they should not resign themselves to the desired quality of education, even when confronted with a non-professional public. *"The family is primarily responsible for the upbringing and successful socialization of the pupil, while the school and teachers are responsible for the pupil's formal education and contribute significantly to the pupil's secondary socialization. The future is uncertain, but to some extent it is possible to forecast its social, political, economic or development as well as the development in the field of social and natural sciences or computer science and technology"* (cf. Jůvová et al., 2015).

However, it should be stated that a teacher or educator should know innovative methods and approaches and be able to apply them effectively in their practice (cf. Kotrba, Lacina, 2015, p. 14, SKAV, 2015). The teacher should also be responsible for creating appropriate conditions, incentives or classroom

climate. Teacher should provide the pupil with feedback that is conducive to learning and personal development (SKAV, 2015).

To be effective in imparting 21st century skills to learners, eight specific roles of the teacher are identified (UNICEF, 2018, p. 96), see Table 1.

Table 1: The teacher for the 21st century and their eight roles

The role of the teacher	
1.	**The teacher as a facilitator** guides the learner, helping them to "learn to learn" by forming their own thoughts and opinions, analysing ideas and taking responsibility for their own learning through self-discovery and dialogue. If the teacher finds that the learning process is not proceeding satisfactorily, they will try to change what is happening in the classroom.
2.	**As a presenter/lecturer,** the teacher knows and can use different ways of presenting information to stimulate learners' self-motivation and curiosity through lecture, interpretation, discussion, questioning. The teacher does not separate knowledge acquisition from knowledge application, but instead integrates them into the same lesson.
3.	**The teacher as a human being** treats his students as equal human beings, not as their superior. Teacher is authentic, and admits when s/he doesn't know something or when s/he makes a mistake.
4.	**Teacher as a lifelong learner** According to John Hattie: "The greatest impacts on student learning occur when teachers become the students in their own teaching and students become their teachers." The 21st century teacher is 100% a 21st century learner – modeling all 21st century skills and learning them with their students.
5.	**The teacher as skill builder** is committed to the acquisition of knowledge and its application through specific skills needed especially in the 21st century. The 21st century teacher reflects on the mindset, dispositions or habits of the learners and always recognizes that true learning is the development of these knowledge, skills and dispositions.
6.	**As a professional,** the teacher works with the expected outcomes in mind and collaborates with other professionals to improve the quality of their work. Professionals are always prepared to do the best job possible under specific circumstances, focusing on even the smallest opportunities and not dwelling on problems.
7.	**As a mentor/advisor,** the teacher works closely with their students to develop their potential as human beings, as learners, as citizens, as future professionals, and as potential leaders; he/she knows the importance of lifelong learning for success in the 21st century. Therefore, a teacher dedicates time to mentoring students and developing their thinking, knowledge, skills, dispositions, habits so that they can apply themselves in the 21st century society and have the opportunity to make a difference in this world.
8.	**Teacher as creator** Regardless of the amount of methodological materials developed for teachers, the learning process still consists in the interaction between teacher and student. The creative teacher opens the classroom to the world to create opportunities for pupils to work with a variety of materials and activities. Creative teachers help students discover not only the world but also themselves, trying to focus students' minds into discovering deeper truths, speculations, assumptions, beliefs, theories and hypotheses, encouraging them to analyze but also to question what we call truths. As a result, creative teachers are constantly looking for innovative ways to improve learning, new activities, encouraging group discussions and sub-projects to help engage students in the learning process.

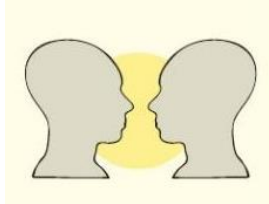|	Creative teachers use intuition to find and portray "teachable moments" in a lesson or activity. A creative teacher develops their skills to understand when it is an appropriate time to praise effort, to invite students to continue, to let students or the group deal with challenges on their own, or to step in and lend a helping hand.

(UNICEF, 2018, pp. 97–99)

In order to successfully participate in a society characterised by rapid technological progress in adulthood, children need to start developing and cultivating the relevant skills from an early age. To this end, key competences are defined in the core curriculum documents. In addition to the development of these core competences, such as learning, communicative, social and personal, civic, work or digital competences, the focus should also be on developing other skills such as critical thinking, problem solving, perseverance, collaboration or curiosity (World Economic Forum, 2015, pp. 3–4). As a consequence of changes in the labour market, there is an increase in demand precisely for employees who possess skills such as creativity, innovative thinking and collaboration. Indeed, skilled work activities are increasingly oriented towards solving unstructured problems and analysing information effectively. Manual work is being replaced by automated operations, and digitalisation is an integral part of everyday life. According to the World Economic Forum, over the last 50 years, the number of employees in occupations that involve common manual or cognitive skills has been declining (World Economic Forum, 2015, p. 4).

Basic literacy has thus become the foundation on which other skills are gradually layered, abilities are developed and cultivated, and the personality of the individual is built on all levels. Skills for the 21st century have been characterized as essential for the current and prospective job market, which requires an individual's ability to critically analyse and communicate information and to work in a team (World Economic Forum, 2015, p. 5). In our text, we will primarily focus on these essential skills for the 21st century as well as other skills that appropriately complement them (World Economic Forum, 2015).

The 21st Century Skills usually include communication, critical thinking, collaboration, creativity. There are also other concepts where curiosity is added to these four basic skills, see Table 2. These basic skills are interconnected and intertwined and can be learned, cultivated and practically used in social development, employment, further studies, family planning and personal growth (UNICEF, 2018, p. 61).

Table 2: The five basic skills (5 CS)

CURIOSITY	Asking questions Observation of new and different phenomena Paying attention to your inner and outer experiences Assessing and questioning from different perspectives Learning goes beyond the classroom and testing	

CRITICAL THINKING	Identifying what we already know and what we don't yet know. Data and information analysis. Evaluation of data and information. Organisation and arrangement of data and information. Decision-making based on data and information. Applying previous knowledge in new situations.	
CREATIVE THINKING	Practicing generative and divergent thinking. Imagination and change of perspective Risking responsibility. Application of the beginner's mind to gather information and ideas. Enabling brainstorming to generate group ideas. Building, refining and testing ideas in the real world. Getting feedback to adapt and improve ideas.	
COLLABORATION	Working in a group to achieve a common goal. Valuing diverse skills, talents and experience within the group. Inviting others to contribute their thoughts, ideas and questions. Supporting and empowering others to perform at their best. Effective task and time management in a project. Giving and receiving feedback.	
COMMUNICATION	Mutual understanding. Listening with empathy. Awareness of verbal (tone of voice, sounds, sentence structure, timing, attention) and non-verbal (posture, facial expression, facial expressions, facial expressions, signs, symbols, written language, context) communication patterns. Asking questions – find out more, inspire thinking, guide to learning. Testing assumptions, biases and insights.	

(UNICEF, 2018, pp. 62–63)

According to the World Economic Forum (WEF) concept, there is an overview of 16 skills for the 21st century, which are further divided into basic literacies, competencies and character qualities (World Economic Forum, 2015), see Table 3.

Tab 3: 16 skills for the 21st century

		Skill	Definition
Basic literacy (how pupils use key skills in everyday tasks)	1	Literacy	Ability to read, understand and use written language.
	2	Numeracy	Ability to use numbers and other symbols to understand and express quantitative relationships.
	3	Scientific literacy	Ability to use scientific knowledge and principles to understand certain environments, test hypotheses, conduct experiments.
	4	Using ICT for learning	Ability to use and create technology-based content including finding and sharing information, answering questions, interacting with other people, computer programming.
	5	Financial literacy	Ability to understand and apply the abstract and numerical aspects of finance in practice.
	6	Cultural and civic literacy	The ability to understand, recognize, analyze and apply knowledge about humanity.
Competence (how students approach complex change)	7	Critical thinking, real-world problem solving and innovation	Ability to identify, analyze and evaluate situations, ideas, opinions and information appropriate to formulate responses and solutions.
	8	Creativity, creativity	The ability to imagine and invent new and innovative ways of solving problems, answering questions or expressing meaning through the application, synthesis or reuse of knowledge.
	9	Advanced communication method	The ability to listen, understand, communicate and contextualise information through verbal, non-verbal, visual and written meaning.
	10	Collaboration	Ability to work in a team focused on a common goal, including the ability to prevent and manage conflict.
Character traits (how students approach their changing environment)	11	Building knowledge, curiosity	Ability and desire to ask questions and demonstrate openness and curiosity.
	12	Activity, initiative	The ability and desire to actively take on a new task or goal.
	13	Perseverance, courage	Ability to maintain interest and effort and persevere to the achievement of the goal.
	14	Adaptability	The ability to change plans, methods, opinions or goals in light of new information.
	15	Managing yourself, managing people	Ability to effectively manage, lead and inspire others to achieve a common goal.
	16	Social and cultural awareness	Ability to interact with other people in a socially, culturally and ethically appropriate manner .

(World Economic Forum, 2015, p. 5, p. 25)

Also noteworthy is the expanded overview of these skills as reported by the StudyCorgi.com platform (2023), see Table 4.

Table 4: Extended list of top 21st Century Skills

1. Cultural literacy.	11. Self-direction and social responsibility.	21. Stress management.	31. Deductive and inductive reasoning.	41. Self-reflection.
2. Global awareness.		22. Decision-making.		42. Stress resistance.
3. Creative thinking.		23. Willingness to learn.	32. Attention to detail.	43. Dealing with new media.
	12. Productivity.			
4. Adaptability.	13. Oral and written communication.	24. Punctuality.	33. Storytelling.	44. Analytical skills.
5. Presentation skills.		25. Sense of style.	34. Motivation and support.	45. Confidence.
	14. Planning and ti-me management.	26. Negotiation skills.		46. Language knowledge.
6. Curiosity.			35. Logical thinking.	
7. Risk management.	15. Teamwork.	27. Media literacy.	36. Prioritizing.	47. Improvisation.
8. Cooperation.	16. Leadership.	28. Multitasking.	37. Technical literacy.	48. Self-management.
9. Time management.	17. Active listening.	29. Emotional intelligence.		
	18. Initiative.		38. Positive attitude.	49. Situational awareness.
10. Problem-solving.	19. Ethics.	30. Delegation.	39. Project management.	50. Assertiveness.
	20. Networking.		40. Engagement.	

(Retrieved from: https://studycorgi.com/blog/21st-century-skills-that-every-learner-needs/)

To succeed in the labour market, graduates must, among other things, be able to cooperate, communicate and solve problems, see Figure 4.

Fig. 4: Portrait of a Graduate Honors the Past, Plans for the Future

(The Winnetka Public Schools District 36, IL, 2022, online, available at: https://www.battelleforkids.org/Insights/learning-hub-item/Honoring-the-Past)

These are skills based on the use of social and emotional learning (SEL) (World Economic Forum, 2016, cf. Hošková, 2020).

2.1 What should an effective teacher look like in the 21st century?

A short answer to this question might be: *"When the teacher connects with each student individually in the learning process and when all decisions about what content is taught and how it is taught are made based on this connection with students in the classroom"* (UNICEF, 2018, p. 96).

According to the SKAV, the teacher should be a guide on the path to education, responsible for creating the appropriate conditions, incentives or classroom climate. He or she should provide feedback to the student that is conducive to learning and personal development (SKAV, 2015).

2.1.2 Teaching methods

It is one of the important didactic tools used by the teacher in teaching to achieve the stated learning objectives. The development of skills for the 21st century is included among these objectives. With regard to a modern and innovative approach in the educational process, methods are chosen that motivate the pupil to learn independently, are in line with the principles of pedagogical constructivism and emphasize the development of the pupil's competences and skills for the 21st century. The teaching method should be emotionally interesting, engaging and effective in conveying information to pupils, see Table 5.

Table 5: Overview of teaching methods and strategies for developing 21st century skills

Action Research	A type of educational research that is usually conducted by teachers or school management. Its aim is to address current educational needs and find opportunities for improvement.
Student-engaging methods	Their task is to activate pupils, to suppress their passivity. An activated pupil learns information much more quickly, which forms his own opinions, knowledge, skills and attitudes. Through the use of pupils' independence and creativity, they should teach pupils to think critically (Lacina, 2015, p. 97).
Exploratory learning	In this educational process, students formulate a problem, evaluate, plan and experiment. Subsequently, they draw conclusions and thus acquire information (Stuchlíková, 2010).
Blended learning	It combines traditional face-to-face teaching with teaching via the Internet and appropriate software. It enables effective learning, supported by the multimedia and communication tools of modern times. The curriculum is adapted to current events in the world, is up-to-date and reflects current issues (see Vogl, 2016).
Brainstorming	It can be translated as "exchange of ideas". It is based on the idea that we need to separate the coming up with ideas from the critical evaluation of them. It is therefore divided into two phases: 1. creative and spontaneous, 2. rational and logical" (ABECEDA, 2011).
CLIL	It has a strong interdisciplinary character, where the language teaching and the taught subject are connected. Language is a means for teaching educational content, which in turn becomes a resource for language learning (RVP Methodological Portal, 2009).
Timelines	They allow to capture the development or sequence of events through their schematic representation (Neumajer, 2014, p. 27).

Discussion	Their aim is to teach students to communicate with each other, to express their thoughts and feelings, but also to perceive others and to listen to them. It motivates students before the actual interpretation, increases their attention during the interpretation and provides feedback to the teacher after the interpretation (Kotrba, Lacina, 2015, p. 122).
Experiment	When performing experimental activities, students acquire the necessary skills that can be considered as active knowledge and also as acquiring a certain readiness to perform selected activities in practical life (Dostál, 2013a, p. 11).
Role-playing and simulation	The essence lies in identifying with the assigned roles and then adopting the right attitudes. It is based on direct experience – the pupil learns much more when he/she plays the role than when it is passively conveyed to him/her as an external observer (Kotrba, Lacina, 2015, p. 147).
Playful and creative learning	Using familiar tools and materials in a non-traditional way so that they can enhance the student's knowledge and skill (Kalaš, 2013, p. 201).
Integrated teaching	It deliberately links the educational content of several disciplines based on thematic proximity and learning objectives. The first step towards integration is usually the search for cross-curricular connections (Hesová, 2011).
"Classical" lesson	Teaching is mainly conducted by the teacher in a monologic frontal method, the lesson has a fixed time structure (Kotrba, Lacina, 2015, p. 28-29).
Cooperative Teaching	By interacting together, students learn from each other. Collaboration creates a productive environment, brings increased effort, positive relationships, and healthier minds (Kalas, 2013, p. 197).
Measurement with smartphones	Using smartphones to explore life and discover patterns around us (Neumajer, 2014, p. 27).
Modelling	They allow you to explore how something works in 2D and 3D. Thus, many times they show great potential because we experience the same effect as if we were in a real situation (Kalaš, 2013, p. 181).
Peer teaching	Pupils teach each other. The pupil who prepares the lesson for his/her classmates is in charge of the lesson or part of it. His or her preparation includes both understanding and elaborating on the topic and choosing appropriate teaching methods. This demanding activity mobilizes important cognitive skills of the student-teacher (Kalash, 2013, 202).
Problem-based learning	In each problem task, a specific problem is solved, which is conceived, processed and solved in different ways using the activation method. Students are required to be active, productive thinkers and independent. It emphasizes thinking, hypothesis generation, discovery and exploration. Problem-based learning creates the habit of creative acquisition of knowledge and leads to creative activity (Kotrba, Lacina, 2015, pp. 98-99).
Project teaching	The aim is to activate pupils and increase their interest in learning by making projects close to their lives and interests. It is often cross-curricular. Projects combine knowledge, skills and abilities from many areas and cover them with one common theme (Kalash, 2013, pp. 204-205).
Cross-curricular topics	The interrelationships between subjects, the understanding of causes and relationships that transcend subject matter, a means of cross-subject integration (Průcha et al., 2003, p. 124).
Guided conversation	The teacher encourages the participants, promotes the discussion, or directs it methodically and keeps it within predetermined limits. Finally, he/she evaluates the results and closes the discussion (Kotrba, Lacina, 2015, p. 123).
Simulation	It is a concept closely related to modeling. It is an imitation of a real thing, a state or a process (Kalaš, 2013, p. 181).
Learning by discovery	It leads students to figure out how something works, to discover the principle that is best applied in problem solving (Kalaš, 2013, p. 199).
Sample, exhibition	Demonstration of the material discussed, students can see in practice what they are learning. Thanks to the demonstration or exhibition, pupils get a concrete idea of the topic and can understand the context better and faster.

Interpretation	A way of presenting didactic information, the main purpose is to explain the material to students. Therefore, it must have appropriate parameters of text difficulty to make it understandable for pupils of a certain age (Průcha et al., 2003, p. 280).
Teaching with mobile phones	The modern trend of teaching with the help of mobile devices that allow you to do interesting learning activities anywhere, e.g. in the field. The aim is to integrate devices that young people are familiar with and interested in into the classroom (Kalas, 2013, p. 29).
Workshop	An informal learning activity where participants work in groups and learn about a specific activity in a relatively limited amount of time. If a suitable topic is chosen, classroom learning can be organized in a similar way (Kalas, 2013, p. 201).
Experiential learning	The learner comes to knowledge actively through his own authentic experience. The learner is required to take initiative, be personally and emotionally engaged, make critically considered decisions, and be able to communicate his or her own ideas to others, as well as be responsible for the results of his or her work (Kalaš, 2013, p. 200).
Pupils as researchers	A pathway to students' own independent thinking and learning. For some types of school research, digital technologies are becoming a welcome tool (Kalash, 2013, p. 211).

(in Hošková, 2020)

In addition to formal education, informal education, which is very important for lifelong learning, is also coming to the fore in this context (La Belle, 1982; EC, 2019, 2002). This concept can also be successfully used in the school classroom. As pupils are surrounded by ICT in their daily lives, teachers can make effective use of their knowledge and skills, see for example the list of competences of the European Digital Competence Framework DigCompEd (Redecker, 2017).

2.2 Digital Teacher Competences
and the DigCompEdu European Framework

Ondřej Duda

Digital competence is part of the teacher's professional competence profile. Since 2021, digital competence has been included in the curriculum documents of school education in European countries. The concept of digital competence of a teacher is gradually becoming a phenomenon in relation to the teacher, the student and society, but it should not be confused with the concept of digital literacy (see Skantz-Åberg et al., 2022). Teacher digital competence encompasses the knowledge and skills that fall under digital literacy and others needed to be competent to practice the teaching profession. However, it should be based on the general European Digital Competence Framework DigComp 2.0[1] (Vuorikari, et al., 2016; EC, 2019). At the national level, digital competence is included in the Strategy for Education Policy of the Czech Republic until 2030+ and the Strategy for Digital Education in the Czech Republic until 2030+

[1] DigComp 2.0: The Digital Competence Framework for Citizens.

(https://www.msmt.cz/uploads/brozura_S2030_en_fin_online.pdf). In these documents, teacher competence is specified as a professional competence, which includes the teacher's ability to use ICT to achieve the expected outcomes given by the relevant framework/curriculum document. These educational objectives are achieved by using ICT as didactic, tangible and intangible resources.

2.2.1 European framework of DigCompEdu

DigCompEdu is a set of digital competences for teachers, based on the DigComp 2.0 framework (Vuorikari, et al., 2016; EC, 2019), and is a listing and description of 22 digital competences grouped into six categories that fall into three competency areas (Redecker, 2017), see Figure 5:

1. *"Teacher professional engagement - professional communication; professional collaboration; reflective practice; continuous professional development.*

2. *Digital resources – selecting digital resources; creating and editing digital resources; organizing, protecting, sharing digital resources.*

3. *Teaching – teaching; pupil guidance; pupil cooperation; pupil independent learning.*

4. *Digital assessment – assessment strategies; analysis of learning outcomes; feedback and planning.*

5. *Pupil support – accessibility and inclusion; differentiation and individualisation; pupil activation.*

6. *Promoting pupils' digital competences – information and media literacy; digital communication and collaboration; digital content creation; responsible use of digital technologies; problem solving through digital technologies."*

Fig. 5: DigCompEdu – European framework of digital competences for educators
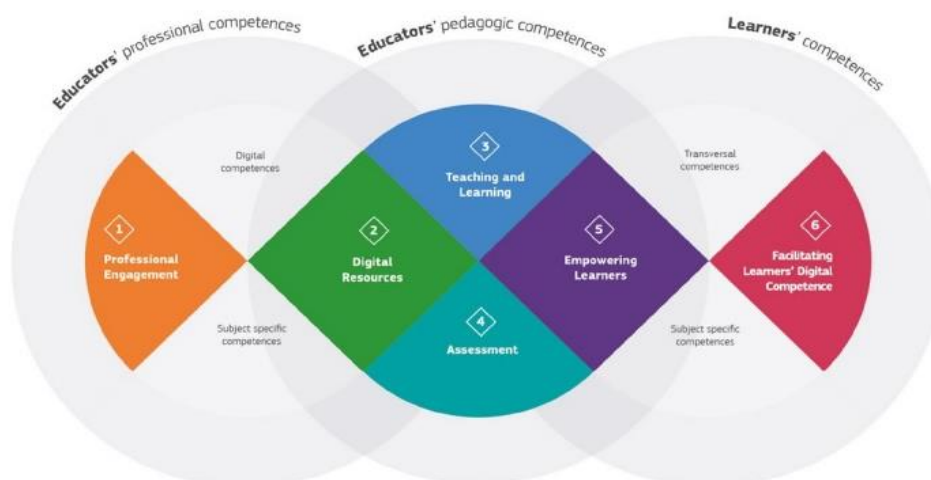
(Source: Redecker, 2017, online available at:
https://publications.jrc.ec.europa.eu/repository/handle/JRC107466)

DigCompEdu consists of three competency areas, namely teachers' professional competences, teachers' pedagogical competences and students' competences, and six categories: 1. Professional Engagement, 2. Digital Resources, 3. Teaching and Learning, 4. Assessment, 5. Empowering Learners, 6. Facilitating Learners' Digital Competence (Redecker, 2017, p. 26–76).

Category 2: Digital resources also includes the sub-competencies: *selecting digital resources, creating and editing digital resources, and organizing, protecting, sharing digital resources*. Creating and editing digital resources then includes the activities of: (teacher) '*editing resources available under an open license and other resources where permitted. Creates new digital learning resources independently and in collaboration with others. In creating and using digital resources, considers and takes into account specific learning objectives, contexts, pedagogical approaches and specific groups of learners'* (Redecker, 2017; MoEYS, 2018). Each category of sub-competences includes a description of activities:

- *"Editing of existing digital assets, where permitted.*
- *Combining and combining individual resources or parts of resources, where permitted.*
- *Creating new digital learning resources.*
- *Co-creation of digital learning resources.*
- *Respect for learning objectives, context, learning practices and specific groups of learners when creating or adapting digital learning resources.*
- *Understanding the different licenses under which digital resources are published and the implications this has for sharing them"* (Redecker, 2017).

However, we believe that the content and description of these activities in each category and also in each heading should be supplemented by two dimensions, namely the teacher's work with hardware and software. This can be shown in the following example of *Presentation as a digital resource.*
The presentation is a digital resource and as a digital tool teachers can use it to support their teaching. It can be:

- created in an offline/online presentation editor/editing tool, with or without a license (e.g. MS PowerPoint, Prezi, Google Slides, etc.). Dimension *Software* (program).
- run on an electronic device (PC desktop or laptop) and projected onto a projection screen, whiteboard, interactive whiteboard or dedicated projection screen using a projection device (integrated or separately installed). *Hardware* (device) dimensions.

The above example shows that the teacher actively uses knowledge and skills from both the hardware and software dimensions of digital competence to perform his/her profession when creating digital resources.

2.2.2 Digital didactic resources

The competency framework of the teaching profession in the case of digital competence (computer skills) needs to be completed to correspond with the DigCompEdu European Framework of Digital Competences for Teachers (EC, 2018). In general, digital competence is defined by the parent document of the DigComp European Framework of Digital Competences 2.0[2] (Vuorikari, et al., 2016; EC, 2019).

---

[2] DigComp 2.0: The Digital Competence Framework for Citizens.

Modern information and communication technologies (ICT)[3] (UNESCO, 2019) are now an essential part of everyday life. Already during school, it is important to think about the future of learners, especially in the context of the European Qualifications Framework for Lifelong Learning (https://europa.eu/ europass/en/europass-tools/european-qualifications-framework). We cannot do without ICT skills today, and it can be expected that the requirements will increase in the future.

The current educational process, which follows current trends and the impact of technology on people, also follows the forecast of the needs of students in the future. In this process, the school and especially teachers play an important role, as they have a duty to teach according to the latest findings of current science and thus prepare their pupils for an active and successful life. This means that teachers must be proficient in ICT in order to be able to meet the educational objectives and to succeed in their profession. Teachers therefore need to respond to these needs primarily in their lifelong learning (Köln Charter: Aims and Ambitions for Lifelong Learning, 1999).

However, if we want to talk about the needs of society, the market and the need to modernize the approach of schools and teachers to prepare pupils for the future, it is not enough to define and accept the requirement that pupils should acquire their knowledge and skills at school. It is not enough to update the list of pupils' key competences (standards and required outcomes), which corresponds to the concept of skills needed for the 21st century (OECD, 2015). The following question needs to be asked: how teachers will achieve the requirements and educational goals given by the standard?[4]

Due to the ongoing global health crisis, which has also affected the Czech Republic, teachers had to react very quickly in practice and supplement their knowledge and skills in digital competence. Teaching was and still is partly implemented in an alternative distance learning form in online mode. For this reason, the further development of teachers' digital competence could be accelerated. This state of affairs could have become the subject of research, but a different objective is set for this study.

Tab. 6: Overview of digital didactic resources

Digital Storytelling	Connecting creative writing with actual work with digital tools - using still photography, sound in the form of music or voice recording, animation, video, etc. (Neumajer, 2014, p. 26).
Edu-clips	Short videos with educational content that correspond to the topic being discussed. They should be illustrative, concise and easy to understand.
E-learning	Learning through new multimedia technologies and the Internet. It is often perceived as distance learning only (Kalas, 2013, p. 29).
Electronic reader	A device that is designed only to display documents (eBooks, PDF files, etc.) (Kalas, 2013, p. 43).
eTwinning	An activity to promote international cooperation between schools at a distance through ICT. Schools create their own partnership projects to prepare students for life in a technology-saturated world (Neumajer, 2014, p. 27).
Geocaching, Educhaching	A hiking game using GPS coordinates to find a hidden box. It is adapted to the conditions of education, e.g. school grounds (Neumajer, 2014, p. 26).
GPS	The Global Positioning System can be used for educational purposes (Brdička, 2006).

---

[3] Hereafter referred to as ICT.
[4] White Paper – National Programme for the Development of Education in the Czech Republic (Ministry of Education, 2001); Frame work Educational Programmes (FEP) (Ministry of Education; National Institute of Education).

Game consoles	A device specifically designed for playing video games. It is usually connected to a TV set and controlled with special controllers. Educational game activities focus on recognition, remembering, analysis and reasoning, counting and visualization (Kalash, 2013, p. 193).
Voting equipment	Through them, the teacher can easily involve all students in the activity at the same time. Using special software, they can enter the question and possible answers. Pupils vote using a small device in their hand. The software automatically evaluates all the votes from the pupils and shows the result via a projector, e.g. on an interactive whiteboard (Kalas, 2013, p. 193). Mobile phone apps (e.g. kahoot.com, socrative.com, pochopimto.cz) can be used for this purpose, which students can easily install on their mobile devices. Such apps also allow teachers to promptly test the current knowledge or attitudes of pupils (Kalas, 2013, p. 193).
Smart mobile phones	Mobile devices can be used in a variety of scenarios: learning in groups with mobile phones, simulation games with the whole class or working with GPS. The success of mobile learning depends on the ability to use technology in personal, community and social contexts (Kalash, 2013, p. 187).
Interactive whiteboards	If we want to use the full potential of the interactive whiteboard, we should choose activities that allow students to manipulate objects on the screen. Using a finger or a pen belonging to the whiteboard, it is possible to: 1. control the pedagogical software on the touch screen of the whiteboard, 2. write or compose correct answers, 3. sort, match, arrange objects by dragging them, 4. draw or compose music, 5. create live compositions using pictures or animations (Kalas, 2013, p. 187).
Linden Oak	A specific rendition of a popular song in the form of a video, which is usually filmed in a single camera shot and through which the viewer becomes familiar with the premises of the entire school (Neumajer, 2014, p. 26).
Podcasting	A method of disseminating audio or video recordings that the author of a podcast places on the Internet in the form of files that are linked to by an established RSS feed (Neumajer, 2014, p. 26).
PowerPoint	PowerPoint is a presentation creation tool created by Microsoft in 1993. Very often educational presentations are prepared using this program.
Worksheets	Printed material that facilitates the understanding of the material discussed, brings it closer, complements and enlivens it. As a rule, they are prepared by the teacher or are available in abundance on various web portals with educational themes.
Presentation	Depending on the way the presentation will be used, the preparation process is also dependent. Before starting the actual work, it is important for the author to think about which topics to include in the presentation. How these topics will be treated (text with pictures, plain text, graphs, etc.), how long the presentation will be (length of the lesson), etc. Before the actual presentation, each teacher should gather the necessary information, publications and materials.
Prezi	Prezi is a cloud-based presentation software and presentation creation tool founded in 2009.
Projector	A device that allows the display (projection) of an image onto a screen or wall, thus providing viewing for all those present in the space. Its source can be a computer, laptop, DVD player and other video devices.
School wiki	The use of websites that allow users to collaboratively add and modify existing content (Neumajer, 2014, p. 26).
Virtual reality	It is often associated primarily with video games, but its utility extends many times beyond games and entertainment. Basically, anything that can be illustrated with images and sound finds its application in virtual reality goggles. As virtual reality goggles become more accessible, the potential for their use in education grows (ABC, 2019).

Remote laboratories and simulations	To observe real physical, chemical or other experiments in real time, we can use so-called remote laboratories. In them, students can directly control remote devices via the Internet, dynamically change the values of their settings and parameters, start and watch via camera experiments taking place in real time in laboratories that they would otherwise not be able to visit in person (e.g. kdt-4.karlov.mff.cuni.cz, www.ises.info/index.php/en/laboratory) (Kalaš, 2013, p. 189).
Educational robotics	It is becoming a popular part of the classroom and a tool for developing cross-curricular relationships. By working with robots, pupils develop the concept of action and reaction, the behaviour of an object based on the properties of the environment, which they can also influence themselves. Robotic toys and kits enable children to become engineers, designers and programmers at the same time. They help build algorithmic thinking and develop higher cognitive skills. Finding a bug in their program, understanding the robot's behaviour when it differs from what is expected - all of this requires analytical skills and an understanding of controlling the robot through the program (Kalash, 2013, p. 191).
Functional models	A simplified imitation of a real system or object, situation or process to help us better understand or know a part of reality. Each model contains information - parameters that are processed according to certain relationships. The model then produces corresponding outputs. For example, even the microworld is a model in which we can simulate and investigate various phenomena and processes (Kalas, 2013, p. 181).
Programmable toys	Simple programmable toys like Bee-Bot and Roamer can be used in kindergarten or primary school. They lead to algorithmic thinking and the development of higher cognitive skills such as planning. A programmable toy with simple functionality (e.g. Bee-Bot - a bee moving on a square grid) can be used as a propedeutic for programming or as a tool to develop cooperation and higher cognitive operations in the lower grades. Using a programmable toy with a variety of behaviors, such as Roamer, will get children to create their first serious programs. When using a programmable building block with the ability to build their own robot or even create a program, students realize themselves as designers, engineers, artists, and programmers all at the same time. At the same time, the skills and abilities we develop depend on the requirements we have for the model (Kalash, 2013, p. 191).
Robots	Robotic kits contain a programmable cube, motors and sensors that are used to control the robot or collect data or measurements. Projects can focus on programming, but also on environmental education, biology, physics, storytelling, or mechanics and engineering (Kalas, 2013, p. 191).

(Hošková, 2020)

Although there are different conceptions of 21st century skills in the literature, the number of them varies, but the essence remains the same. Skills for the 21st century have become an important prerequisite for a successful and meaningful life for every individual, for their personal development and for their employment in society and the labour market. It is a set of knowledge, abilities, skills, attitudes and values whose possession and mastery determine the quality of an individual's life.

Resources

ABC (2019). *Virtuální realita ve vaší škole: Připrav se, studente, začínáme!* [online]. Available at:
https://www.abicko.cz/clanek/precti-si-technika/25716/virtualni-realita-ve-vasi-skole-priprav-se-studente-zaciname.html.

ABECEDA, občanské sdružení (2011). *Moderní vyučovací metody – 1. díl – Brainstorming a jeho variace.*
[online]. Available at: http://www.ctenarska-gramotnost.cz/projektove-vyucovani/pv-metody/metody-1.

AERA (2012). *Using project based learning to teach 21st century skills: Findings from a statewide initiative*.
Vancouver: AERA. [online]. Available at:
https://www.researchgate.net/publication/258188193_Using_project_based_learning_to_teach_21_st_century_skills_Findings_from_a_statewide_initiative_Jason_Ravitz_Buck_Institute_for_Education.

BATTELLE FOR KIDS. (2020). *Partnership for 21st Century Learning.* [online]. Available at:
https://www.battelleforkids.org/networks/p21.

BINKLEY, M.; ERSTAD, O.; HERMAN, J.; RAIZEN, S.; RIPLEY, M., RUMBLE, M. (2010). *Defining 21st century skills.* The University of Melbourne: Assessment & Teaching of 21st Century Skills. [online].
Available at: https://oei.org.ar/ibertic/evaluacion/sites/default/files/biblioteca/24_defining-21st-century-skills.pdf.

BELLANCA, J. A., & BRANDT, R. S. eds. (2010). *21st Century Skills: Rethinking How Students Learn.* [online].
Available at: http://soltreemrls3.s3-website-us-west-2.amazonaws.com/solution-tree.com/media/pdf/study_guides/21st_Century_Skills_Study_Guide.pdf.

BRDIČKA, B. (2003). *Role internetu ve vzdělávání.* 1. vyd. Praha: Univerzita Karlova v Praze.

BRDIČKA, B. (2006). *GPS ve výuce.* Metodický portál: Články. [online], Available at:
https://spomocnik.rvp.cz/clanek/12061/GPS-VE-VYUCE.html.

DOSTÁL, J. (2013a). *Experiment jako součást badatelsky orientované výuky.* [online]. Available at:
https://tvv-journal.upol.cz/pdfs/tvv/2013/01/02.pdf.

DOSTÁL, J. (2013b). Badatelsky orientovaná výuka jako trend soudobého vzdělávání. *e-Pedagogium*, *13*(3),
81–93.

EC. (2019). DigComp 2.0. *ec.europa.eu* [online]. Available at:
https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework.

EC. (2002). Report on the Memorandum of 30 October 2000 on Lifelong Learning. *europarl.europa.eu.*
[online]. Available at: https://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A5-2001-0322+0+DOC+XML+V0//EN&language=EN.

EDUCATION TECHNOLOGY. (2019). *Keep up with 21st-century skills.* [online]. Available at:
https://edtechnology.co.uk/comments/keep-up-with-21st-century-skills/.

EDUCATION & TRAINING QUALITY AUTHORITY. (2018). *21st Century Skills.* [online]. Available at:
https://www.bqa.gov.bh/En/AboutQaaet/Pages/4thGeneration.aspx.

GRIFFIN, P. E., MCGAW, B., & CARE, E. (2012). *Assessment and Teaching of 21st Century Skills.* Dordrecht:
Springer.

HANDELZALTS, A. (2019). Collaborative Curriculum Development in Teacher Design Teams. In Pieters, J., Voogt, J., Pareja Roblin, N. (eds) Collaborative Curriculum Design for Sustainable Innovation and Teacher Learning. Springer, Cham. https://doi.org/10.1007/978-3-030-20062-6_9.

Hanover Research – District Administration Practice. (2011). *A Crosswalk of 21st Century Skills.* [online]. Available at: http://www.hanoverresearch.com/wp-content/uploads/2011/12/A-Crosswalk-of-21st-Century-Skills-Membership.pdf

HESOVÁ, A. *Integrace ve výuce.* Metodický portál: Články. [online]. Available at: https://clanky.rvp.cz/clanek/c/Z/12039/integrace-ve-vyuce.html/.

HOŠKOVÁ, V. (2020). *Škola a dovednosti pro 21. století.* Diplomová práce. Vedoucí práce: PaedDr. Alena Jůvová, Ph.D. Olomouc: Univerzita Palackého. [online]. Available at: https://theses.cz/id/vbx6w8/.

JŮVOVÁ, A., CHUDÝ, Š., NEUMEISTER, P., & PLISCHKE, J. (2015). 21st Century Skills in University and Primary Education Curricula in the Czech Republic. *e-Pedagogium*, *15*(2), 21–32. doi: 10.5507/epd.2015.014.

Kahoot! (2020). *Make learning awesome!* [online]. Available at: https://kahoot.com.

KALAŠ, I. a kol. (2013). *Premeny školy v digitálnom veku.* 1. vyd. Bratislava: SPN.

KOTRBA, T. & LACINA, L. (2015). *Aktivizační metody ve výuce.* 3. vyd. Brno: Barrister & Principal.

G8 Cologne Summit. (1999). *Köln Charter: Aims and Ambitions for Lifelong Learning.* [online]. Available at: http://www.g7.utoronto.ca/summit/1999koln/charter.htm

La BELLE, T. J. (1982). Formal, Nonformal and Informal Education: A Holistic Perspective on Lifelong Learning. *International Review of Education, 28*(2), 159–175. [online]. Available at: http://www.jstor.org/stable /3443930.

LAMB, S.; MAIRE, Q.; DOECKE, E. (2017). *Key Skills for the 21st Century: an evidence-based review.* Melbourne Australia: Victoria University. [online] [cit. 28. 1. 2020]. [online]. Available at: http://vuir.vu.edu.au/35865/1/Key-Skills-for-the-21st-Century-Analytical-Report.pdf.

NEUMAJER, O. (2014). *Inovativní výukové aktivity pro rozvoj dovedností pro 21. století.* Praha: Univerzita Karlova v Praze, Pedagogická fakulta.

NEUMAJER, O. (2016). *Digitální technologie ve vzdělávání – příležitosti a fakta*. Praha: Univerzita Karlova v Praze, Pedagogická fakulta. [online]. Available at: https://www.politikaspolecnost.cz/wp-content/uploads/2016/03/Neumajer_Digit%C3%A1ln%C3%AD-technologie-ve-vzd%C4%9Bl%C3%A1v%C3%A1n%C3%AD.pdf.

OECD (2015). *Students, Computers and Learning: Making the Connection*. PISA, OECD Publishing.

PRŮCHA, J.; WALTEROVÁ, E.; MAREŠ, J. (2003). *Pedagogický slovník*. 4. vyd. Praha: Portál.

REDECKER, C. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu.* Publications Office of the European Union, Luxembourg, doi:10.2760/159770, JRC107466.

SITNÁ, D. (2009). *Metody aktivního vyučování: Spolupráce žáků ve skupinách*. 1. vyd. Praha: Portál.

SKANTZ-ÅBERG, E., LANTZ-ANDERSSON, A., LUNDIN, M. & WILLIAMS, P. (2022). Teachers' professional digital competence: an overview of conceptualisations in the literature. *Cogent Education, 9*(1), 2063224, DOI: 10.1080/2331186X.2022.2063224.

SKAV (2015). *Desatero SKAV.* [online]. Available at: https://skav.cz/desatero-o-vzdelavani/.

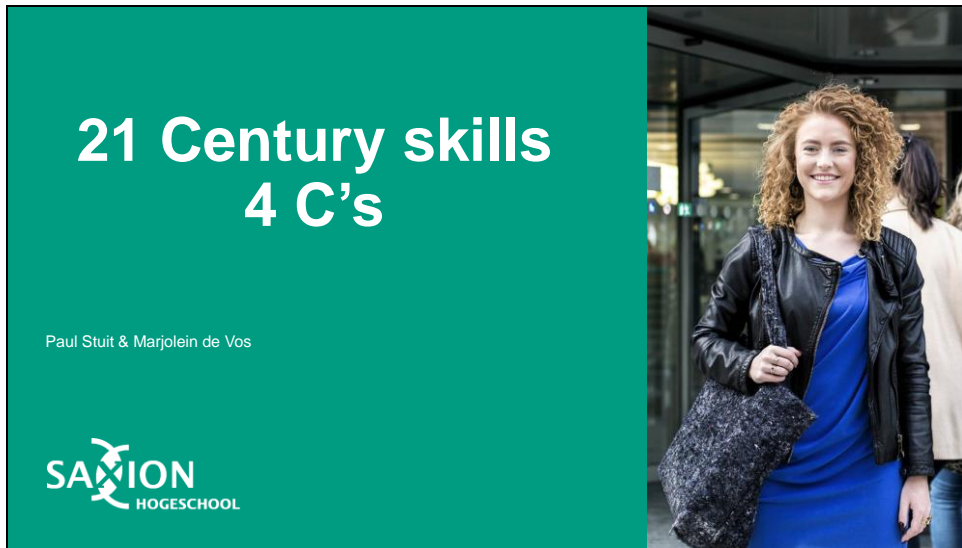Socrative (2020). *Socrative app*. [online]. Available at: https://socrative.com.

STUCHLÍKOVÁ, I. (2010). O badatelsky orientovaném vyučování. In *Didaktika biologie v České republice 2010 a badatelsky orientované vyučování. DiBi 2010, sborník příspěvků semináře, 25. a 26. března 2010.* České Budějovice: Jihočeská univerzita.

StudyCorgi. (2023). *21st-Century Skills That Every Learner Needs.* [online]. Available at: https://studycorgi.com/blog/21st-century-skills-that-every-learner-needs/

UNESCO (2015). *Rethinking Education. Towards a global common good?* Paris: UNESCO.

UNESCO. *Information and communication technology (ICT) in education.* [online]. 2019. Available at: https://learningportal.iiep.unesco.org/en/issue-briefs/improve-learning/curriculum-and-materials/information-and-communication-technology-ict.

UNICEF. (2018). *A Guide to Becoming a 21st Century Teacher*. [online]. Available at:

https://static1.squarespace.com/static/5231099ce4b056c05311d4c4/t/5ae0ef1c352f53223e1ea18b/1524690728335/21CSGuide_English.pdf.

VOGL, H. (2016). Blended Learning – from theory to practice. In Jůvová, A., & White, J. (Eds.). *The development of soft skills and professional competences for European teachers*. Brno: Paido. [online]. Available at: https://www.flipsnack.com/ADDE5EEC5A8/voices-the-development-of-soft-skills-and-professional-compete.html.

VUORIKARI, R., PUNIE, Y., CARRETERO, S. & VAN DEN BRANDE, L. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens.* [online]. Available at: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC101254/jrc101254_digcomp%202.0%20the%20digital%20competence%20framework%20for%20citizens.%20update%20phase%201.pdf.

WAGNER, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need - and what we can do about it.* New York: Basic Books.

WORLD ECONOMIC FORUM. (2016). *What are the 21st-century skills every student needs?* [online]. Available at: https://www.weforum.org/agenda/2016/03/21st-century-skills-future-jobs-students/.

WORLD ECONOMIC FORUM. (2015). New Vision for Education. *Unlocking the Potential of Technology.* Geneva, Switzerland. [online] Available at: http://www3.weforum.org/docs/WEFUSA_NewVisionforEducation_Report2015.pdf.

Internet resources

https://www.battelleforkids.org/

https://www.itacec.org/21st_century_learning.pdf

https://www.edweek.org/teaching-learning/how-do-you-define-21st-century-learning/2010/10

https://www.panoramaed.com/blog/comprehensive-guide-21st-century-skills

https://www.nea.org/professional-excellence/student-engagement/tools-tips/being-21st-century-educator

PRESENTATION ON THE TOPIC OF THE 21ST CENTURY SKILLS

**21 Century skills
4 C's**

Paul Stuit & Marjolein de Vos

Programm

- Survey (5 minutes)
- Introduction into the 4Cs (15 minutes)
- DINO assignment (45 minutes)
- Reflection on DINO assignment, including comparing the development of the 4 Cs in the participating countries (20 minutes)
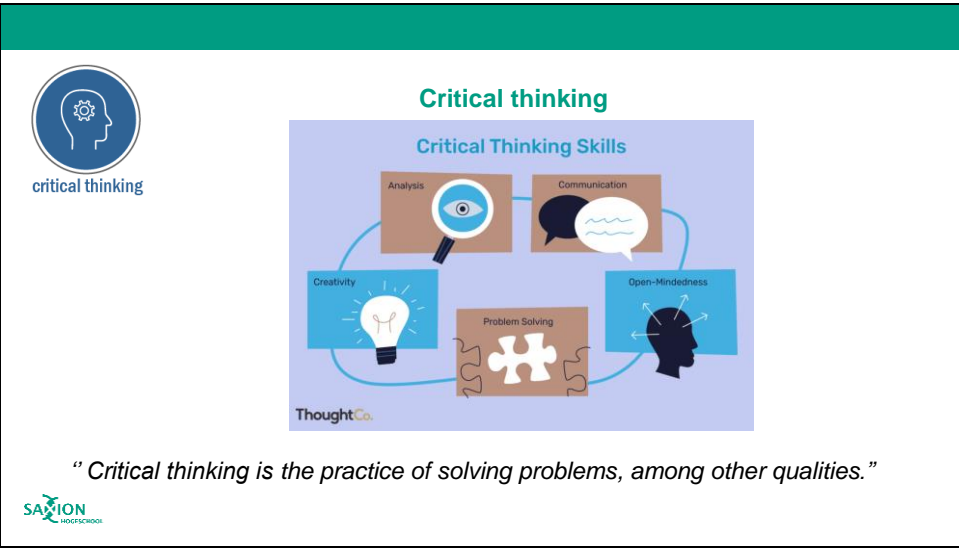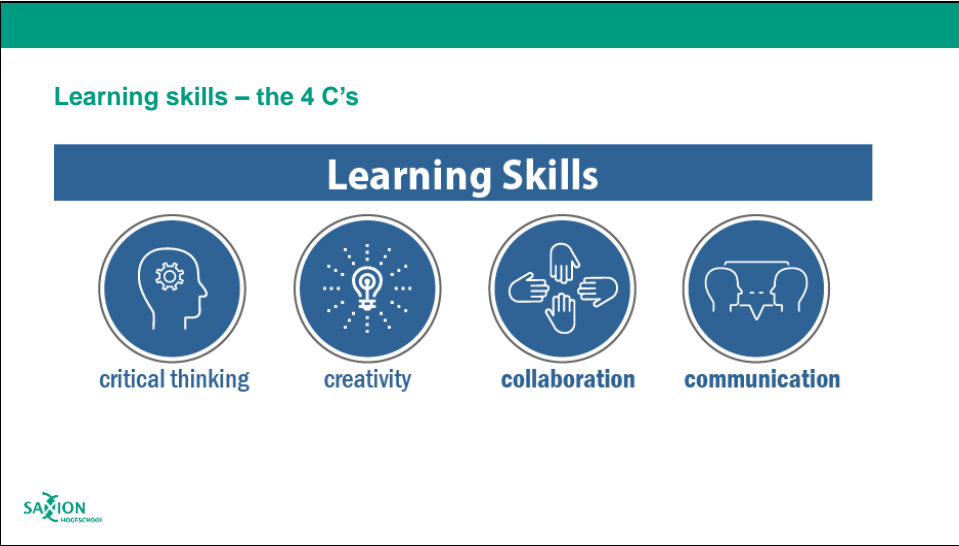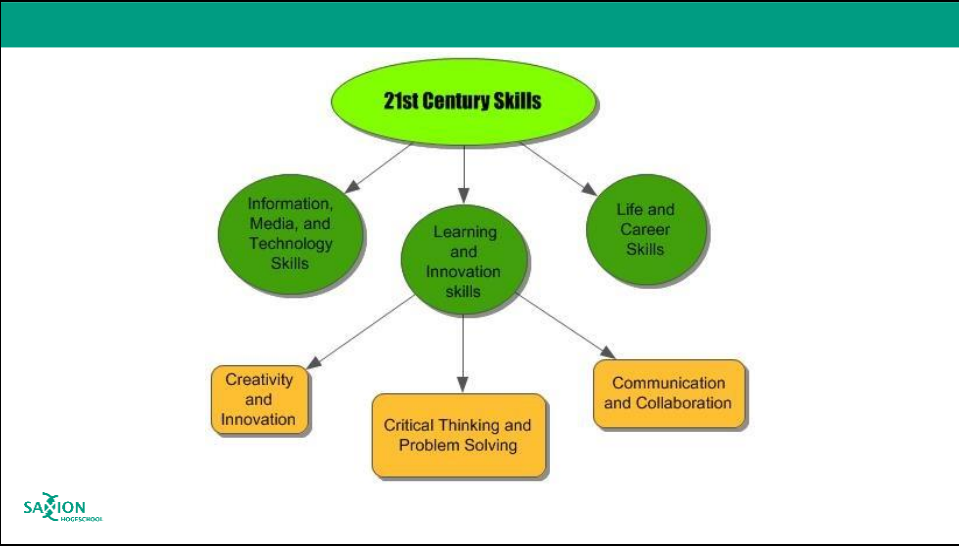- Exchange of practices around the 4 Cs (30 minutes)
- Survey (5 minutes)

a small survey to assess the state of the art in Socrative?

1. Do you know (some of) the 21st century skills?

2. Do you apply 21st century skills within the school practice?

3. Which of the 21st century skills do you apply in the school practice?

4. Do you think learning 21st century skills is important for you?

5. Do you think learning 21st century skills is important for the children in your class?

6. What would you like to learn about 21st century skills yourself?

Four-point scale, question 3 + 6 open question.

At the end: question 1, 3, 5 again + question 6: what benefits have you derived from the workshop?

Learning skills – the 4 C's

Critical thinking

'' Critical thinking is the practice of solving problems, among other qualities.''

The ideal critical thinker: "habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fairminded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit." (Facione, 1990, p2)

Effective didactic strategies: authentic and meaningful contexts as a starting point for dialogue (1), initiating dialogue and discussion (2), making explicit the (sub) skills and characteristics of critical thinking that are developed (3) and guidance during the learning process (4).

Critical thinking is the practice of solving problems, among other qualities. Critical thinking is a term used by educators to describe forms of learning, thought, and analysis that go beyond the memorization and recall of information and facts. Critical thinking occurs when students are **analyzing**, **evaluating**, **interpreting**, or **synthesizing** information and applying creative thought to form an argument, solve a problem, or reach a conclusion.

It empowers students to discover the truth in assertions, especially when it comes to separating fact from opinion. With critical thinking, students don't just learn a set of facts or figures. Instead, they learn how to discover the facts and figures for themselves. They ask questions. They become engaged in the world around them. They help *others* think critically, too. That might be the most important part of critical thinking. Once one student has it mastered, it quickly spreads to their peers.

It works just fine when students use it alone. But when students combine it with the *next* skill, the sky is the limit to what they can achieve.

What does that mean for our students?

Today's students need to develop Critical Thinking skills by learning to:

- Use different kinds of reasoning, such as deductive and inductive, to understand a situation.

- Analyze complex systems and understand how their interconnected parts support the systems.

- Gather relevant information. Ask important questions that clarify points of view and help solve problems.

- Make decisions by selecting appropriate criteria and identifying alternatives to make reliable choices

'' Creativity is the practice of thinking outside the box.''
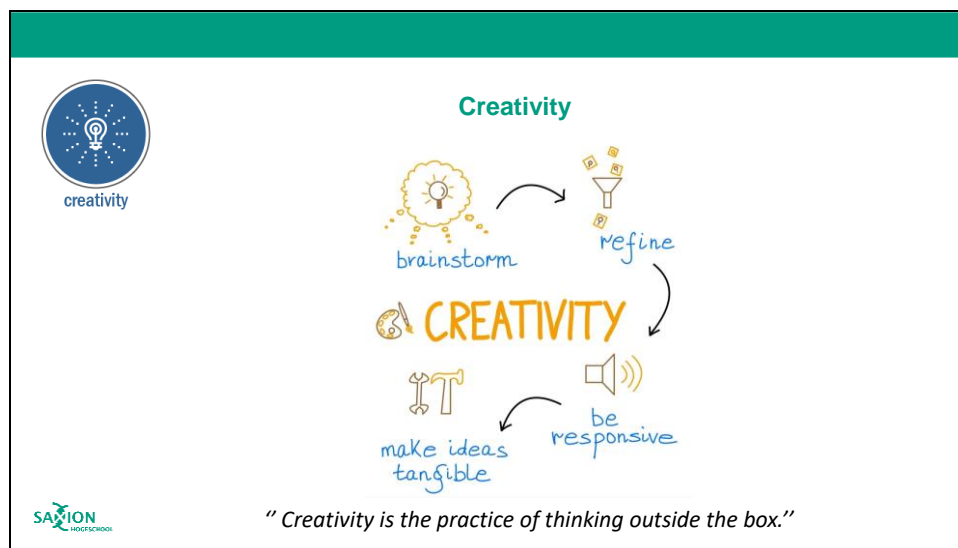
Creativity is the creative ability to find new and/or unusual but applicable solutions to existing problems. Children need activities in a rich learning environment that are open-ended and offer possibilities for own solutions to develop creativity.

Education must adapt to the passion and talents of the students in order to allow creativity to develop optimally (Robinson, 2011).

Creativity is the practice of thinking outside the box. It is equally important as a means of adaptation. This skill empowers students to see concepts in a different light, which leads to innovation.

Creativity is the ability to produce new, diverse, and unique ideas. Thinking creatively means looking at things from a different perspective and not be restricted by rules, customs, or norms While creativity is often treated like a you-have-it-or-you-don't quality, students can *learn* how to be creative by solving problems, creating systems, or just trying something they haven't tried before. It means students will be able to look at a problem from multiple perspectives — including those that others may not see.

This 21st-Century Skill allows students to embrace their inner strengths from big-picture planning to meticulous organization. They learn about their creativity and also learn how to express it in healthy and productive ways. More importantly, they also become *motivated* to share that creativity with others.

Just like with critical thinking, that makes creativity contagious. One student creates an interesting or innovative solution to a problem. Then, when they share it, the next student can become inspired to try something similar.

The point of creativity is to encourage students to think differently than convention demands.

What does that mean for our students?

To build effective Creatively Skills students must learn to:
- Use a wide range of idea creation techniques (such as brainstorming)
- Create new and worthwhile ideas (both incremental and radical concepts)
- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
- Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

''Collaboration is the practice of working together to achieve a common goal.''
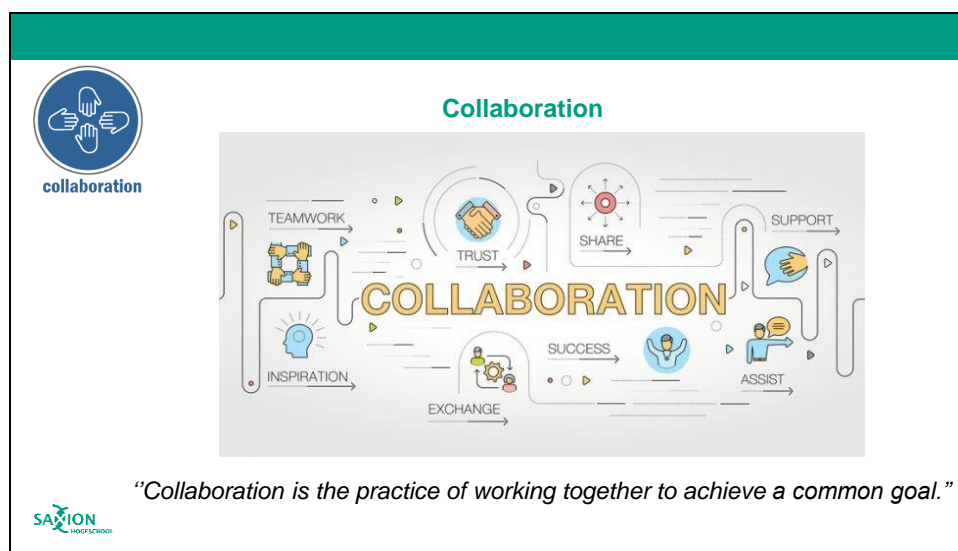
This 21st- Century Skill, is about working together to reach a goal and putting talent, expertise, and smarts to work. Just like with communication, technology has made collaboration easier. Technology takes this skill a step farther, making types of collaboration possible that weren't before technology. Just like with communication though, the same breakdowns can happen. The number of choices can get overwhelming, and the actual collaboration can get lost while we pay too much attention to the tool we're using to collaborate. As the world goes more interconnected, the collaboration will become a more and more essential skill than it already is, which is why it makes the list of the **4 C's for 21st Century skills**.

Collaboration is important because whether students realize it or not, they'll probably work with other people for the rest of their lives. Practicing collaboration and teamwork helps students understand how to address a problem, pitch solutions, and decide the best course of action. It's also helpful for them to learn that other people don't always have the same ideas that they do.

**What does that mean for our students?**

- To build good Collaboration Skills, students must learn to:
- Work effectively with different groups of people, including people from diverse cultures.
- Be flexible and willing to compromise with team members to reach a common goal.
- Demonstrate responsibility as a team member working toward a shared goal.

Communication is a requirement for any company to maintain profitability. It's crucial for students to learn how to effectively convey ideas among different personality types. That has the potential to eliminate confusion in a workplace, which makes your students valuable parts of their teams, departments, and companies.

Collaboration skills are a generic set of knowledge and skills not tied to any content area or discipline. Collaboration requires communication because it is impossible to collaborate without some form of communication (Lench et al., 2015). Collaborative learning may stimulate critical and creative thinking (Lai and Viering, 2012). Thinking is often triggered by the ideas of others, and different perspectives in a group can lead to the consideration of innovative or alternative ways of thinking.

Collaboration skills
- Plan and make group decisions
- Communicate about thinking with the group
- Contribute resources, ideas, and efforts and support group members
- Monitor, reflect, and adapt individual and group processes to benefit the group

"Communication is the practice of conveying ideas quickly and clearly."
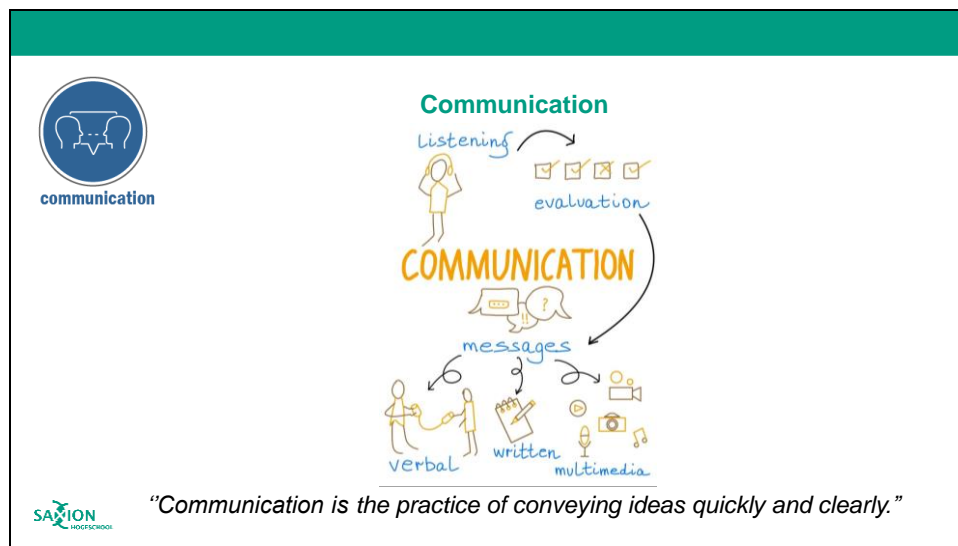
Communication is the practice of conveying ideas quickly and clearly. It is expressing thoughts clearly, crisply articulating opinions, communicating coherent instructions, motivating others through powerful speech.

What does that mean for our students?

To build effective Communication Skills students must learn to:

- Communicate using digital media and environments to support personal and group learning
- Share information efficiently and effectively using appropriate digital media and environments.
- Communicate thoughts and ideas clearly and effectively to different audiences using various media and formats

How do the 4 C's work together?

- **Critical thinking** teaches children to question claims and seeks truth.
- **Creativity** teaches children to think in a way that's unique to them.
- **Collaboration** teaches children that groups can create something bigger and better than they can on their own.
- **Communication** teaches children how to efficiently convey ideas.

Combined, the four C's empower children to become one-person think tanks. Then, when those children get together, they can achieve almost anything!

The 21st century teacher

The Adapter	The Visionary	The Model
The Communicator	Characteristics of a 21st Century Teacher	The Collaborator
The Learner	The Leader	The Risk taker

The 21st Century teacher, as a risk taker, must

- have a vision of what he wants and what the techonology can achieve to be able to identify goals and facilitate learning
- take risks and sometimes surrender to the students' knowledgeand use the strengths of these digital natives to understand and navigate products
- have students teach each other.

The role as a teacher

What is needed to realize this change?

- observe students
- judge the levels of student ownership of the inquiry mode
- decide on the degree of freedom to be given to students in terms of the research question to be set
- study methods
- data collection
- choice of presentation and collaboration tools
- be open to ongoing professional development: share knowledge with colleagues/ in a community, engage in reflection of your own teaching and take risks.

From teacher to coach

The Dinosaur - assignment

Step 1: Make groups of 3 or 4 students

Step 2: Collect information of one Dino: Tylosaurus, Elasmosaurus, Triceratops, Tyrannosaurus or Parasaurolophus

The question is: What does your dino need to survive?

1. Decide together what you need to know to be able to answer this question correctly. Think about information such as: food, habitat, does a dinosaur live alone or in groups, etc.

2. Try to collect as much information as possible and make sure that everybody in the group has all the information (the groups will be split up later and it is important that everybody can contribute the information to the new group).

3. Discuss what you think is a good way of working.

4. Make use of you own devices tot collect the information about your dinosaur

---
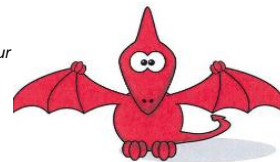
Jurassic Park – part 2

Step 1: redivide the groups so that each group has knowledge of as many different dinosaurs as possible

Step 2: design a Jurassic Park for the 5 dinosaurs

Ask yourself the following questions:
- *Which dinosaurs can be kept together in one enclosure?*
- *What should the enclosure look like?*
- *How can visitors safely admire the dinosaurs? Make sure that the security is safe for both dinosaurs and humans*
- *How can you make as much money as possible? Think about reducing costs (power, staff)*
- *What are the ways you get as many visitors as possible?*
- *……..*

Step 3: present the design of your park

Try to convince the rest of the audience of the quality of the park as best you can.

Reflection on the dinosaurs assignment

To what extent did this assignment stimulate:

- creativity
- critical thinking
- collaboration/communication/

And if so, what made you use these skills? What worked well for you? And what perhaps less so?

Would this assignment fit into your country's education system? What might be needed to do this assignment?

Are these kinds of assignments done in your country?

Exchange of practices around the 4 Cs

Aim: exchange examples and learn from each other's experiences around activities to stimulate the 4Cs

- In groups led by a Dutch student
- The Dutch student introduces his or her own experience (video in combination with format) in his or her class at primary school
- Conversation about this experience: what do you notice? What is similar to the situation in your country? What are differences? What would you like to do yourself? What tips do you have?
- Other examples?

For the end of January: share at least 1 example in teams and on the wave-it site (in the Format). Have a conversation about it with THIS group of students. Make already an appointment for a teams-meeting. https://forms.office.com/r/vDGg61SWGR

Creativity takes time

- https://www.youtube.com/watch?v=WDngw5R32WE

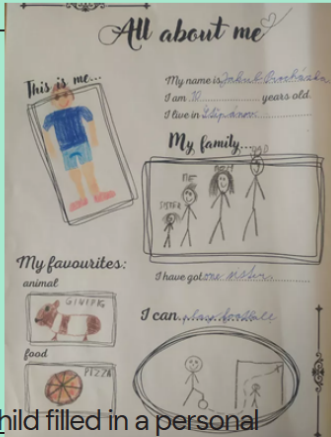**School Projects Examples**

WAVE-IT

FRIENDSHIP ALL OVER THE WORLD

A SCHOOL PROJECT - AUSTRIA, CZECH REPUBLIC AND THE NETHERLANDS

Gender

Students discussed about their favorite toys and also analyzed them towards typical male or female toys. In addition the kids created gender neutral toys and designed adverts.

Migration & Diversity

. Each child filled in a personal questionnaire sheet and introduced him/herself to the other children. These friendbook–pages were shared on a padlet.

Sustainability

After collecting waste from school and home, the students build their own musical instruments and perform a song with the upcycled instruments. The idea behind this activity is that music connects people beyond boarders.

4 Cs

The idea behind the project was to show positive aspects of communication across boarders (Austria, Czech Republic and the Netherlands), the collaboration among teachers of the countries mentioned before, critical thinking about (non-)gender perspective and to create a creative approach through music.

PRINSESCHOOL

PROJECT 'FRIENDSHIP ALL OVER THE WORLD'

NICKI STUIVENBERG

- COMMUNICATION AND COLLABORATION IN THE GROUP AND WITH OTHER COUNTRIES THROUGH PADLET AND TEAMS TO CREATE A WALL NEWSPAPER.
- CREATIVITY   DESIGN A GENDER NEUTRAL TOY
- CRITICAL THINKING ABOUT PARTS OF THE PROJECT AND RECYCLING

LEARNING OUTCOMES
- WORKING TOGETHER WITHIN THE GROUP AND WITH CHILDREN FROM AUSTRIA AND CZECH REPUBLIC
- KNOWLEDGE ABOUT OTHER COUNTRIES
- PRESENT THE OUTCOMES
- COMMUNICATION WITH CHILDREN IN ENGLISH