21ST CENTURY SKILLS DEVELOPMENT TUTORIALS

"OMNI – BE Aware STudent" (OMNI-BEAST)"
Project N° 2020-1-PL01-KA203-082198

"OMNI - BE Aware STudent" project (2020-1-PL01-KA203-082198) implemented by University of Information Technology and Management in Rzeszow (UITM) (Poland), Alma Mater Studiorum - Universita di Bologna (UNIBO) (Italy), Instituto Politécnico de Portalegre (IPP) (Portugal), Militos Symvouleutiki A.E. (Greece), Universidad de Sevilla (US) (Spain).

This project has been funded with support from the European Commission. This methodological note reflects the views only of the author, and the Commission or National Agency for the Erasmus+ Programme cannot be held responsible for any use which may be made of the information contained therein.

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

What are 21st century skills?

21st Century Skills are important determinants of success

The term **21st century skills** refers to a broad set of knowledge, skills, work habits, and character traits that are believed—by educators, school reformers, college professors, employers, and others—to be important to success in today's world, particularly in collegiate programs and contemporary careers and workplaces.

21st century skills help individuals to reinvent themselves throughout their life path, adapt to changing and diverse circumstances, and identify opportunities for growth amid differences.

Generally speaking, 21st century skills can be applied in all academic subject areas, and in all educational, career, and civic settings throughout a student's l

These skills have always been important for students, though they are particularly important in the information-based economy that we are experiencing. The rapid changes in our world require students to be flexible, to take the initiative and lead when necessary, and to produce something new and useful. To hold information-age jobs, students also need to think deeply about issues, solve problems creatively, work in teams, communicate clearly in many media, learn ever-changing technologies, and deal with a flood of information.

List of the most commonly cited 21st century skills.

- Critical thinking
- Communication skills
- Creativity
- Problem solving
- Perseverance
- Collaboration
- Information literacy
- Technology skills and digital literacy
- Media literacy
- Global awareness
- Self-direction
- Social skills
- Literacy skills
- Civic literacy
- Social responsibility
- Innovation skills
- Thinking skills

These skills are intended to help students keep up with the lightning-pace of today's modern markets. Generally, however, educators agree that educational institutions must weave these skills into learning experiences and their common core instruction. Each skill can be considered unique in how it helps students, but they all have one quality in common: They're essential in the age of the Internet.

The Three 21st Century Skill Categories

Each 21st Century skill is broken into one of three categories:

1. Learning skills

2. Literacy skills
3. Life skills

Learning skills (the four C's) teaches students about the mental processes required to adapt and improve upon a modern work environment. (**Critical thinking**: Finding solutions to problems | C**reativity**: Thinking outside the box | **Collaboration**: Working with others | **Communication**: Talking to others)

Literacy skills (IMT) focuses on how students can discern facts, publishing outlets, and the technology behind them. (**Information literacy**: Understanding facts, figures, statistics, and data | **Media literacy**: Understanding the methods and outlets in which information is published | **Technology literacy**: Understanding the machines that make the Information Age possible)

Life skills (FLIPS) focus on both personal and professional qualities. (**Flexibility**: Deviating from plans as needed | **Leadership**: Motivating a team to accomplish a goal | **Initiative**: Starting projects, strategies, and plans on one's own | **Productivity**: Maintaining efficiency in an age of distractions | **Social skills**: Meeting and networking with others for mutual benefit)

To conclude these skills are transversals because they are widely transferable to different settings and not specific to a job, task, sector, discipline, and occupation. 21st Century skills can impact people's personal and professional lives throughout all stages of life.

The Importance of 21st Century Skills

We live in a complex and changing world, a world of challenges and uncertainties, both because of socio-political changes and especially because of technological transformations that show us new opportunities, but also new needs (Morales, 2009; Domene and Morales, 2020). This situation highlights the importance and necessity of lifelong learning; it is necessary to be well-trained and willing to be constantly updated. Training should be understood as a process through which knowledge, skills, attitudes, and values are acquired to enable our personal and social development and our active incorporation into (work and) society; in other words, a process of developing meaningful skills and acquiring competencies (Domene and Morales, 2020). The most important thing in this knowledge-based society is not so much the contents or specialized knowledge as the capacities/skills of people, especially to respond/adapt to the continuous and changing demands of our environment.

On the basis of different studies and contributions from different agents, an inventory of significant skills for the knowledge-based society can be drawn up. A set of skills

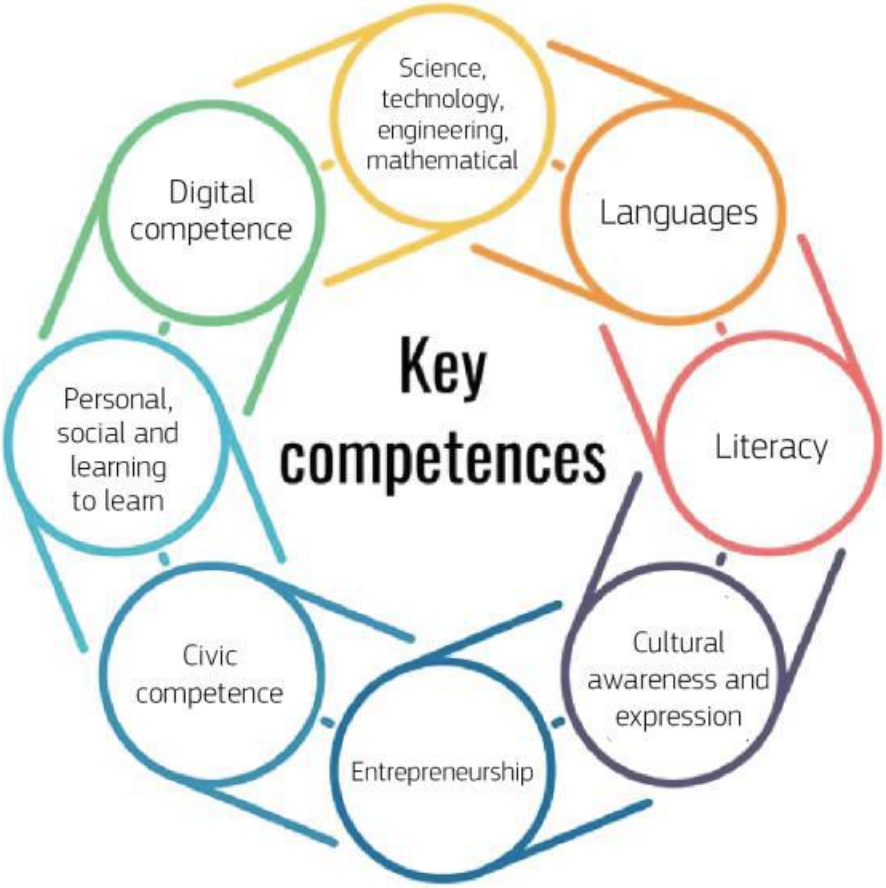
with cross-sectional value, that promotes people's training, facilitates their integration into the labor market, and their adaptation to changing demands. An inventory that will have to include both personal aspects (autonomy, commitment, creativity, empathy, flexibility, initiative, perseverance, responsibility...) and social interaction (interpersonal communication, social skills, leadership, teamwork...) and information processing skills (information analysis, critical spirit, report writing, innovation, technology management, decision making, problem-solving...).

Since the Lisbon Summit (2000), the European Union has been committed to the importance of training (any learning activity carried out throughout life with the aim of improving knowledge, competencies, and skills with a personal, civic, social, or employment-related perspective) for the construction of the *Europe of Knowledge*. In this commitment, in 2006 we find the Recommendation of the European Parliament and of the European Council on key competencies for lifelong learning (2006/962/EC), which specifies 8 key competencies (Communication in the mother tongue; Communication in foreign languages; Mathematical competence and basic competencies in science and technology; Digital competence; Learning to learn; Social and civic competencies; Sense of initiative and entrepreneurship; and Cultural awareness and cultural expression. But it also points to a set of themes to be applied throughout this framework and which are involved in the eight key competencies: critical thinking, creativity, initiative, problem-solving, risk assessment, decision-making, and constructive management of feelings.

Key competencies are a combination of knowledge (consisting of concepts, facts and figures, ideas and theories that are already established and support the understanding of a given area or topic), skills (ability to carry out processes and use existing knowledge to achieve results) and attitudes (willingness and mindset to act or react to ideas, people or situations), which are developed throughout life, through formal, non-formal and informal learning in different settings (European Commission, 2019).

And more recently (2018) a revision of these European frameworks for competencies has been addressed (2018/C 189/01), which Margherita Bacigalupo (2022) describes as a set of eight constellations of key competencies, that we can represent in the following figure.

Figure 1. *Key Competences for Lifelong learning. Source Commission Staff Working Document accompanying the document Proposal for a COUNCIL RECOMMENDATION on Key Competences for Lifelong Learning [COM(2018) 24 final].*



A recommendation on key competencies for lifelong learning, that identifies eight essential key competencies for citizens for personal fulfillment, a healthy and sustainable lifestyle, employability, active citizenship, and social inclusion. A recommendation that establishes a common understanding of the competencies needed now and in the future (European Commission, 2019).

One value of these competency frameworks lies in their multi-stakeholder consensus, and thus their potential as tools for guidance and lifelong learning. As Bacigalupo (2022) points out, "key competence frameworks do not aim to establish a hegemonic approach to competence development, but rather to establish a common language for those actors who find it useful, in order to achieve different objectives, such as: adopting a common language to bridge the worlds of education and work, teaching and learning competences, assessing competence levels, demonstrating progress, recognizing prior learning or certifying competence levels".

In line with the approach of key competencies for lifelong learning, more specific models have been developed, or as Bacigalupo (2022) refers to us, "constellations that serve to highlight that in the universe of knowledge, skills, and attitudes there is a

greater wealth than that which we focus on with the lines we draw and that these lines are arbitrary, although consensual. They do not exist, but only because they are shared by a community of people". Thus we can refer to the European Framework of Digital Competence for Citizens (DigComp), the Framework for Entrepreneurial Competencies (EntreComp), the European Framework for Key Personal, Social, and Learning Competencies (LifeComp), or the European Reference Framework for Sustainability Competencies (GrenComp).

Thus, competencies are a relevant contribution to reducing the discord between training and work, facilitating the progressive and continuous acquisition of relevant skills for professional development, which people can progressively accumulate in their curriculum. It is also an opportunity to promote learning and training through innovative approaches and active methods that place students at the center of the process, promote their active participation and facilitate their understanding of their reality and context.

Frameworks for 21st Century Skills

The challenge of improving education systems and methodologies to face the economic and societal requirements in the 21st Century, because the Volatile, Uncertain, Complex and Ambiguous (VUCA) environments faced by everyone, motivated several initiatives trying to identify themes and skills to be valued, developed and taught.

The main concern was enunciated by Time Magazine (2006): ”This is a story about... whether an entire generation of kids will fail to make the grade in the global economy because they can’t think their way through abstract problems, work in teams, distinguish good information from bad, or speak a language other than (their own).”

In fact, technical skills (generally denominated as Hard Skills) are no more enough to face an increasingly changing environment (VUCA) in the context of firms and other organizations pursuing their strategic objectives, namely inside a global economy and society.

This means that students and professionals, under a lifelong learning perspective, should develop other kind of skills generally denominated as Soft Skills, which implies structural changes in the traditional education systems, since childhood until the university levels.

One of the initiatives: Partnership for 21st Century Skills (P21) established in 2002 (P21, 2022), joined around 90 companies with universities and other schools, public organizations and institutions, researchers, teachers and pedagogics from the USA.

Under this initiative several concepts, methodologies, reports and initiatives were developed as a framework to guide future developments.

This framework is divided in two main themes as follows:

1. 21st Century Student Outcomes;
2. 21st Century Support Systems.

Which are represented in Figure 1 with the Student Outcomes displayed as a rainbow and the Support Systems as semi circles below.

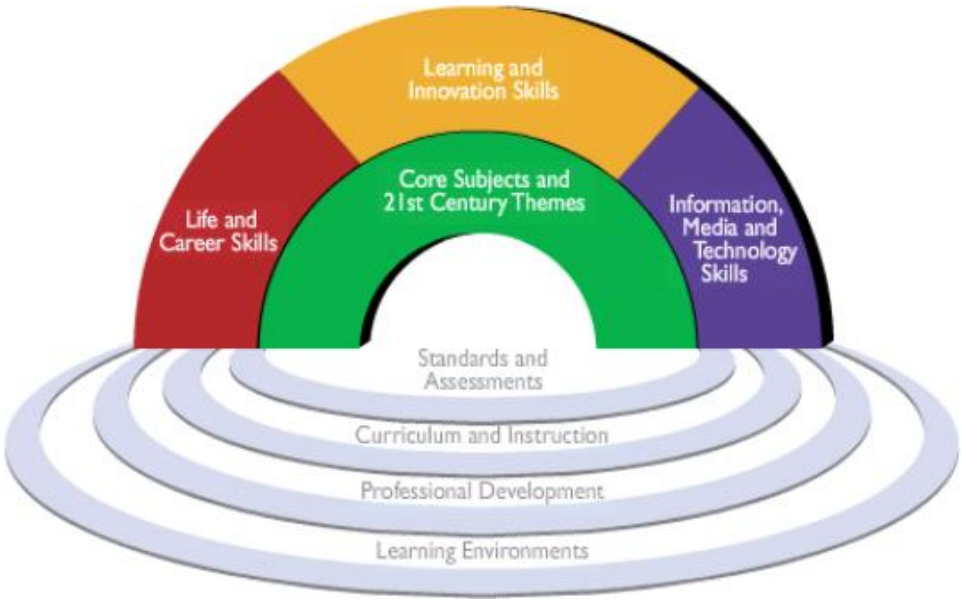


Figure 2 – P21 Framework (source: ODE, 2016, p. 1)

In the first theme the intended skills, knowledge and expertise students should develop are divided as follows:

1. 21st Century Student Outcomes:

1.1. Core subjects and 21st century themes (green area):
1.1.1. Global Awareness:
Understanding and address of global issues, collaboration with mutual respect with any other people and the use of another(s) language(s);
1.1.2. Financial, Economic, Business and Entrepreneurial Literacy:
Know-how on economic choices and the use of entrepreneurial skills to enhance productivity and career options;
1.1.3. Civic Literacy:
Citizenship awareness and involvement at local, national and global levels;
1.1.4. Health Literacy:

Awareness to the importance of health matters including active actions to prevent diseases;

1.2. Life and Career Skills (red area):
1.2.1. Flexibility and Adaptability:
To varied roles and responsibilities and to work effectively in a changing environment;
1.2.2. Initiative and Self Direction:
Awareness for the need for a lifelong learning process with self-monitoring and understanding of personal needs, initiative to take the right actions and efficient time management;
1.2.3. Social and Cross-Cultural Skills:
To work productively with anyone else, despite any differences, leveraging the collective intelligence;
1.2.4. Productivity and Accountability:
Pursuing of high standards and objectives with work ethic and delivering quality work on time;
1.2.5. Leadership and Responsibility:
Capacity to influence and guide others, leveraging their strengths, toward common goals with ethical behaviour and responsibility to the larger community;

1.3. Learning and Innovation Skills (yellow area):
1.3.1. Creativity and Innovation:
Capacity to be original, open to diverse perspectives and to communicate effectively to enable creative ideas to come to light successfully;
1.3.2. Critical Thinking and Problem Solving:
Capacity to answer to concrete questions and solve concrete problems, in the context of complex systems and changing situations;
1.3.3. Communication and Collaboration:
Collaborative work with shared responsibility and effective communication with others;

1.4. Information, Media and Technology Skills (purple area):
1.4.1. Information Literacy:
Efficient access and use of information attending to the ethical/legal issues inherent to it;
1.4.2. Media Literacy:
Efficient access and use of information from media, understanding the logic and intentions behind different media actors;
1.4.3. Information, Communications and Technology (ITC) Literacy:
Efficient use of ITC resources to research, organize, evaluate, communicate and use information in any context.

In short, with the intended outcomes the P21 wants to develop a citizenship with a strong general culture, awareness and tolerance to the other, autonomy and responsibility in a lifelong perspective, with the awareness that we live in an everyday changing environment, where people has to develop and increase various skills along time to adapt and take advantage of the circumstances and, better, to be paradigm change agents through innovative and/or entrepreneurial initiatives.

In order to enable the attainment of these objectives, the framework attended to support conditions too:

2. 21st Century Support Systems:
   2.1. 21st Century Standards;
   2.2. Assessment of 21st Century Skills;
   2.3. 21st Century Curriculum and Instruction;
   2.4. 21st Century Professional Development;
   2.5. 21st Century Learning Environments.

Where human, tangible and intangible resources are organized in order to achieve the intended qualified citizens able to drive countries and organizations' competitiveness in a global context.

The outcomes of the partnership range from the definition of learning programs by grade (4th, 8th and 12th grades) in 2004, framework maps and other support tools organized by the themes presented before (ODE, 2016).

This framework inspired other initiatives to "work on the ground" as is the case of Batelle for Kids (https://battelleforkids.org/), which has absorbed the P21 initiative, among others.

Another initiative is the: Global Partnership for Education (GPE) founded in 2002, "GPE brings together developing countries, donors, international organizations, civil society, teacher organizations, the private sector and foundations. The Global Partnership for Education is the only global fund solely dedicated to education in developing countries" (GPE, 2022).

This initiative published a report: 21st Century Skills: What potential role for the Global Partnership for Education? (GPE, 2020) where analysed the grade of integration of these two initiatives in different countries and potential ways of development.

The North Central Regional Educational Laboratory (NCREL) is one of the 10 regional educational laboratories funded by the U.S. Department of Education and, as a member of the Regional Educational Laboratory Network, is dedicated to providing high-quality research-based resources to educators and policymakers in several US states.

In this way, created jointly with a firm: Metiri Group, that has as Mission: "To use laboratories as a tool to inform decisions that improve the lives of people and our planet. Laboratories generate unique and essential data sets to support the

development of healthy communities, clean environments, and responsible stewardship" (MG, 2022), a framework presented in Figure 2.

This framework starts from the assumption that we are in a Digital Age, from that the framework is built with many situations close to the ones from P21, with a strong focus on how to improve education systems to enable the achievement of the intended skills. The skills pursued are present in the P21 framework as a subset of them.

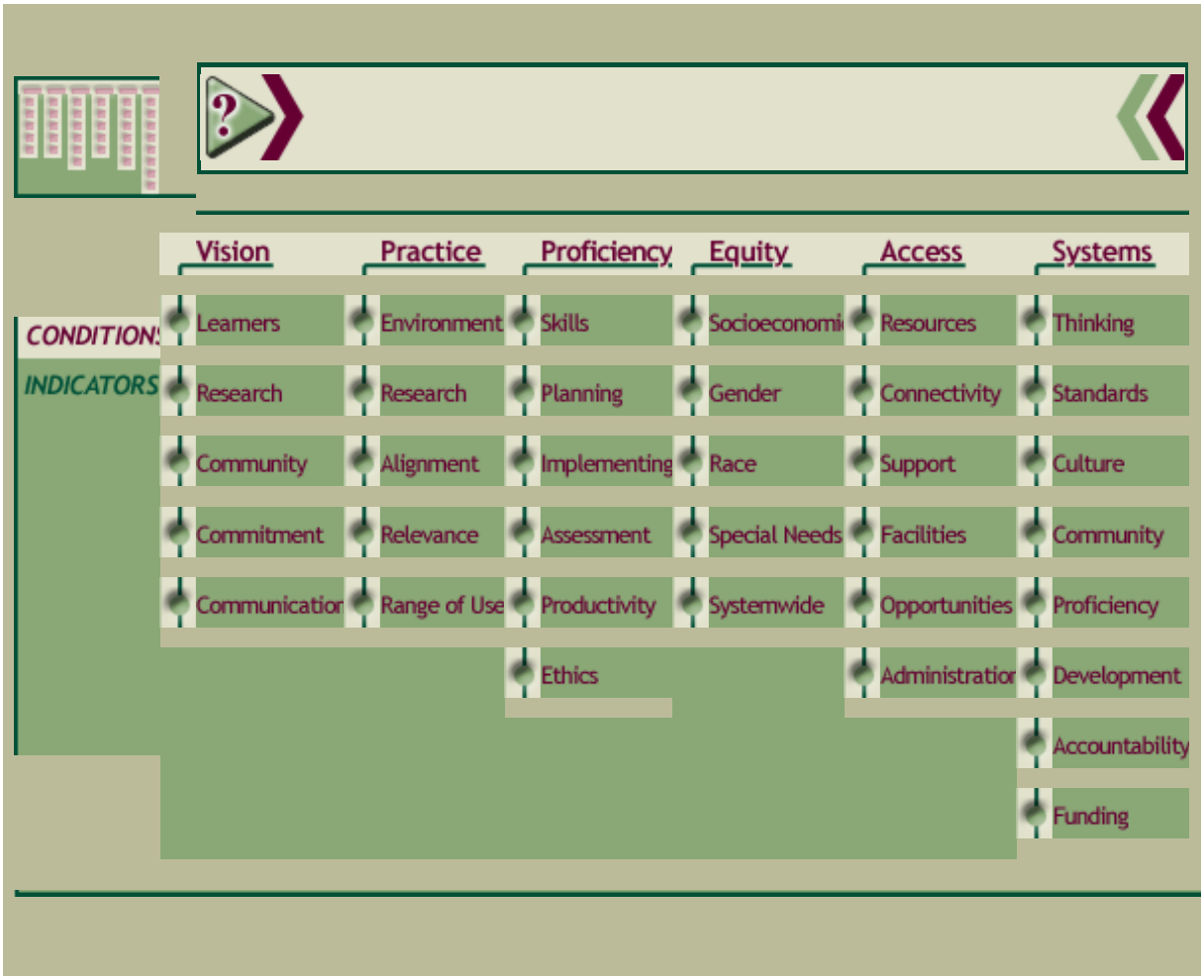


Figure 3 - NCREL framework (source: NCREL site: http://www.ncrel.org/engauge/framewk/index/)

The American Association of Colleges and Universities (AACU) (https://www.aacu.org/trending-topics/essential-learning-outcomes) have several initiatives towards the improvement of education systems on several areas with a focus on: Liberal Education.

Without a global framework Figure, however they approach different areas:

- Knowledge of Human Cultures and the Physical and Natural World:

    - Focused on engagement with big questions, both contemporary and enduring;
- Intellectual and Practical Skills:
    - Practiced extensively, across the curriculum, in the context of progressively more challenging problems, projects, and standards for performance;
- Personal and Social responsibility:
    - Anchored in active involvement with diverse communities and real-world challenges;
- Integrative and Applied Learning:
    - Demonstrated through the application of knowledge, skills, and responsibilities to new settings and complex problems.

In general, the skills advocated are present in the P21 with marginal differences, as it is the case of considering arts too.

The Organization for Economic Cooperation and Development (OECD) developed a framework under the: Definition and Selection of Competencies (DeSeCo) Project, around three axes to achieve Key Competences (OECD, 2005):

- Use of Tools Interactively;
- Interaction in Heterogeneous Groups;
- Autonomous Action.

Under the reasoning presented in Figure 4.

Figure 4 – OECD Individual and collective goals and competencies (source: OECD, 2005, p. 6)

In this way the three axes are developed as follows:

- Using Tools Interactively:
  - Why:
    - The need to keep up to date with technologies;
    - The need to adapt tools to own purposes;
    - The need to conduct active dialogue with the world;
  - What competencies:
    - Use language, symbols and texts interactively;
    - Use knowledge and information interactively;
    - Use technology interactively;
- Interacting in Heterogeneous Groups:
  - Why:
    - The need to deal with diversity in pluralistic societies;
    - The importance of empathy;
    - The importance of social capital;
  - What competencies:
    - Relate well to others;
    - Co-operate, work in teams;
    - Manage and resolve conflicts;
- Acting Autonomously:
  - Why:
    - The need to realise one's identity and set goals, in complex world;
    - The need to exercise rights and take responsibility;
    - The need to understand one's environment and its functioning;
  - What competencies:
    - Act within the big picture;
    - Form and conduct life plans and personal projects;
    - Defend and assert rights, interests, limits and needs.

This framework was developed accordingly with Figure 5.

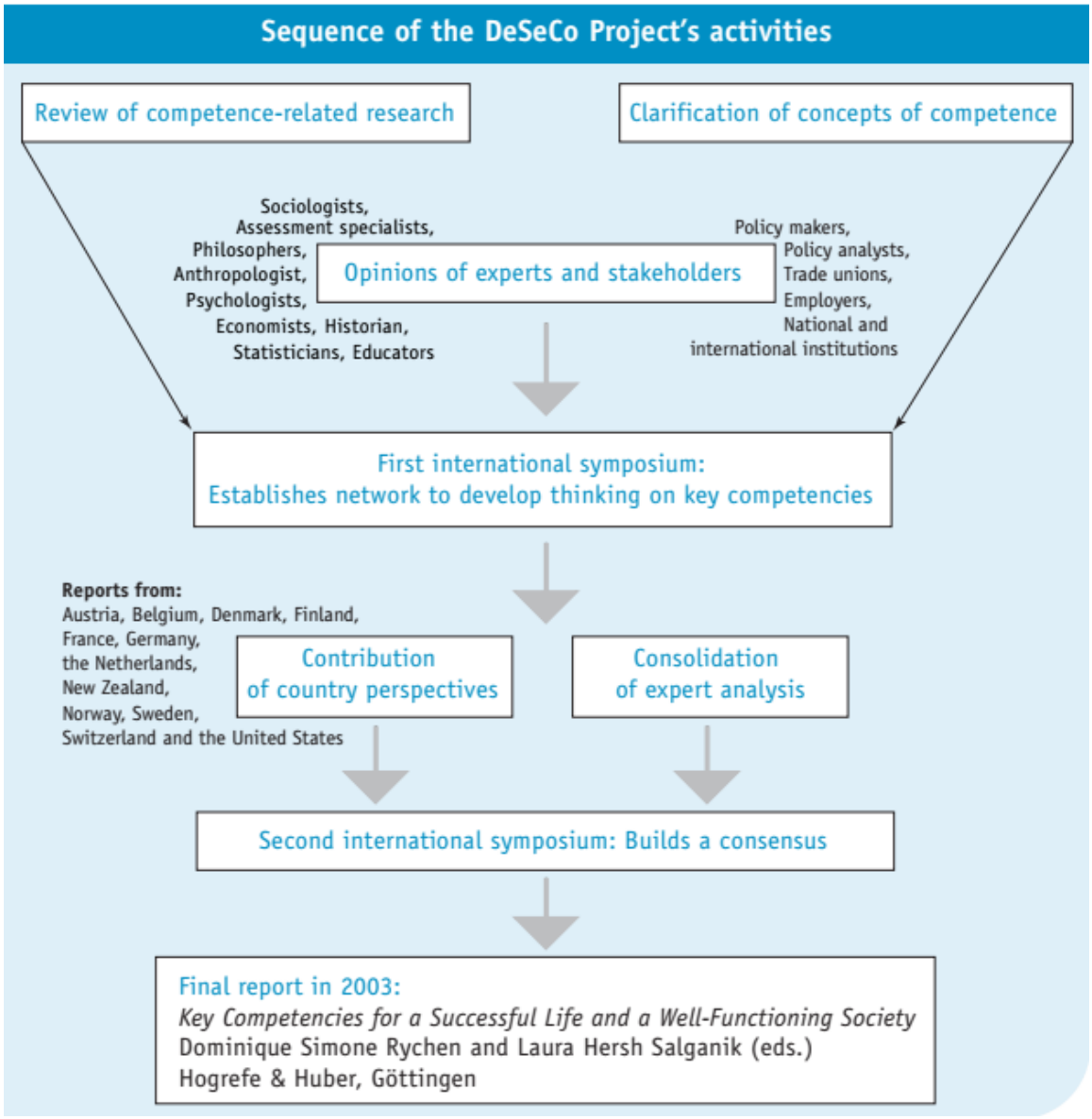


Figure 5 – OECD Sequence of the DeSeCo Project's activities (source: OECD, 2005, p. 18)

The main differences for P21 rely on Competences vs Skills and some more abstract definition of intended skills, but in general the concerns are similar to the P21 framework.

Also from OECD we have developments in this theme with the: Learning Compass 2030 (LC2030) presented in Figure 6 (OECD, 2019), an ongoing process that started in 2015 with a first phase under the "What?" question: "What kind of competencies – knowledge, skills, attitudes & values – will today's students need to thrive and shape a better future?" presented in May 2019, with a second phase, under development from 2019, to answer to the "How?" questions: "How to design learning environments? How to effectively implement curriculum? How to develop Teacher Agency?".

Figure 6 – OECD Learning Compass 2030 (source: OECD, 2019, p. 6)

This framework evolves from a central cross, where competencies are understood as the interconnected nature of: knowledge, skills, attitudes and values, as the core foundations to fuel: transformative competencies, creation of new value, reconciliation of tensions and dilemmas and taking of responsibilities, in a second circle of the compass. All this calling for: reflection, anticipation and action, a never ending cycle around all aspects of life.

For this, the framework calls for student agency, collective agency and co-agency with peers, teachers, parents and communities toward a Well-being 2030 objective. Indeed, "The notion of societal well-being has changed over the years to encompass far more than economic and material prosperity. Even though there may be many different visions of the future we want, the well-being of society is a shared destination" OECD (2019, p. i).

The main difference between the last initiative from OECD and the others presented before, relies in the focus on competencies against skills, envisioned as a subset of attributes necessary to build new and better competencies. However, the concerns with attitudes and values in the LC2030 are, in some extension, also attended in the other frameworks, but as additional skills to achieve and develop. May be this perspective can help to better operationalize their achievement and development, unless a more "abstract" definition of these attributes.

In brief, the common concerns arising from the analysed frameworks can be expressed as we found in LC2030: "The metaphor of a learning compass was adopted to emphasise the need for students to learn to navigate by themselves through unfamiliar contexts." (OECD, 2019, p. i)

21st Century Skills Assessment for higher education

Assessment Objectives

An assessment is an important part of the teaching and learning process. It can play three main roles:

- helps students set goals they wish to reach and monitor their progress toward those goals
- measure student's ability to apply and learn of the skills, and identify where intervention is required
- allows students to demonstrate their proficiency in 21st century skills
- helps teachers monitor students' progress in terms of the current status of their educational achievements

Assessment Scales

According to Robert J. Marzano and Tammy Heflebower (*Teaching & Assessing 21st Century Skills*), when creating an assessment system, teachers should begin by ***designing a specific scale*** that describes the levels of performance and understanding regarding specific 21st century skills. They proposed description of the following levels:

Level 4 - More complex learning goal (the student can demonstrate proficiency that represents application of the target goal in a way that demonstrates unique inferences about its use)

Level 3 - Target learning goal (the student can demonstrate proficiency independently with no major errors or omissions).

Level 2 - Simpler learning goal (the student has an understanding of basic elements of the goal, but cannot independently demonstrate proficiency).

Level 1 - With help, partial success at score 2.0 content and score 3.0 content (student cannot demonstrate proficiency on any of the learning goals independently, but with help and prompting, he or she can perform some aspects of it).

Level 0 - Even with help, no success (even with help and prompting, the student has no success at executing the skill).

The teacher can also design a ***simple assessment scale*** that describes the levels of performance and understanding of 21st century skills. Teacher might rank skills as *basic, intermediate, and advanced*, and decide if student meets the requirements assumed by the teacher.

Assessment Tools/Strategies

There are a number of tools/strategies to assess 21st century skills. Teachers should bear in mind that 21st century skills are not always easily measurable in quantitative terms. It is emphasized that specific skill components should be assessed mainly using evidence-based methods such as student performance, self-assessment, customized assessment tools, application of learning analytics, questionnaires, and content analysis of artifacts developed by students (Chu, Reynolds, Tavares, Notari & Lee, 2017). Teacher should consider the use of the diverse assessment tools as single assessment tool may not meet all the goals indicated in *Assessment Objectives* section. Appropriate assessment tools must be carefully selected and adapted to the needs of both teachers and students.

This section describes the following assessment tools that can help achieve assessment objectives and foster a 21st century learning environment:

- Tasks that reflect realistic application of the skill – Teacher Observation
- Traditional Tests
- Student's self-assessment

This list does not include all assessment tools, but includes the most common ones and those that may be particularly relevant in an educational context.

Teacher Observation: tasks that reflect realistic application of the skill

21st century skills are demonstrated through actions. Hence, in assessment process of the skills, the teacher should focus on developed student's capacity to apply those skills to real life situations. The best way to measure the skills are the assessment tasks that must be designed to take into account cognitive and social processes rather than knowledge. The teacher should plan tasks that reflect realistic application of the skill and reflect the cognitive and social processes that contribute to behavior in real life.

The benefit of this assessment strategy is that it is inherently student-centered strategy and helps students to be more engaged and invested in their learning. Some examples of this kind of tasks include designing and constructing a model, developing, conducting and reporting on a survey, carrying out a science experiment, writing a letter to the editor of a newspaper, creating and testing a computer program, and outlining, researching and writing an in-depth report (Price, Light & Pierson, 2011).

The main criteria for assessment should be "whether the student have the skills to apply that knowledge in a real-world situation". Assessment of skill development can be done with use of the scale indicated in *Assessment Scales* section or in the form of a simple score allocation for each student (based on the formative or summative assessment form prepared by the teacher). Teacher can use the Rubrics tool that allows to measure certain skills and abilities not measurable by standardized testing systems. The Rubric is a tool that supports communicating task expectations, providing feedback on the task and performance, student's self-monitoring and self-assessment, and provides structure to the final evaluation (Price, Light & Pierson, 2011). The process of filling out the Rubric should be based on actual student work that has been collected, sorted and evaluated.

The teacher should record his observations about the students on a regular basis (weekly, every meeting, each task implemented through the classes etc.). A teacher might assign scores weekly or biweekly to each student in the class, focusing on a small set of skills. Hence, students would be tracking their progress on the skill every week/classes.

Traditional Tests

Skills assessment tests can provide insight into how well a student can demonstrate proficiency in applying a skill. They often take the form of a simple test or a questionnaire (multiple choice, fill in the blank, true or false, etc.) or kind of simulation (the student may be required to perform a sample of something, depending on the nature of the skill).

- *Tests developed by a teachers* - when the assessment criteria involve, for example, the ability to recognize some important details that are used in achieving a learning objective, the teacher can develop a test for items that were directly taught in class.
- *Standardized Tests* - the teacher can use professional assessment platforms offering library of traditional tests. Most of those test are dedicated to HR departments responsible for recruiting employees and they are paid.

Student's self-assessment / Peer Assessment

Self-assessment occurs when students judge their own proficiency on learning goals (development of the skill) to improve performance taking into consideration the gap

between current and desired performance. Students should record self-perceptions of their status on a particular 21st century skill. Self-assessment is viewed as a formative kind of assessment, that can be use rather as a tool aimed to identify students' strengths and weakness and improvements needed to meet specific criteria and measure the progress they have made in specific area than one used to determine a student's final grade. Self-assessment is used to promote self-regulation, to help students reflect on their progress and to inform revisions and improvements on process of skills development (Andrade & Valtcheva, 2009). The student's sell-assessment would be effective when the students are taught how to apply the criteria, receive feedback on their self-assessments as well as teacher help students use assessment data to develop an action or improvement plan. A number of tools can be used to help students in their self-assessment including checklists, rubrics, interviews, questionnaires and student-teacher conversations. Students might score themselves at the same time the teacher scores them.

Teacher can consider also to introduce peer assessment that helps to provide feedback to each other on their work. It helps students develop skills in assessing and providing feedback to other students. During peer-assessment, students are asked to be the actual evaluator offering feedback and suggestions on how to improve their classmates' skills or how the classmate preformed in skill development.

Meta framework for teaching 21st Century Skills

It is interesting to analyze the connection that exists between the most important skills that have been selected and described and the tools that are proposed for each of them to develop them.

Depending on the course that a lecturer is teaching, it becomes interesting to delve into the skill that one wants to communicate and have students acquire and navigate it from the perspective of the skills.

For example, if the lecturer wants students to acquire the skill of *critical thinking* he can select this skill and see what are all the tools that help him to have this skill developed.

However, the teacher can also see what other tools that skill goes to activate and she can also compact the number of tools because she can develop multiple skills with the same tool.

In this regard, a 1-0 matrix has been developed that shows the links between skills and tools. If a tool is used to develop a skill there is 1, otherwise 0.

This table can therefore be navigated by both skills and tools.

For example, a teacher may choose a particular tool because this allows him to develop more skills.

	SKILLS									
	1. COMMUNICATION & PRESENTATION	2. CREATIVITY & INNOVATION	3. CRITICAL THINKING	4. DIGITAL LITERACY	5. ENTREPRENEURSHIP & INITIATIVE	6. LEARNING TO LEARN	7. PROBLEM SOLVING & DECISION MAKING	8. SOCIAL RESPONSIBILITY	9. TEAMWORK & COLLABORATION	10. TIME MANAGEMENT & PRODUCTIVITY & DEEP WORK
TOOLS										
Writing activities	1		1			1				
Preparing and presenting the summary of classes delivered	1									
Oral classes summary in pairs	1									
Exit question summary	1									
Preparing retrospective on assignments done in team	1									
Finding and pitch the WHY? of classes material	1									
Product box development & presentation for the subject	1									
Electronic communication (Facebook posts, WIKI entries, E-mail communication, On-line collaboration and teamwork)	1									
Telling a story with data	1									
Oral Presentation/Ignite talks	1		1		1					
Using all senses		1								
Reverse thinking		1								
The 50-solutions mentality		1								
Avoiding the letter "e"		1								
Eliminating "I", "me," "my" and "mine" when writing		1								
Look at things from a new perspective		1								
Brainstorming		1								
Debates/Discovery Learning			1		1	1		1		
Questions and enquiries/Preparing interview questions	1		1			1				
Problem solving/ Problem-based Learning/Problem-Solving Protocol			1				1	1		
Case study/ Case Based Learning			1					1		
Feedback			1							
Drama			1							
Real-world activities/Teamwork with real stakeholders			1		1	1				
Inquiry Learning								1		
Just-In-Time-Teaching								1		
Project-based learning/ Collaborative Learning/ Cooperative Learning/ Project-led Education/ Group-Investigation			1		1	1		1	1	
STAD (Student Team-Achievement Divisions)/TGT (Teams-Games Tournaments)									1	
Aronson's Puzzle Technique									1	
DeVries' game-contest technique									1	
Peer Tutoring									1	
Set up an appropriate learning environment for the learning process						1				

Skill and tool match matrix

It is interesting to see if there are skills that are together creating paths from the perspective of the tools.

From the skill-tool matrix we identified a second-order 1-0 skill-skill square matrix, in which we related skills that have similar or common tools. In the case where two skills share a tool then 1 is present, otherwise 0. In this way we can create clusters of skills that have tools in common.

At this point then within a given course the teacher who wants to develop these skills a lot can therefore decide to develop a certain cluster of skills, for example the cluster of reflective skills.

	1. COMMUNICATION & PRESENTATION	2. CREATIVITY & INNOVATION	3. CRITICAL THINKING	4. DIGITAL LITERACY	5. ENTREPRENEURSHIP & INITIATIVE	6. LEARNING TO LEARN	7. PROBLEM SOLVING & DECISION MAKING	8. SOCIAL RESPONSIBILITY	9. TEAMWORK & COLLABORATION	10. TIME MANAGEMENT & PRODUCTIVITY & DEEP WORK
1. COMMUNICATION & PRESENTATION										
2. CREATIVITY & INNOVATION										
3. CRITICAL THINKING	1									
4. DIGITAL LITERACY										
5. ENTREPRENEURSHIP & INITIATIVE	1		1							
6. LEARNING TO LEARN	1		1		1					
7. PROBLEM SOLVING & DECISION MAKING			1							
8. SOCIAL RESPONSIBILITY			1		1	1	1			
9. TEAMWORK & COLLABORATION			1		1			1		
10. TIME MANAGEMENT & PRODUCTIVITY & DEEP WORK										

Skill and skill match matrix

Description of each cluster that results in a course developing a skill package within which the tools reinforce each other.

This matrix can have an impact not only on the individual teacher's course but also on the curriculum.

On the course of study, it is therefore possible to decide which tools to include and which skills are important to develop so that each course can reinforce one or more skills in particular. By defining tools that are reinforced in the course of study, it is possible to use as a tool for the development of a particular skill one that is shared by several skills that perhaps has already been used by another lecturer for teaching another skill.

It is possible to call this kind of tool a *hybrid tool*.

So at this point if a teacher wants to include within her course a tool for teaching a skill she can start with a *hybrid tool* so as to create a link and continuation with the skill previously taught with that tool. Subsequently, the teacher can administer a couple of more *skill-centered* tools to teach the skill.

The use of more *skill-centered* tools and *hybrid tools* thus has the benefit of developing the skill connection and reinforcing the learning mechanism.

SECTION 2

THE TUTORIALS

SKILL#1
COMMUNICATION & PRESENTATION

Authors: *Joanna Świętoniowska, Jacek Jakieła [UITM]*

Short Characteristic

Communication skills play an important role in everyday life, including in the workplace. Future success in the job market depends on communication skills, mainly with clear oral communication that includes what is said, how it is said as well as body language (non-verbal communication). Understanding how to communicate effectively with peers/co-workers sets the stage for positive self-esteem. Effective use of oral communication allows students to advocate for themselves. A student who can effectively ask questions and get help from the teacher is often more successful than students who remain silent. Moreover students need to develop the ability to communicate effectively through the written word (also with the use of presentations). They need to know how to clearly write arguments, summaries, hypotheses and be able to synthesize complex ideas and concepts. Thoughts and ideas must be expressed and presented clearly, with effective use of presentations for the intended audience.

Abilities connected to communication & presentation skill

Communication comes in many forms:

- verbal (sounds, language, tone of voice),
- aural (listening and hearing),
- non-verbal (facial expressions, body language, and posture),
- written (journals, emails, blogs, text messages),
- visual (signs, symbols, and pictures).

Examples of typical professional tasks supported by the skill

Communication is crucial to many professional activities in the workplace. The following tasks are strongly dependent on communication skills:

- Taking active part in meetings
- Solving conflicts
- Negotiation
- Solving problems
- Teamwork
- Presenting ideas, solutions, problems to be solved, products/services
- Reporting
- Providing feedback
- Interviewing

Methodologies/learning strategies

This section describes answers for the *WHY?* and *WHAT?* questions for learning strategies. The next section is about answering the *HOW?* question and gives

recommendations and recipes on how to develop communication & presentation skills during any classes. Therefore students can develop these skills in classes not strictly devoted to communication.

Learning strategies should develop communication skills in all of the areas, such as:

- active listening,
- expressing (thoughts and insights),
- oral communication,
- writing,
- being specific,
- being persuasive,
- presentation
- team communication,
- searching for information,
- non-verbal communication.

Active listening

Active listening allows both the listener and speaker to be actively involved in the conversation. Active listening include: being fully present in the conversation, showing interest, noticing, responding (asking open-ended questions, paraphrasing, reflecting back what has been said).

Expressing

Being able to express thoughts, insights and feelings is essential component of effective communication that reinforces the importance of a message and its value for interlocutor.

Oral communication

Oral communication is communicating with spoken words. It includes speeches, conversations, presentations, discussions and any other forms of face-to-face interaction or through an electronic device such as a phone, video platform or radio.

Writing

Writing skills are a part of communication skills. Good writing skills allow students to put their ideas on paper and to organize their knowledge and beliefs into convincing arguments.

Being specific

Effective communication requires *being specific.* When the message sent is vague or ambiguous it may be wrongly interpreted and understood. The main drivers of being clear and concise are properly selected descriptive words and clear intention. It is important to take some time to carefully plan and elaborate message to be sent.

Being persuasive

Persuasion does mean presenting clear, logical arguments, explaining facts and letting people draw their own conclusions. Being persuasive does not mean convincing people to do something they shouldn't or won't do.

Presentation

Presentation skills are required in almost every field. Presenting information clearly and effectively is a key skill in getting message across. Effective presentation requires a good subject matter, set up the objectives, should best fit the audience, and should be well organized.

Team Communication

Communication skill is the most common quality of high-performing teams. The teams are focused on solving problems together so the communication skills help the exchange of information and transmission of meaning.

Searching for information

Searching for information refers to a well-defined, focused search for information for a clearly defined purpose and includes: planning the search, identifying useful keywords, deciding about the best sources of information and finally making the best use of a range of resources.

Non-verbal communication

Non-verbal communication is communication that is not expressed in words. It refers to gestures, facial expressions, tone of voice, eye contact, body language, posture etc. Non-verbal communication is important as it can help people understand what has been said.

Each *learning strategy* presented below focuses on selected *areas of communication abilities*. In every strategy it is clearly stated what areas have been addressed.

Learning strategy: Writing short essay

Areas of communication abilities: writing, persuasion, expressing thoughts, being specific.

Writing an essay develops the abilities to being specific and to the point, critical thinking and being persuasive. On the first place it improves the skills of writing and effective as well as efficient expressing of thoughts. Essay can take different forms. They can describe the process, specific argument, classification or cause and effect situations. Therefore the *writing an essay* learning strategy can be used during any classes on any subject as an assignment developing communication skills. In all types of an essay an author would like reader to agree with specific position after she has the essay read. For example in case of argument related essay the reader should finally agree on an issue. When describing the process, reader should be able to understand how it works

and what value it delivers. Classification description should explain the specific categories, what they include and why the elements have been classified like that. Writing an essay may be very efficient learning strategy for written communication skills development.

Learning strategy: Preparing and presenting the summary of classes delivered

Areas of communication abilities: active listening, expressing thoughts, writing, being specific, oral presentation, communication with visuals.

This learning strategy forces students to be good, active listeners and focus on what is being said and learned during classes. Final result of the activity is the summary of the classes content, prepared in the form selected by teacher: written or visual. During the classes student has to be fully focused and be able to filter less important information while remembering key subject-matter related messages sent by the teacher. In case of written summary as it is being developed in the real time, students should be able to effectively and efficiently express thoughts with their own words, be mindful during the whole classes and be very specific when formulating the sentences. At the end of the classes selected students may be asked for short 1-3 min pitch on the summary developed and write the most important points on the whiteboard. Teacher can also organize the voting for best summary and grade the winner. Precision and being to the point in summary statements measure the level of active listening of students taking part in classes. This learning strategy can also be extended to pair activity done at the end of the classes (see How to section on the learning strategies).

Learning strategy: Preparing retrospective on assignments done in a team

Areas of communication abilities: active listening, expressing thoughts, team communication, collaboration, oral presentation (if retrospective results will be presented), writing (if retrospective results will be written down).

This learning strategy develops, on the first place, the skills of team communication. Communication between the participants is particularly important aspect in retrospectives. Retrospective can be defined as looking back on or dealing with past events or situations. The purpose of a team assignment retrospective is to identify potential pitfalls and mistakes students made, evaluate the past working cycle and define actions that may improve things. This is also the great tool to better understand the assignment solution process and point at the elements that require better understanding or better developed skills. Retrospectives enable to assess the approaches taken by the team when preparing the assignment. The key success factor is team communication as every team member should express the doubts and his/her opinion on the process conducted by the team during preparing the solution of the assignment, team discussion and finally coming to common conclusions as well as agree on them collectively. To fully understand the teammates doubts, students will have to be good (active) listeners. They also should be able to be specific and express

thoughts properly to be understood by colleagues. Finally coming to common conclusions requires a good collaboration.

Learning strategy: Finding and pitch the WHY? of classes material

Areas of communication abilities: active listening, expressing thoughts, writing, being specific, oral presentation.

This learning strategy is based on the concept of *golden circle* coined by Simon Sinek and described in the great book *"Start with WHY?"*. According to it, it is important to ask right questions in specific order – *why?* as a first, *how?* as a second and *what?* as a third one. This learning strategy can be used during the classes when specific methods, techniques and tools are being introduced and explained. The subject area or major does not matter. To better understand material presented students should actively listen, ask themselves the questions *"Why am I learning this?", "How this can be used in practice?", "What is this about?"* Asking questions in this order with regard to material that is being learned provides deeper understanding of its usefulness, process of using in practice the skills developed and the main idea behind it. To be able to give right, consistent and specific answers to these questions students should actively listen and skillfully express thoughts in written and oral forms.

Learning strategy: Product box development & presentation for the subject

Areas of communication abilities: active listening, expressing thoughts, writing, being specific, oral and/or visual presentation.

This learning strategy requires students to think about subject from the perspective of most important benefits. To do the assignment well, student has to deeply understand the learning outcomes of the subject and their job market importance. She should be also very specific and properly express her understanding of the subject's material scope as well as its value. Product box development is well known technique used in *Game Storming* approach. This is some kind of thought experiment. Let's assume, that the subject under consideration may be put into the box and put on the shelf, so students could buy it, by selecting from many other boxes with other subjects. Creating a product box for the subject, and asking why someone would buy it, gets you or team focused on what's compelling for your customer (students) and the underlying benefits of the subject. Both are good things to be aware of while arousing internal motivation for learning the subject. This activity also improves the abilities of expressing thoughts, writing in the concise and clear form and presentation when product box design is presented.

Learning strategy: Electronic communication

Areas of communication abilities: active listening, expressing thoughts, writing, being specific, providing feedback, searching for information, collaborating, team communication.

Nowadays electronic communication is a basic form of on-line interaction and collaboration for young generations. However the quality of written communication has dropped down significantly. Messages are full of slang or emojis. The purpose of this learning strategy is to force students to start using it in proper form. Writing electronic messages may take different forms. Students can prepare e-mails, posts on Facebook or WIKI entries or collaborate on-line in team to develop resources supporting learning.

Learning strategy: Preparing interview questions

Areas of communication abilities: expressing thoughts in the form of questions, active listening, being specific, collecting information.

Questioning is fundamental to successful communication. Ability to formulate and ask questions is a key to gain information. Without asking questions interpersonal communication will fail. Gathering information through asking questions may be used for several purposes – learning, solving problems, making decisions, understanding the stuff that is being learned as well as each other more clearly.

Learning strategy: Telling a story with data

Areas of communication abilities: presentation of important insights based on data, presentation with visuals (e.g. charts), storytelling with data.

For many years storytelling has been the great medium to influence, teach and engage audience. Storytelling enables to bridge the gap whenever it is needed to convince to take action, be more persuasive, understand complex topic or take home kye message.

As Knaflic says "*Nowadays a lot of activities in the workplace are related to presenting insights drawn from data. Being able to tell stories with data is a skill that's becoming ever more important in our world of increasing data and desire for data-driven decision making. Ability to visualize effectively data can mean the difference between success and failure when it comes to communicating the findings of a study, presenting to board, or simply getting your point across to your audience…*" (Nussbaumer, 2015)). It is really important to be able to communicate effectively and efficiently with data, every organization collects in petabytes on daily basis.

How to?

Learning strategy: Writing short essay

Writing short essays enables students to develop written communication skills, learn how to persuade with written sentences, how to express thoughts and be more specific. Other important benefit is that it also enables to better understand subject-matter of classes. The activity is subject agnostic and may be used during any classes on any major, from STEM to non-technical.

When providing students with essay writing assignment, teacher should explain what type of essay it is and how to create the desired effect. The topic of an essay should be connected with subject matter of the classes that are being delivered and may take different forms e.g. title for analytical essay – *"Three Reasons Why We Won't See a Repeat of the 2000 year problem"*, argumentative essay – *"Are We Using the Right Success Metrics for project management?*, persuasive essay – *"Four Ways Free Wi-Fi Will Boost the our City Economy"*, compare-and-contrast essay – *"Why object-oriented approach to software development is better than structured approach"*. After student has essay writing task assigned, she should be informed about *best practices on how to write a good essay*. This can be done during the classes or they could be provided with short 1-2 page description with hints and if possible sample essay written.

In order to write an effective essay, student should have an idea how to arouse interest of reader. Therefore strong introductory paragraph is needed that shows the perspective writer has taken. Essay introduction must ease the reader into the way writer looks at the *take-home message* as it provides the context for the topic selected. The most important goals of an introduction are:

- Arousing interest and engaging reader
- Provide the context for the topic as well as argue why is up-to-date and relevant.
- State the thesis that will explain clear position of the topic.

There are different ways to make the reader interested via introduction. *Essay Essentials with Readings* by Dynes, Norton, and Green (2019) provides the following:

- Describing an event.
- Putting the question.
- Generalize about subject.
- Introducing interesting quotation.
- Providing thought-provoking statement.
- Challenging social norm or widely held opinion.
- Introducing a definition or term.

Once a reader is interested, it's time to offer explanation in the body of an essay. Body paragraphs can follow the simple structure including the following elements:

- Topic sentence
- Examples in the form of quotes or description
- Explanation
- Conclusion that takes reader to next idea/paragraph.

Every element plays specific role. To focus and limit the paragraph content, topic sentence is needed, that must clearly state what the paragraph is about. Examples provided must be closely related to topic sentence and make an abstract idea better connected to the world. Material provided and the main point will be connected by explanation. Conclusion should sum up the paragraph and take the reader smoothly

to the next idea. This pattern can be repeated for every paragraph in the body that should be clearly connected to essay focus. The body is followed by conclusion.

Conclusion should restate the central point of an essay. Using different language to express what has previously been said ensures variety and enables to avoid repetition. However, this part is very important as it allows to clearly reinforce central argument or observation. Summary provided in next paragraphs supports to re-establish merits of writer's position on the topic. Final part is responsible for conveying closing that will be remembered by reader and thought provoking. This is last chance to make an impression and change the reader's mind. When writing a conclusion it is worth to remember about the following hints:

Without a doubt writing good essay needs effort and is challenging task. Therefore some universal hints are useful. Dynes and Norton provide the following:

- Think and reflect on the essay's topic.
- Treat the writing process as a challenge to be overcome. Try out different ideas before you will formulate the main focus of an essay.
- Think about objections to your position and counterarguments.
- Essay's tone should be balanced between confidence and humility.
- Base your conclusions on evidence (facts, experts' opinions, studies results, observations etc.).
- Rewrite parts of essay when needed – writing good essay is an iterative approach.

Learning strategy: Preparing and presenting the summary of classes delivered

This activity may be used for developing communication skills in many areas, such as: writing, active listening and presenting. Summarizing is an essential skill that is needed in the workplace and in the community. Writing a summary is an excellent learning strategy that allows students to monitor their own progress in learning course material and improve active listening skills. Preparing the summary may take different forms. It can be written, oral or visual.

In the first step students should be informed, before the classes start, that they are supposed to prepare the summary in specific form (written, oral, visual) on the topic/material presented.

Students have to get to know the basics of preparing summary – to pick out the most important facts from the classes and need to be able to tell someone who has not learned the material the most relevant parts. Moreover explanation is needed that a summary should be as brief or short as possible; therefore, they do not want to get too specific or have too many details. What is also important is to remind students that in a summary they should use their own words or other forms of expression, and they should also be objective, or not use their opinion.

In case of written summary it should be prepared gradually in the real time during the classes and presented at the end of the classes.

Visual summary is more demanding and can take a form of homework assignment. There are different options to select from. Students can prepare classes summary in the form of mind map, infographics or traditional presentation (see *Techniques* section). The summaries prepared during whole semester may be put on-line and shared among students and used before final exam to prepare *final summary*. Visual summary preparation can also be team assignment when students collaborate on-line in teams to summarize material presented during classes.

Learning strategy: Preparing journal article/book chapter summary

This learning strategy is about summarizing journal article or textbook chapter.

In case of article/book chapter summary, the same rules apply as for classes summary. Moreover students can bear in mind the following hints:

- Keep the most important ideas. Students should write down the most important ideas from the read article/book chapter.
- Remove the ideas that are not very important. Some ideas that will not be that important are not needed in the summary. These details make the reading more interesting, but for the purposes of a summary, they are not needed.
- Use your own words to write the summary. One way to write a summary with the important ideas is to review some of the "Wh" words. What is the article/book chapter about?

Finally students can share their summaries and paraphrase them as well as explain what they have understood from reading the classmate summary. Authors who know more than readers about summary source can confirm or reject the explanation provided by the reader.

Learning strategy: Oral classes summary in pairs

This learning strategy takes only few minutes and involves students quite much. If there is only few minutes left of class it is good way to summarize what has been learned. The process is as follows:

1. Pair up students (Student A and Student B)
2. Explain to students they will have 4 rounds (2 rounds of 30 seconds each and 2 rounds of 15 seconds each) of oral summary. Describe how each round works

Round 1: Student A orally summarizes the material from today's lesson to Student B. Student B only listens and doesn't ask questions. This goes on for 30 seconds.

Round 2: Students switch and now, Student B orally summarizes today's lesson for 30 seconds to Student A. Student A only listens and doesn't ask questions.

Round 3: Now the students can add information they remembered when listening to their partner and add on to their original summary.

Student A adds information to his/her original summary for 15 seconds. Student B only listens and doesn't ask questions.

Round 4: Student B adds information to his/her original summary for 15 seconds. Student A only listens and doesn't ask questions.

Learning strategy: Exit question summary

Inform students that they will need to summarize what they have learned during the classes with an *exit question summary*. At the end of the classes each student is supposed to tell you one new thing she learned from today's material and how it relates to the lesson. This can be oral or written on small cards you will collect as they leave the classroom.

Example:

Teacher: *"What is one thing or the most important thing you have learned from today's classes on decision making with data?"*

Student: *"I have understood what is a difference between making decisions under risk and under uncertainty. I've always thought these are the same concepts"*

The variation of this activity may be to ask students about the biggest question they have with regard to classes content. Information collected on such questions may be used at the beginning of next classes for the review of the material presented. It is also a way to see what is not fully understandable for students.

Learning strategy: Preparing retrospective on assignments done in team

This learning strategy may be used whenever students are provided with team assignments. After assignment is done and feedback provided by the teacher, students can do in a team short 5-10 min. retrospective. They should answer the questions related to work done in a team. There are several useful questions that could be asked. The list below presents sample ones, however list is not exhaustive and students can formulate their own questions.

- What helps you to be successful as a team?
- How did you do this assignment?
- Where and when did it go wrong in this assignment?
- What do you expect, from who?
- Which tools or techniques proved to be useful? Which not?
- What is your biggest impediment?

- If you could change 1 thing, what would it be?
- What caused the problems that you had in this process?
- What's keeping you awake at night?
- Which things went smoothly in this assignment? Which didn't?
- What is fully understandable and what still requires some clarification?
- What elements of stuff learned seem to be useful and valuable from the perspective of job market?

All the answers should be summarized to extract the essence of collective insights. Finally the team can designate one spokesperson who will provide 1-2 min pitch on a group forum. More extensive description of the retrospective results may be published on-line in the subject's repository and may be used by students to improve their skills and draw conclusions. They also constitute very important feedback for teacher who can better understand how she/he is doing from educational point of view and how to tune team assignments to be more efficient.

Learning strategy: Finding and pitch the WHY? of classes material

Deep understanding of WHY? of the classes material is crucial to internal motivation driving the students' learning process. In this learning strategy it is possible to kill two birds with one stone Firstly students will get better understanding and rationale of *WHY* they learning specific stuff. Secondly communication skills may be improved in many areas of important abilities. At the beginning of the classes students should be informed about the requirements – after the topic will be discussed they should be able to answer 3 questions: *Why am I learning this?*, *How can I use it?* and *What is it about?* The strategy is especially useful when specific methods, techniques, tools or processes are being taught. Every student should do this small assignment on her/his own. It will require real active listening and thinking during the classes in terms of the questions provided. This may be also a trigger for the questions asked by students to the teacher. They will want to get to know more to be able to answers these 3 questions more to the point. After the classes, selected students can provide the answers in 1 min. summary. Apart from being more specific and expressing thoughts abilities, critical thinking skills are also being developed.

Learning strategy: Product box development & presentation for the subject

This learning strategy is most efficient and effective as a team assignment. It is quite common that during the first classes teacher presents the syllabus of the subject. To improve understanding of subject value proposition and communication skills, students can be tasked in teams to prepare the *product box for the subject*. The assignment needs more time and therefore should be planned as a team homework. However active listening and asking questions are a must to be able to complete the assignment at home. General idea of the jobs to be done can be presented during the classes but short how-to document will be helpful. The process of preparing the subject's product box can be done in 3 simple steps.

- Brainstorm the subject's benefits you see at a glance. It is not about classes topics, but benefits you will get when having them learned.
- Create a slogan. The key to any good slogan is to say as much as possible in very few words. The slogan should communicate value proposition of the subject under consideration.
- Find or sketch the cool picture, that will be closely related to the subject-matter of the material you are supposed to learn.
- Design a subject's product box by putting all these elements together.

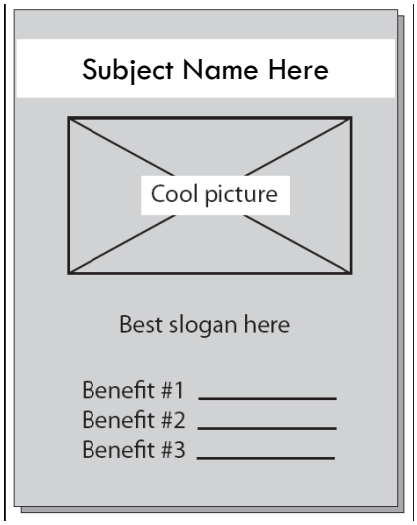


Figure 7. Sample structure of subject's product box

Learning strategy: Electronic communication

Facebook posts

Before the next classes students are provided with topic and goal of the material that is going be presented. Selected students may be tasked with ***preparing the post on the Facebook page of the subject (it is good idea to create it for subject at the beginning of the semester!) with "next classes advertisement" – information on why it is so important to take part in the next classes.*** Post should be as persuasive as possible and expressed in terms of benefits participants can receive from the material that will be presented. The benefits can be connected to personal and professional development, job market importance of the skills that will be developed or knowledge internalized. Teacher can organize 3 min. Q&A session at the end of the classes for students who are responsible for the task.

For those students who like vlogging post can include short movie.

The next step would be to ***ask all students for feedback posts after classes***. It may take a form of short summary with answers to the following questions: *What is one thing I do consider as the most important to me, I've learned during classes?, What 3 doubts I have after classes?* Feedback should also contain 3 questions students would like to ask to clarify doubts.

When preparing the posts students should remember about some practical rules. The most important are following:

- **Take your time**

Think carefully about what you want to convey and how best to do that. Check all the information in your post and scrutinize it as much as possible. It may require few iterations to have properly developed message.

- **Know your audience**

Think about your colleagues. While writing the message, imagine your classmates. What is their problem and how does the text make them feel? What would they wish to know about the topic you're writing about and which answers would they have? Try and answer them.

- **Choose the right vocabulary**

Choosing the right words is sometimes a lot harder than it seems. Repetitions of some words show how limited our vocabulary is. However, using too technical expressions, also doesn't speak to our advantage. Therefore try to carefully select right vocabulary. Remember not to lose you authenticity and human factor. The communication with your colleagues should look line real-life conversation as much as possible.

- **The length matters**

Text of the message should not be too long. Otherwise it will not be read. If it's impossible to avoid long texts, you can make them more "readable" by arranging them into meaningful paragraphs and dividing them with empty lines. If your tone of communication permits it, you can lighten the mood of the post by using emojis.

- **Proofreading**

Making mistakes is human. However remember that every mistake in your copy diminishes your authority. Therefore before you click on *Publish* button, take another look at your text or ask one of your colleagues to do it for you. We usually don't notice our mistakes because we've gone over the message many times. "Fresh eye" of your classmate may help.

WIKI entries

Another learning strategy that can improve electronic communication skills as well as collaboration, is to provide students with an opportunity to collectively develop WIKI for a subject. This can be done as team assignment. Teacher can split the group into teams. Every team will be assigned to specific classes – one classes, one team. The selected team will be responsible for preparing the WIKI entry on the topic that has been discussed during the classes. In order to do that all team members should actively

listen during classes and take as valuable notes as possible. After classes team members can create shared document on-line and merge all the notes in one clear and concise summary of the classes material. After team decides that the collaboration is over the content of the document can be entered into the WIKI of the subject.

E-mail communication

Without a doubt writing effective e-mails is very important communication skill nowadays. Teacher can provide students with many different tasks that can be done with e-mail messages. Here we have only few examples and the list is not exhaustive.

Some ideas for e-mail assignments are the following:

- *Be curious & impatient.* After classes, prepare and send an e-mail with 1-3 questions you would like to have answered by teacher at the beginning of the next meeting. Comment shorty on every question and explain why it is so important to you to get the answer. How it is related to your understanding of subject discussed.
- *Be polite rebel.* Think about the biggest problem you had with understanding the material introduced during classes. Do small on-line research and try to solve it with resources available. Prepare and send an e-mail to your classmates and teacher with short summary of your problem and one on-line resource (hyperlink to blog, website article, movie etc.) that explains the topic much better than it has been done by teacher. Maybe next time the teacher will change the approach and be able to do it better by changing perspective or the way he explains the topic.
- *Be aware of material importance.* After classes prepare and send an e-mail with information about the most important thing you have learned during the classes and justification why you do consider it as so important from the perspective of your professional development and job market requirements.

To have this learning strategy well implemented provide students with some rules on writing effective e-mails. These may be the following:

- **Don't create information overload, don’t overcommunicate by E-mail**

  Too many e-mails sent and too extensive content of them may be a source of stress for receivers. At first, before you begin writing an email, ask yourself: "Is this really necessary?". Just identify the channels that are best for different types of messages you would like to send.

- **Use of Subject Line effectively and efficiently**

  Avoid a blank subject line as is more likely to be overlooked or treated as a SPAM. Always use a few well-selected words to tell the recipient what the email is about.

- **Keep Messages Clear and Brief**

E-mails need to be concise and clear to be read with full understanding. Therefore keep your sentences short and to the point. Body of and e-mail should be informative and direct and includes all the information needed to convey the message to the receiver.

- **Be Polite**

Common belief is that emails are less formal than traditional letters. However you message reflects your own professionalism, values and attention to detail. In case you are not on good terms with receiver do not use slang or jargon or abbreviations. Emoticons may help with expressing your emotional tone but use them only with people you know quite well. Properly close your message. You can use more formal phrases like "Regards," "Yours sincerely," or "All the best," in less formal situations.

- **Check the Tone**

Face-to-face communication is supported by body language – vocal tone, facial expressions etc. These enable to assess how the receiver of message feels. In an e-mail all this information is not available. Therefore we cannot easily determine when the people are confused or misunderstood our message. How your email "feels" emotionally? If you realize that your intentions or emotions could be misunderstood, find a better way to phrase your words.

- **Proofreading**

Take a moment to review the spelling, grammar and punctuation. Quality of message content with regard to language correctness is a part of your professional image. Therefor try not to send messages that include typos. During proofreading it is possible to focus on length, consistency and clarity of your message. This is also a challenge because your e-mail should be as short as possible but at the same time you cannot exclude necessary information.

On-line collaboration and teamwork

Whole group is split into teams. Every team will be assigned to specific subject's area discussed during the classes. There should be an on-line environment prepared for collaboration and teamwork. The best tools for these are Miro, Mural, that enable to create an e-board for teams collaboration. Using the e-board every team is supposed to develop e-repository for learning resources. All teams are working on the same board divided into logically into different areas for different teams. The content may be structured as follows:

- Instructional Movies
- Podcasts

- Articles
- Blogs
- Vlogs
- Books
- Infographics
- Student's notes

The repository is being developed during the whole semester. Every team can add new elements, reorganize existing and delete those considered as not important etc. The content should be available to the whole group. Before the final exam students can vote on most valuable learning resources items and prepare a *"Board for an exam"* including *learning goodies*.

Learning strategy: Preparing interview questions

Main idea behind this learning strategy is to provide students with assignments that will shape the skills in the areas of formulating and asking questions. Moreover it is useful when trying to better understand main reasons for asking questions and how to formulate questions according to best practices. Two sample assignment have been presented below.

Interview a teacher. This individual assignment is about preparing interview questions students would like to ask a teacher. The areas may include teacher's professional development insights with regard to the topic of the classes, most important professional skills related to classes content, most valuable skills with regard to job market requirements, important *aha moments* during professional development, the best approaches to learn the subject's materials etc. All the questions prepared by students may be shared on-line in subject's repository. Five minutes before the end of each class selected students can ask 3-5 questions and teacher provides answers.

Interview questions as a final test content. In this assignment it is assumed that students play a role of HR department clerk who would like to hire her colleague on specific job position. The requirements for this occupation are mainly based on skills and knowledge developed during the classes. Students prepare individually the set of interview questions they would like to ask as well as answers for these questions. During the class before final test/exam the students can play in pairs the roles of HR dept clerk and prospect employee. After 10 min. they can swap the roles.

All questions prepared by students can be shared with a teacher and classmates. The teacher will assess questions developed by students, select the best ones and finally include them into the contents for final test/exam. It may be formally stated that 30% of all questions in final test, will be randomly selected from students questions if they will meet quality level that has been set.

When preparing the questions students should be aware of different reasons of asking questions and how to properly formulate them. The list of typical reasons important for this learning strategy is presented below (list is not exhaustive).

- *To obtain Information* - the primary function of a question is to collect information needed.
- *To maintain a conversation* – asking questions enables to control a conversation. In this case questions are asked to gain the information.
- *To express an interest in the other person* – through questions one can learn more about the respondent.
- *To clarify a point* – questions are also used to reduce misunderstanding and clarify things. These activities may improve the effectiveness and efficiency of communication.
- *To test knowledge* – questions are used in all sorts of tests and exams. Main purpose is to ascertain the knowledge of the respondent.
- *To encourage further thought* – questions may be used to encourage people think about something more deeply. It is possible to word a question in a way forcing a person to think about a topic in a new perspective or reframe the view.

The information we will receive back after asking the question depends on type of the question we will ask. Questions may be divided into *open* and *closed*. Closed questions force a short, most often one-word answer. Closed questions can require "yes" or "no" answer, selecting from the list of possible options (*Which Data Science language is most popular – R, Python?*), or to identify chunk of information from limited set of answers (*Which Porter strategy is about adding unique features to a product/service?*). Open questions provide an opportunity to receive more elaborated response that requires creativity and provides more information. Questions that cannot be answered with "yes" or "no" usually begin with: *When, What, Where, Who, Whom, Whose, Why, Which, or How*. They are much more powerful to trigger a story and collect interesting insights.

Learning strategy: Telling a story with data

This learning strategy can be used during classes on any subject. Just provide students with material related hypothesis on selected topic and ask them for confirming or disproving it with a data story. An example may be "*Most enterprises undertake Digital Transformation effort*" or "*Working on occupation related to Data Science is a source of significant income, which is much higher than an average income in other IT related occupations*".

The figure below presents the power of properly applied *Storytelling with data rules*.

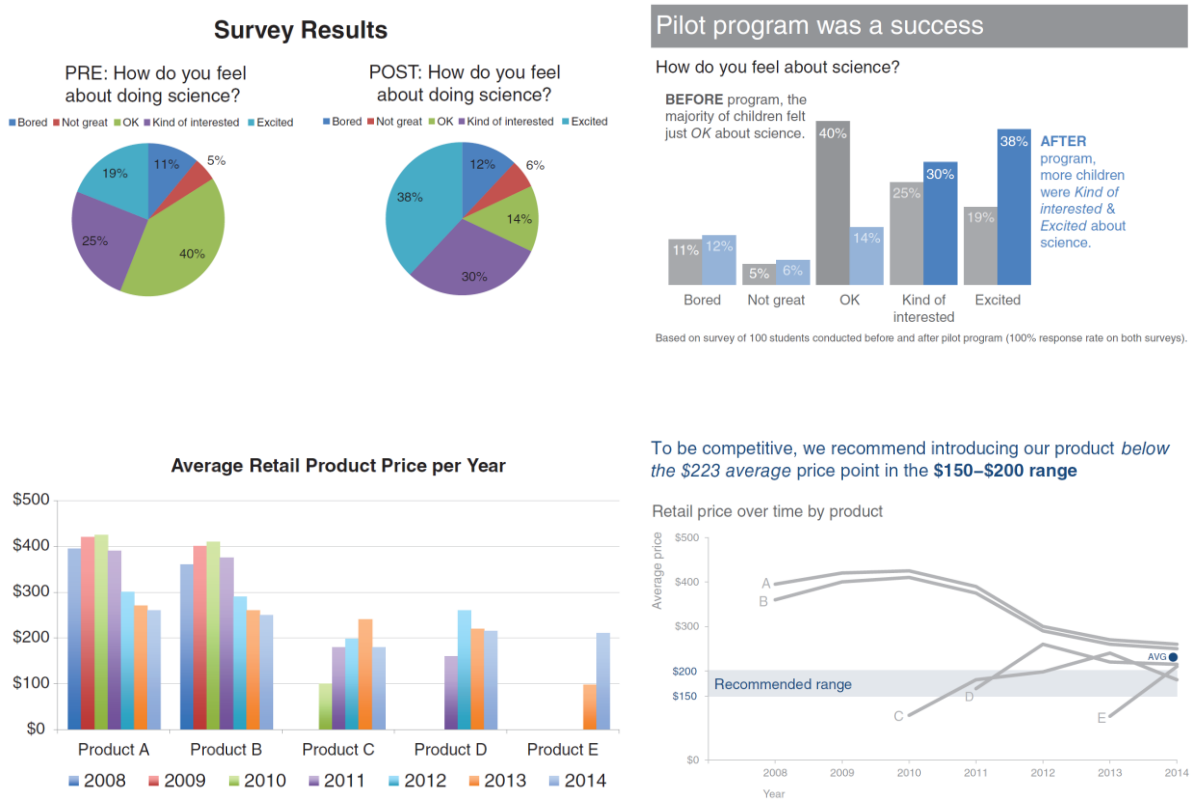


Figure 8. Before and after storytelling with data is applied (Nussbaumer, 2015).

In the first column there are *bad graphs*. Second column presents how it is possible to emphasize the take-home message how easier is to understand the most important insights related to presented data. Storytelling with data requires practice, however as has been mentioned before, it is very important area of effective communication nowadays. Before doing assignments it is useful to provide students with the process, that may be followed. Typically there are the following steps:

- Understand your audience
- Decide on the Takeaway Message
- Set the context
- Develop narrative
- Decide on visualization forms
- Tell a story

Critical success factor for effective and efficient storytelling with data is a *deep understanding of the audience*. The questions that may be asked are related to audience demographics, roles of stakeholders involved, challenges they are facing, metrics they are tracking, factors that influence them or skills level. Better you will know your audience, better your story will resonate with them. Crucial element of the next step is *decide on central idea* or *main message that will communicated*. This is a foundation for preparing the insights and selecting presentation elements that will be well visible.

Context enables to *underline the importance of data presented* and *arouse interest* as well as *focus*. It gives the answer to the question why they should listen carefully, and what is more important, hear. When *developing the narrative* it is very useful to adopt Freytag's pyramid as a narrative framework. It includes 5 main stages: *exposition*, where the context and background are introduced; *rising action*, where visualizations presenting facts are presented to coin kye message; *climax*, where drivers to the decision will be revealed in the form of key takeaway or challenge – it is definitely the highest point; *falling action*, where consequences/catastrophe are being introduced; *resolution*, where "a ray of hope" appears, along with actionable insights leading to steps that audience should act upon to achieve the goals. Proper *selection of visualization forms* enables to integrate data and insights. Every visualization has its own best application area. For example trends (with continuous data) should be shown on *line charts*, comparisons on the *bar charts*, relationships between things – *scatterplot charts etc.* (see Figure)

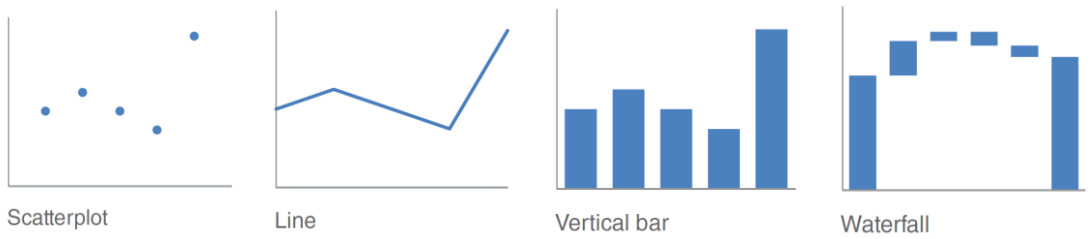


Figure 9. Examples of commonly used visualization forms (charts) (Nussbaumer, 2015)

It is also important to remember that some visualization forms are not recommended. Good examples are *pie charts* and *3D charts*.

As Nussbaumer states *"In many cases, there isn't a single correct visual display; rather, often there are different types of visuals that could meet a given need […] If you're wondering What is the right graph for my situation?, the answer is always the same: whatever will be easiest for your audience to read."* (Nussbaumer, 2015)

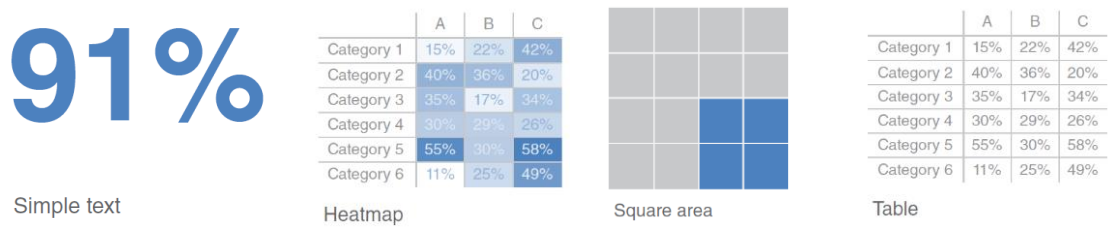


Figure 10. Examples of commonly used data presentation forms (Nussbaumer, 2015)

Presentation techniques description

Preparing a PowerPoint presentation

PowerPoint presentations are often called evil. This is not true if presentation software will be treated as a container for our ideas, an empty shell that could be filled in with valuable content. This kind of presentation may be really powerful support for communication if it is in the hands of good communicator. In order to use full potential of PowerPoint presentations it is important to bear in mind some best practices.

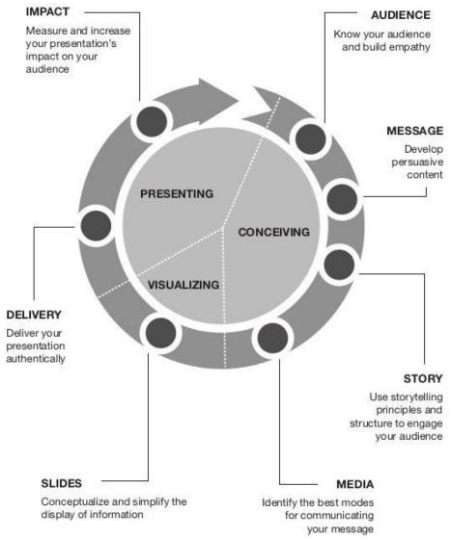


Figure 11. Planning presentation (Duarte, 2012)

The figure shows many areas related to planning presentation. However in this tutorial we will focus mainly on *preparing/deigning the slides* and *delivery of presentation*. Read the section on references to find sources that discuss the rest of all these issues in detailed manner.

Designing Slides

Presentations are one of the most popular communication tools that attract customers and keep employees on track. To do that the content should have some properties. The most important include:

- clear, simple and compelling display if data is presented,
- visuals should convey value and meaning,
- persuasive slides that help the audience to solve problems or to build proper mindset.

In other words, the one of the best practices in this area is *"Think like designer"*. With designer mindset you will think about presentation's content from the perspective of audience perception abilities and needs. The following hints may help to improve the slaids.

Design slides audience can understand and grasp in 3 seconds. It is important to remember that everybody can process only one stream of information at the time – listen to what is being said or reading the slaid's content. When audience sees dense, full of text slaid and will start reading it, they won't be able to hear what you are talking about. If the slaid content can be comprehend in few seconds, audience may switch the perception to listening. The glance test *"Is it possible to understand the slaid in 3 seconds?"* forces you to think about slaid as a billboard. In order to do that start with clean surface and do not add elements without a reason. Try to limit the text and scale it accordingly. Coordinate visual elements by selecting at most two typeface of fonts, at most three complementary colors with couple of neutral shades. Finally arrange elements with care (graphics and text) and scale them with regard to importance they have.

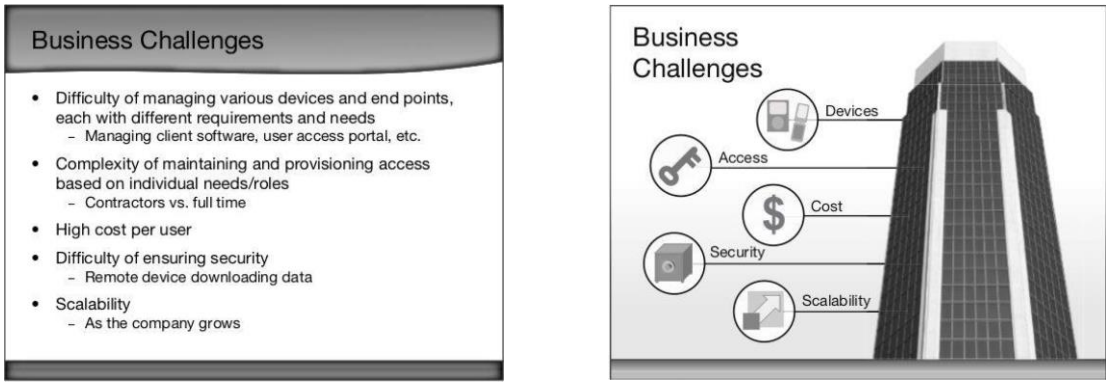


Figure 12. Glance test results with before and after slaids

Choose proper type of slides. The first slaid that is visible after people enter the room creates first impression – it is called *walk-in slide*. *Title slaid* is about the title of the presentation and it helps to focus the audience on the main topic. If the presentation is longer one, *navigation slide* helps to determine where you are in the presentation and how much of the content has already been discussed. In case, the related ideas should be clustered, *bullet slide* may be used. However remember not to show all items on bullet point list at once. Short phrases that convey one message or idea in large type should be put on *big-word slides*. Adding credibility to what you are saying can be supported by experts' quotes on *quote slide*. When presenting data don't overwhelm audience with data but visualize main message on *data slide* (see *Telling story with data* learning strategy). Diagram slaid contains abstract concepts into something people can understand. "*Opening the eyes*" of audience with regard to overseen problem may be done with *conceptual image slaid*. *Video slide* can be nice brake from static slaids presented. Finally leaving people with some issues to think about or call to action they

should act upon may be done with *walk-out slide*. Figure below presents selected types of slaids: *title*, *big word*, *quote* and *data* slaids.

Figure 13. Different types of slaids (Reynolds, 2019)

Storyboard one idea per slide. Creating storyboards saves time! For every slide draw small visual representation of main idea, that is supposed to be conveyed by slaid. Use small space for drawings as it will force you to be concise and specific. Keep it as simple as possible. Remember to put only one idea per slaid – give every idea its moment on stage. During storyboarding you will be able to determine the concepts that are to complex or to ambiguous.

Organize slide elements and arrange them carefully. The way elements of slaid are arranged drives a *flow*, which is the way audience eyes traverse the slaid content. Think what should be noticed as first, second and third. How to focus an attention? The solution is a *contrast*. Contrast can be shown through size, shape, color and proximity. *White space* should also be included as it sharpens audience focus by isolating elements and enables content to breath. Dense slaids without white space are hard to comprehend because all the elements compete for viewer's attention. Clear *visual hierarchy* explains the importance of the elements and helps to understand the main message of the slaid. Finally *unity* should be maintained through font face, colors elements placement in the slide deck.

It is important to have right number of slides. How many slaids you need depends on several factors like sense of pacing, audience, presentation aims, slaids' design or setting you are in. According to some opinions moderate slide count is 1-2 slaids per

minute (30-60 slides per 1 hour presentation). However if the rule *"one idea per slide"* is followed, then it could be more than 60 slaids per hour. Golden rule is: *number of slides doesn't matter as much as their importance with regard to presentation aims*.

Presentation delivery

The first critical success factor of presentation delivery is *rehearse your material well!* If it is possible ask for feedback from someone with *"fresh eye"*. This will help to make sure if all the ideas presented are clear and understandable not only for you but also for others. Next important issue is related to unpredictability of time frame you finally will have. It happens that some factors will cause to cut down the time you have scheduled for presentation. The solution for such situations is to have short version of the presentation prepared, just in case. Improve the slaids' design until the day you will present. This refinement process will make you more familiar with the content what will result in seamless integration with messages you will present. Other hints related to delivery are as follows.

Be completely present. This is absolutely crucial as a presentation, like a conversation requires you to be fully present at a time and place. Be mindful without thoughts of the past or future. Don't think about mistakes that may happen. This is not a competition. Be in the moment, interact and converse with audience with full focus.

Develop connection with audience. It is related to being able to appeal not only to logical but also emotional side of the audience. Don't be dull! Speak with energy and passion. Content that is novel, humorous, novel or unexpected helps to make connection from beginning. Don't read slides as it can negatively impact the connection you have stablished.

Try to engage audience as much as possible. Engagement is about arousing audience's emotions. It is about awakening – possibilities in others. It is also about removing all the barriers between you and audience, also physical. Therefore avoid podiums and lecterns and move around naturally. Try to be positive and humorous. Show and stimulate curiosity – it is infectious! Fully believe in the ideas you are presenting or you won't be able to "sell" them.

Successful presentation delivery is also dependent on many other factors, such as:

- Setting the right tone for the talk
- Communicate with body (proper body language)
- Communicate with proper voice
- Full usage of Q&A part of the presentation
- Building trust

Extensive discussion on these topics may be found in books listed in *References* section.

Mind mapping

A *mind mapping* is a technique for collecting, structuring and presenting complex information, which can relate to course content, student performance, etc., in a clear and easy-to-remember manner. Created by Tony Buzan, mind maps have found applications in many areas related to education, business, information technology, among others. The basic idea of representing information in the form of a mind map is related to the concepts of *radiant thinking* and *visual thinking*. According to Buzan, people do not think in a linear way, but in different directions simultaneously. Working conceptually, we have a sense of a large number of emerging thoughts, visions, concepts that "pro-change" in different directions simultaneously. A technique of rendering such a way of thinking is to represent it in the form of a mind map, i.e. a structure that has a central theme in the center and related additional elements are on branches spreading radially in all directions.

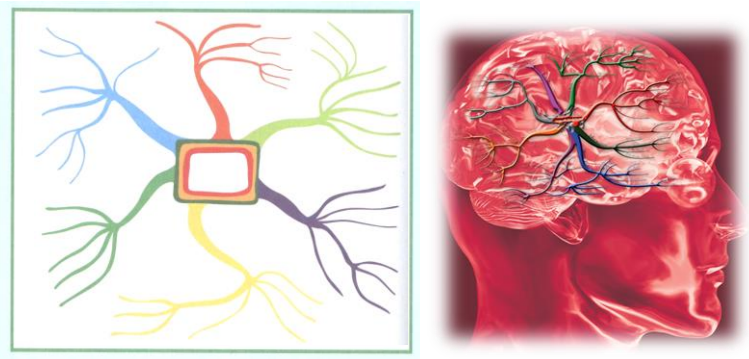


Figure 14. Radiant thinking and its representation as a mindmap.

An additional element supporting the way humans process information is the graphical representation in the form of *key images* and the proper selection of short names in the form of words/phrases called *key words*. Key words are words/phrases that constitute the "key to memory" because they provide a point of reference to something we want to remember with associations. In addition, they stimulate the left hemisphere of the brain. When well-chosen, they are a "trigger" for associations and remembered information. The key image is the cornerstone of memory, it evokes related associations, activates the right hemisphere and is at the heart of conceptual techniques and mind mapping. It should be related to the key word. The biggest challenge, aside from the organization of the mind map itself, is the *proper selection of key words and images*. It is difficult to switch from writing down information in a linear fashion into the form of complete sentences, because we are accustomed to doing so in the course of formal education. It is also important to properly organize the mind map, presenting the content according to its interrelationships and level of detail.

How to create a mind map?

The general process of creating a mind map can be presented in the form of the following steps:

1. Identify the topic to be presented in the form of a mind map. The topic should be written down in text form and a suitable key image, related to the topic, should be selected.
2. Select the basic organizing concepts, that is, the names of the key words and images for the main branches of the mind map. This is the highest level of abstraction. The content written on the map should not be in the form of long sentences or paragraphs. Wherever possible, the shortest possible terms should be aptly chosen.
3. Add more branches presenting more and more detailed issues with corresponding names and images.
4. Add colors, icons, that is, a visual "facelift" of the map.
5. Add information on the order, if the order of the various branches is important for some reason.

The gradually forming structure will look like in the picture below.

Figure 15. How mind map evolves

When creating mind maps, it is also worth remembering the following recommendations:

- Use appropriately selected key images. This stimulates associations and provides an effective aid to memory.
- Appeal to the senses.
- Vary the size of the letters, images and drawings.
- Use colors, because they are one of the strongest mechanisms for stimulating creativity and memory. If possible, establish color codes and color-code the map.
- Introduce coding with symbols (e.g. icons). This type of approach can be useful for showing priorities, degree of completion, sequence, etc.

The process of creating mind maps seems very simple, but switching from the traditional way of organizing and processing information to mind mapping can initially be a problem, both for the teacher and the students. However, teaching experience shows that it is really worth it. Another challenge is to encourage students to use this form of information gathering and processing. The problem is the linear way of collecting and processing information related to learning and teaching that has been formed over the years - traditional notes, PowerPoint presentations, mostly organized in the form of "dense" slides consisting of bulleted lists and solid text.

Using mind mapping technique provides several benefits. The most important are the following:

- Provides a global perspective on ideas and information.
- Improves problem-solving and communication skills.
- Improves creativity and critical thinking.
- Improves concentration and photographic memory.
- Improves the flow of ideas.
- Increases effectiveness and efficiency of learning and knowledge transfer.
- Enables more interesting and visually appealing presentations during classes.
- Improves planning of activities during classes.
- Develops the ability to be more specific.
- Improves visual thinking and visual communication skills.

Assessment scales to measure that specific skill

Scale for Communication & Presentation skill

Skill assessment can give a teacher the confidence that students developed *the Communication Skill* they will need in their professional career as well as in private life. The assessment can also help students identify the components of *the Communication Skill* they need to develop.

The assessment measures for the communication skill should cover all relevant verbal and non-verbal communication parameters. *Communication Skill* is not easy to measure in quantitative terms. Teacher should design a specific scale that describes levels of performance and understanding regarding communication and presentation skills. This scale can be used in both teacher's assessment of the tasks that reflect realistic application of the skill as well as in self-assessment or peer-assessment conducted by students. An example of a generic scale for communication and presentation skill is presented below. More detailed criteria can also be developed by the teacher.

Table 1. Example of assessment scale for Communication and/or Presentation Skill

Score 4	Student can apply the communication/presentation skill in ways that go beyond what was done in class.
Score 3	Student can use the communication/presentation skill as presented in class without making any big mistakes.
Score 2	Student understand the important information about the communication/presentation skill, but I can't use it by myself.
Score 1	Student can't explain much about the communication/presentation skill on her/his own, but with help she/he can.
Score 0	Even with help, Student can't explain anything about the communication/presentation skill.

Source: Adapted from R. J. Marzano; T. Heflebower; *Teaching & Assessing 21st Century Skills.*

Assessment strategies

The components of this skill should be assessed mainly using evidence-based methods, thus the following assessment strategies can be considered to measure the skill development:

- Tasks that reflect realistic application of the skill – Teacher Observation
- Traditional Tests
- Student's self-assessment

Tasks that reflect realistic application of the skill – Teacher Observation

As it was said in "*21st Century Skills Assessment for higher education*" section, the best way to measure the universal skills is to observe students as they perform tasks. The main criteria for assessment should be ***whether the student have the skills / developed the ability to apply the skill in a real-world situation***.

Sample tasks that enhance the development of *Communication and Presentation Skills* are presented in *the Learning Strategies – HOW TO?* section (as a part of individual strategies). With these tasks, the teacher can measure the progress of students in the following areas:

- active listening,
- expressing (thoughts and insights),
- oral communication,
- writing,
- being specific,
- being persuasive,
- presentation,

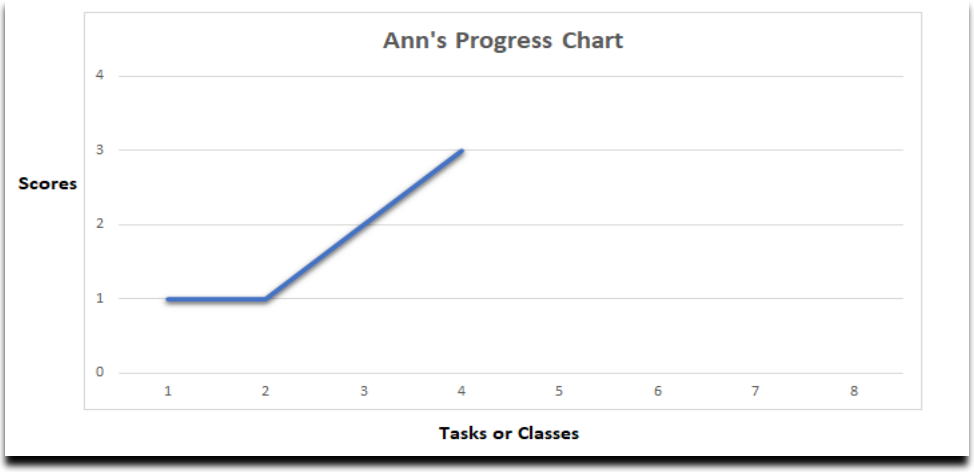
- team communication,
- searching for information,
- non-verbal communication.

Observation/assessment tools that help teacher gather data about students' development

The Progress Chart tool

The teacher can assess the student's progress in developingommunication/presentation skills over time using *the Progress Chart tool*. After each activity/meeting, the teacher marks the appropriate scoring level. *The Progress Chart tool* can address a specific skill (e.g. active listening) or a set of skills. It is worth noting that such scoring requires the teacher to be systematic.

Figure 16. Example of student progress chart.



Source: Adapted from R. J. Marzano; T. Heflebower; *Teaching & Assessing 21st Century Skills.* USA: Marzano Research, 2012.

Teacher Tracking Sheet

The teacher can assign scores to each student using a Teacher Tracking Sheet. The example of the template shown below (Table 2) uses a scale from 0 - 4 (presented in the "*21st Century Skills Assessment for higher education*" section. The teacher can also ask that students to rate themselves on the same scale. The teacher can compare the students' self-assessments with her/his own assessment.

Figure 17. Teacher Tracking Sheet

Learning strategy		Anna	Anthony	Kate	Tom	Vincent
Writing short essay						
abilities	writing	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
	persuasion	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
	expressing thoughts	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
	being specific	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
Preparing and presenting the summary of classes delivered						
abilities	active listening	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
	expressing thoughts	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐
	writing	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐	4☐ 3☐ 2☐ 1☐ 0☐

Source: Adapted from R. J. Marzano; T. Heflebower; *Teaching & Assessing 21st Century Skills.* USA: Marzano Research, 2012.

Rubric tool

The rubric is an assessment tool that clearly indicates achievement criteria in all elements of any type of student work. The teacher should record his observations about the students on a regular basis (weekly, every classes, each task implemented through the classes etc.). Three steps to develop the Rubric are as follows:

Step 1: Teacher should design the criteria or essential elements that student should present in her/his work to ensure that it is high in quality,

Step 2: Teacher should decide how many levels of achievement should be included on the rubric,

Step 3: For each the criteria or essential elements of quality, the expected results at each level of achievement should be indicated.

Figure 18. Sample Rubric used for the "*Product box development & presentation for the subject*" learning strategy

	Below Expectations [Score 1]	Approaching Expectations [Score 2]	Meets Expectations [Score 3]	Exceeds Expectations [Score 4]
Understanding of the topic	Does not understand the subject	Shows a good understanding of parts of the topic, but not some of them	Shows a good understanding of parts of the topic	Expresses a complete and deep understanding of the subject
Content planning	Have not planned	Difficult to follow speech and inconsistent connections, indicating poor planning and little effort	Follows a proper general outline, even if he/she gets lost or needs to pay more attention to details	Well planned speech, links topics logically and coherently
Clarity in speech	Little clarity. Often mumbles and mispronounces words	Speaks clearly 85–90% of the time and mispronounces numerous words	Speaks clearly 90–95% of the time, although she/he mispronounces some words	Speaks clearly practically all of the time.
Posture and eye contact	Does not maintain eye contact and body posture is inadequate	Sometimes maintains an upright posture and maintains eye contact with the audience, but less than 90% of the time	Upright posture and makes eye contact with everyone, although some indicators of tension/disinterest are observed	Straight back, relaxed and confident posture, make eye contact with everyone
Volume and tone of voice	Too low to be heard by all and excessively monotonous	Loud enough to be heard around 70% of the time by everyone and/or inappropriate tone (monotonous, boring)	Loud enough to be heard by all and adequate tone of voice around 90%	Loud enough and with an appropriate tone of voice to be heard by the entire audience

Source: Adapted from V.R Ferrer-Pardo, I. Jimenez-Perez, M. Gil-Calvo, P. Pérez-Soriano, J.I., Priego-Quesada; *Relationship between Students' Perception of a Rubric for Oral Presentations and Their Academic Characteristics*. Education Sciences, 2022, 12(11).

Figure 19. Sample Teacher's Assessment Template for Rubric tool

Date	Score	Understanding of the topic	Date	Score	Content planning
DD/MM/YYYY	*2*	*Feedback with examples*	*DD/MM/YYYY*	*1*	*Feedback with examples*
Date	**Score**	**Clarity in speech**	**Date**	**Score**	**Posture and eye contact**
DD/MM/YYYY	*3*	*Feedback with examples*	*DD/MM/YYYY*	*3*	*Feedback with examples*

Source: Own elaboration.

Traditional Tests

Besides the tasks that reflect realistic application of the skill, teacher can use professional assessment platforms offering library of communication skills tests. In many cases, *Communication skills* assessment tests are a way to test individual's

proficiency in the language as well as her/his ability to use it in different scenarios. Most of those test are dedicated to HR departments responsible for recruiting employees and they are paid. Usually standardized tests cover the following basic dimensions of interpersonal communication:

- *written communication* - evaluate writing abilities based on following components: grammar, spelling, punctuation, vocabulary, etc.
- *reading comprehension* - evaluate abilities to interpret and analyze written information accurately: comprehension ability, focus ability, the ability to pay attention to details, attention span
- *listening comprehension* - evaluate abilities to accurately receive and interpret messages in the communication process
- *spoken language (language proficiency)* - evaluate the language skills, syntax, vocabulary, semantics, and other fields of evidence of linguistic abilities.

Teacher should bear in mind that the communication skills tests often rely on student's self-report (e.g. the student in the test has to indicate whether she/he agrees/disagrees with a series of statements choosing the answer that's closest to her/his opinion).

Examples of paid assessment platforms including communication tests:

- TestGorilla - www.testgorilla.com (evaluates skills: understanding written communication, active listening and non-verbal interpretation, ability to summarize messages effectively and outline next steps, etiquette in professional communication). Sample test: https://www.testgorilla.com/test-library/situational-judgment-tests/communication-test/
- Metl - https://mettl.com (evaluates skills: language proficiency in listening, comprehending text and writing). Sample test: https://mettl.com/test/corporate-communications-assessment

Student's self-assessment

A teacher might consider using self-assessment as part of measurement process for the *Communication and Presentation skill*. Self-assessment (or peer-assessment) can be a process that is conducted:

- throughout the whole course (formative assessment) – the student judge his/her own proficiency in meeting the learning objectives after each meeting/task throughout the course and strives to improve the achievement of the learning objectives.
- at the end of the course (summative assessment) - student can judge her/his communication & presentation skills at the end of a learning period (whether she/he developed the skills by completing the course).

The teacher can also consider different ways to combine summative assessment with formative assessment.

In order to compare the progress a student has made (to determine what she/he has learned), the teacher may ask the student to complete a test at the beginning of the course in order to determine his or her level of the skills (ex-ante assessment).

For assessment purposes, the teacher can prepare a test in frame of which students are asked to rate themselves on various areas. The answers can be on a scale:

- ✓ a Likert scale: *Strongly Disagree* | *Disagree* | *Neither agree nor disagree* | *Agree* | *Strongly Agree*
- ✓ a five-level scale for rating quality: *Poor* | *Fair* | *Good* | *Very good* | *Excellent*
- ✓ a four-level scale for rating quality: *Below Expectations* | *Approaching Expectations* | *Meets Expectations* | *Exceeds Expectations*

Instead of a test, the teacher can prepare open-ended questions that require answers on paper/on a computer or ask the student to prepare an essay in which she/he will do a self-assessment.

Figure 20. Sample self-assessment test for *"Presentation delivery" learning strategy*

During presentation delivery…	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
…I can present ideas in a clear and understandable way					
…I can schedule the time frame for my presentation					
…I can interact and converse with audience with full focus					
…I can speak with energy and passion					
…I can include humorous, novel or unexpected elements to develop connection with audience					
…I can present without reading the slides					
…I can show and stimulate curiosity					
…I can set the right tone for the talk					
…I can body language in proper way					
…I can communicate with proper voice					
…I can use Q&A part					

Source: Own elaboration

A similar test may be prepared for each of the tasks proposed in frame of different learning strategies (depending on the learning outcomes assigned to these tasks) or an aggregate test for a competency (with no division into learning outcomes carried out by individual tasks).

SKILL#2
CREATIVITY & INNOVATION

Authors: Georgia Micheli, Kyriakos Lingas [Militos]

Short Characteristic

Creativity is a complex concept without any commonly accepted definition. In contrast, there are many misconceptions about its nature, the most popular of which are addressed below:

Creativity is **not** always and necessarily linked to:

- Eccentric personality: Creativity arises from a particular behaviour and results in a certain idea. Creativity is not a quality of a personality, but it can be nurtured and fostered within and by stimulating environments.
- Art: Arts is intrinsically linked to creativity. However, it would be too restrictive to think of creativity only in the terms of Arts, as it can be expressed in any domain of human activity.
- Intelligence: Although intelligence can be undoubtedly connected to creativity, research shows that above modestly high IQs, there is no clear relationship between these two concepts.

According to Amabile (1996), creativity is the production of novel and useful ideas in any domain. Similarly, Mumford (2003) defines creativity as the production of novel, useful products while York (2001) as the ability to be original or inventive and to apply lateral thinking. If comparing these three definitions, we can conclude that the concepts of novelty ("novel", "original") and creation ("production") are present in all of them, therefore we will use them as key words when referring to creativity.

Creativity is often used together with the concept of "innovation". According to Amabile (1996), innovation is the useful and successful implementation of creative ideas within an organisation. In this point of view, innovation "uses" creativity to turn ideas into tangible and / or measurable outcomes (e.g. products / services) in a novel way.

The components of creativity

The componential model of creativity includes all factors that contribute to creativity – person factors, as well as work environment variables (Figure 1).

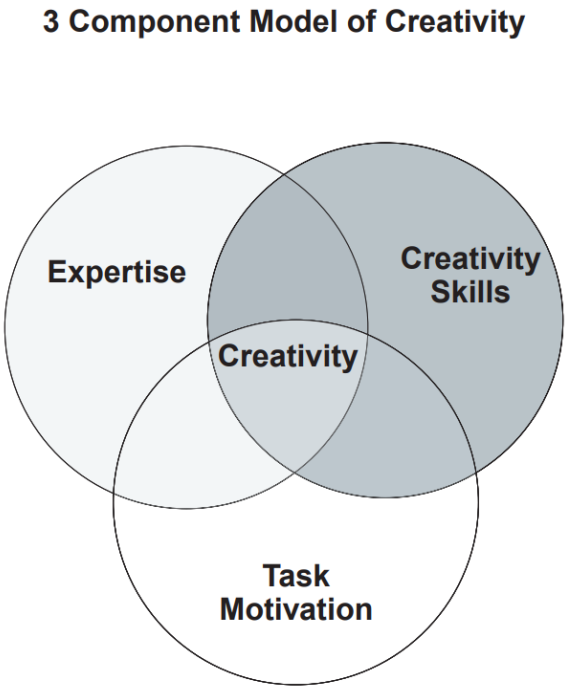


Figure 21: The 3 Components of Creativity

- Expertise: Expertise includes memory of factual knowledge and technical proficiency in the target work domain. It is the foundation for any task assigned as it can be viewed as the set of cognitive pathways that lead to "technically good" and "adequate" performance. In the modern world and the current job market with the rapid changes, courses and seminars appear to be ideal for keeping professionals up to date.

- Creativity thinking: This is the cognitive style favourable to taking new perspectives on problems, an application of techniques for the exploration of new cognitive pathways and a working style conducive to persistent, energetic pursuit of one's work.

- Task motivation: Motivation can take two forms; intrinsic and extrinsic. Intrinsic motivation is driven by curiosity, enjoyment, or deep interest about a work / issue, while extrinsic motivation is driven by a desire to attain a goal that is not directly linked to the work per se but rather to an external factor (e.g. achieving a reward or meeting a deadline). Therefore, according to this model, task motivation could be expressed as (a) the personal, primary attitude towards a task (i.e. intrinsic), (b) the person's perception of the external reasons for undertaking the task (i.e. extrinsic), and (c) both forms.

It is important for instructors / teachers to be aware of and recognise these components to enable learners both enhance and practice creativity in workplace environments. At company / organisation level, it should be noted that the

management of a company / an organisation (from lowest to highest level) plays a crucial role in creating a stimulating environment that fosters creativity and innovation of professionals (e.g. allowing a considerable degree of freedom or autonomy of one's work) by positively impacting the person's motivation (e.g., either by assigning them tasks within their interests or by increasing their extrinsic motivation). The following schematic diagram (Figure 2) depicts the influence of the organisational work environment on the creativity of individuals and teams.

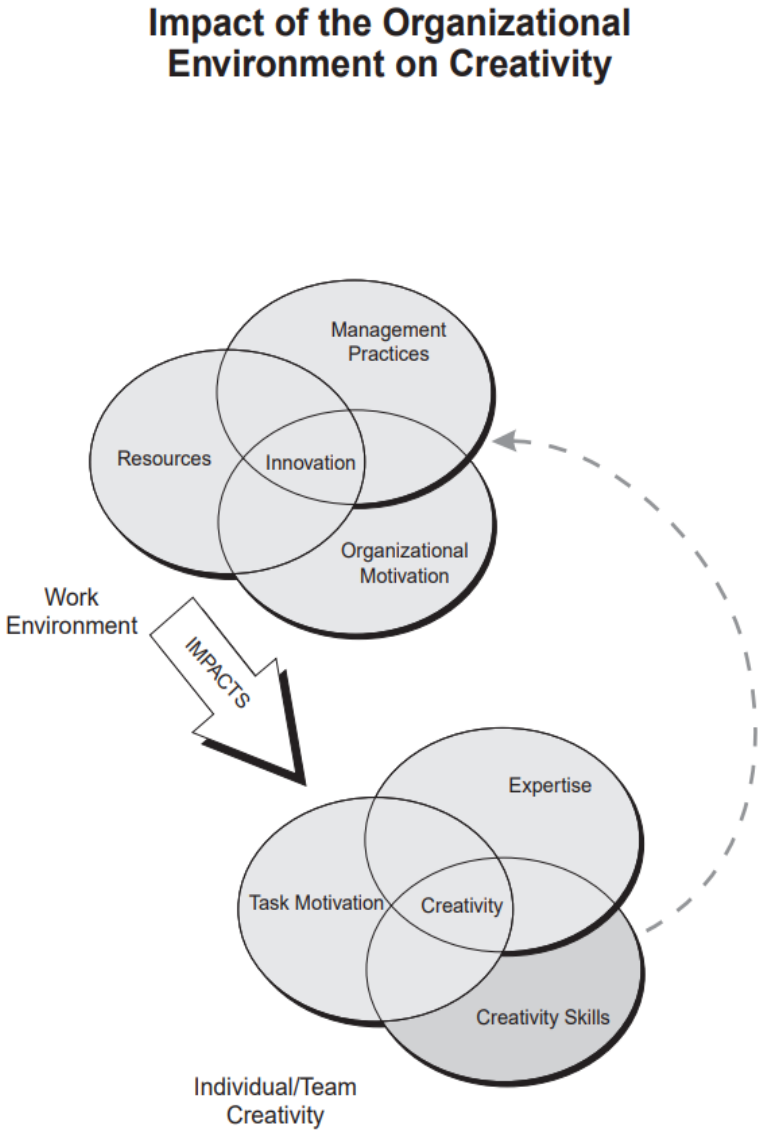


Figure 22: Impact of the Organisational Environment on Creativity

According to this figure, certain areas of the working environment impact individual's creativity and, vice versa, the creativity produced by individuals and teams, serves as source for innovation within the organisation. The main take-away of this theory is the assertion that the work environment influences creativity by influencing the

individual components, with the impact on task motivation to appear the most direct and immediate. This conclusion is valuable also in learning environments that aim to enhance learners' creativity.

Since the 1950s, a considerable number of creativity-enhancement training programmes have been designed and offered to organisations.

Abilities connected to creativity & innovation skill

According to Astutic et al. (2020), creativity can be expressed in several thinking ways, including:

- Divergent thinking (i.e., application of an unstructured, free-form way of thinking to produce ideas quickly and spontaneously),
- Productive thinking (i.e., application of a more structured and critical way of thinking to better understand the issue / problem and provide creative comments / solutions),
- Inventive thinking heuristics (i.e., mental processes that simplify complex concepts and issues facilitating the learning process), and
- Lateral thinking (i.e., horizontal way of thinking, the application of which requires approaching an issue / problem under new and unusual light to identify patterns / solutions that are not immediately obvious).

Examples of typical professional tasks supported by the skill

Creativity and innovation are crucial for certain professional activities (e.g. advertising, marketing, media). However, as horizontal skills, they are also essential for all working environments, irrespective of the economic sector in which the company / organisation is active, as they can conclude in:

- A new approach to a problem,
- A resolution to a conflict between employees,
- A new result from a data set,
- A previously untried approach to earn revenue,
- A new product—or product feature.

At company level, creativity thinkers can boost departments' and organisations' productivity, as they tend to be strong problem-solvers, able to think outside of the box and discover new ways to meet challenges and carry out tasks. This is the reason why creativity is listed in number 5 of the top 15 skills for 2025, according to the World Economic Forum (2020).

Methodologies/learning strategies

1. Brainstorming

Brainstorming is a problem-solving method that involves the spontaneous contribution of creative ideas and solutions. It combines an informal approach to problem-solving with lateral thinking – a method for developing new concepts to solve problems by ooking at them in innovative ways. Some of these ideas can be built into original, creative solutions to a problem, while others can generate additional ideas.

Brainstorming can be implemented as a group or individual task. As a group task, it requires intensive, freewheeling discussion in which every member of the group is encouraged to think aloud and suggest as many ideas as possible based on their diverse knowledge.

Although group brainstorming is frequently adequate for generating innovative ideas, individual brainstorming can sometimes produce better ideas. This might occur because group members pay so much attention to others' ideas that they forget or do not create their own ideas.

2. Negative (or Reverse) Brainstorming

Reverse brain-storming is valuable when it is difficult to identify direct solutions to a problem. Research shows that when an idea is new or complex and / or when there is little margin for error examining potential failures is more useful that examining potential solutions.

An indicative question to initiate negative brainstorming is: "What could go wrong with this project?"

3. Problem finding

The importance of defining problems is very popular. Albert Einstein, for example, is often quoted as suggesting that "the formulation of a problem is often more essential than its solution". On a similar note, based on Wallas' model of creative thinking (1926) ("preparation, incubation, illumination, and verification"), problem finding is the first step towards problem solving.

4. Debating

The term debating represents a discussion between two parties aspiring to conclude. Modern-day debating skill are practiced when two parties that (usually) hold different views about the same topic, reason and argue to persuade the other side to reach a common conclusion.

How to?

1. Brainstorming

Between group and individual brainstorming, teachers are encouraged to implement group brainstorming exercises as students find them more interesting and entertaining.

Step 1 – Preparation

The teacher asks students to form groups of 10 – do not exceed that number to ensure that everyone has the chance to participate in discussions. (S)he then asks each group to appoint one person to record the ideas shared during the session, ensuring that nothing gets lost or forgotten.

The teacher takes care of keeping the room well-lit so that participants stay alert throughout the process. (S)he provides each group with papers, writing tools and post-it notes. The class whiteboard will be also utilised.

Step 2 – Presenting the problem to be solved

The teacher outlines the goal of the brainstorming session: to come up with as many potential solutions as possible to the presented problem. Then, (s)he presents the problem and asks a person per group to state the problem in their own words. In that way, the teacher ensures that every group has a clear understanding of the problem. Another way to help students understand the problem is to provide more specific questions to answer. For example, rather than asking, "*How can we make our product better?*" the teacher takes a more specific, goal-related approach, such as "*How can we make our product more user-friendly?*".

Step 3 – Initiating the idea generation process

Brainstorming sessions use various techniques and exercises to generate ideas. One effective method is to start by allowing students to take time as individuals to brainstorm ideas. This step can be as simple as having everyone write a list of ideas on the provided piece of paper.

Teacher explains to students that they have the freedom to write down anything they consider as potential solution, no matter how impossible or strange it may seem. At this point, feasibility does not play a large role because making these ideas more feasible will take place during the group discussion phase.

Working individually at first, guarantees that all students are actively engaged as well as it minimizes distractions – in contrast, in group brainstorming, when individuals try to come up with ideas, they often listen to others and get distracted.

Step 4 – Initiating the idea sharing

Once students have come up with their ideas, they work as groups sharing and discussing the identified solutions. It is important that teachers set rules for this discussion, by clearly stating that participants should not criticize or judge others' ideas. At this point, group members discuss each idea that their group members have generated separately and try to build on each of them considering how much and in what way each idea can be feasible. Students can discuss each idea verbally and keep notes regarding their feasibility. To make assessments vis-à-vis idea's feasibility,

students can ask questions about each idea to determine its potential. For example, they can ask whether the idea can be implemented as it is or if it would require additional resources or time.

Step 5 – Narrowing down the list of ideas

Once all the generated ideas have been discussed, the group must narrow the list down to the two or three best solutions. The best solutions represent these ideas that will solve the problem outlined at the start of the session. One way to narrow down the list is to encourage group members to vote on their top three choices. The ideas with the most points represent the group's best ideas. Then, group members shall prioritize them in order of importance or feasibility.

Step 6 – Class discussion

Once the groups are ready, each one presents their top ideas on the class whiteboard using the post-it notes. A class discussion follows aiming to evaluate each idea in terms of feasibility. The teacher shall be proactive and do not allow any judging attitude.

Tip: Seelig (2012) introduces the concept of a new brainstorming technique; instead of restricting themselves to certain time for brainstorming, students are encouraged to devote plenty of time to brainstorm 50 different solutions to a single problem (which can also become 100 solutions). This exercise works better in teams; when face with such a daunting task, students become less judgmental and they unleash their creativity.

2. Reverse brainstorming

Reverse brainstorming technique can be implemented following the exact steps as normal brainstorming but with an essential difference; students approach a problem from the opposite way. Reverse thinking, in general, encourage thinkers to step back, redefine the statement in an opposite way and identify ways to cause / worsen the problem, instead of solving it. These ways will work as anti-patterns for inspiration and generation of new ideas. For example, the question "How can we get more subscribers to our newsletter?" can be rephrased as "How can we get people to unsubscribe to our newsletter?". Solutions to this new, reversed problem can unlock learners' creativity and enable them to generate fresh ideas for the original problem (i.e., increasing subscriptions).

At the idea generation phase, the teacher encourage students to start with one of two "reverse" questions. More specifically, instead of asking, "How do I solve or prevent this problem?" they ask, "How could I possibly cause the problem?" and instead of asking "How do I achieve these results?" they ask, "How could I possibly achieve the opposite effect?"

Also in reverse thinking, students are allowed to generate as many solutions as they can without rejecting anything at this stage.

Once students have brainstormed all the ideas to create the problem, they then reverse them into solution ideas for the original problem or challenge and share it with the rest of class (see "Step 6"), which assess all ideas in terms of how much and in what ways they are / may be feasible.

3. Problem finding

According to "*The Osborn-Parnes Creative Problem Solving Model*", the first three (out of six) steps when approaching a problem is:

I. Identification of the issue / problem,

II. Identification of all facts which may affect the outcome,

III. Clear statement of the problem,

IV. Brainstorming for as many potential solutions as possible,

V. Convergence on the suggested ideas,

VI. Refinement of the selected ideas.

To effectively complete these three initial steps (in italics), students shall be encouraged to use the fishbone technique.

<u>The fishbone technique</u>

The fishbone technique uses a visual organizer to identify the possible causes of a problem. This technique discourages partial or premature solutions and demonstrates the relative importance of, and interactions between, different parts of a problem.

Step 1 – Preparation

Teacher asks students to form groups and provides each group with sheets of papers and writing tools. (S)he then asks each group to appoint one person to undertake the drawing and to writing down the ideas shared during the session, ensuring that nothing gets lost or forgotten.

Teacher initiates the process by writing on the whiteboard the problem to be solved.

Step 2 – Drawing the fishbone

Teacher asks students to draw on a broad sheet of paper a long arrow horizontally across the middle of the page pointing to the right. The title of the issue to be explained will be the title of the arrowhead. This is the "backbone" of the "fish."

Step 3 – Identifying all facts affecting the problem / all causes of the problem

Teacher asks students to draw "spurs" from this "backbone" at about 45 degrees, one for every potential cause of the problem. The group think of a potential cause / fact affecting the problem per spur and label each. Sub-spurs can represent subsidiary causes.

Step 4 - Reflection

The group considers each spur/sub-spur, taking the simplest first, partly for clarity but also because a simple explanation may make more complex ones unnecessary. Ideally, the fishbone is redrawn so that position along the backbone reflects the relative importance of the different parts of the problem, with the most important at the head.

Tip: This process can represent the initial phase of an idea generation. In this case, it shall be followed by a brainstorming exercise.

4. Debating

The main challenge when debating is to ensure all students are engaged. To this end, teacher shall identify scenarios based on students' interests, needs, and characteristics.

Step 1 – Preparation

Teacher asks students to work in pairs and provides them with papers and writing tools. On the whiteboard, (s)he writes a "neutral" statement per pair and ask them to give all reasons why they disagree with it.

Tip: Depending on their class, teachers can choose a content-specific statement.

Step 2 – Working in pairs

One person of each pair shall present the statement in a positive way ("London is a big, multicultural, thriving city") and the other in a negative one ("London is a big, dangerous, noisy city").

Step 3 – Taking on personas

Edward de Bono, an author and expert in the field of creativity and lateral thinking, said, "Creativity involves breaking out of established patterns in order to look at things in a different way"; this is the inspiration for this second phase of the exercise. Now, students are encouraged to take on a persona (e.g. a 12-year old boy, an old unemployed man) and present the same statement from the persona's perspective. At this point, students are encouraged to think as a different person with different needs and priorities. Students can also adopt the perspective of a person from their everyday life (e.g., colleague, classmate, friend). The more different mentality the person has, the more challenging the exercise becomes.

This exercise will help them develop the ability to look at things in new and different ways.

How to assess skills' development?

Creativity can be recognised and assessed as long as the responsible persons have a good degree of familiarity with the produced work and the particular domain it belongs. Research shows that experts often converge on the feedback they provide, although they might have different perceptions of activity. This method is called "consensual assessment". Based on this type of evaluation, instructors / teachers are advised to assign familiar-to-them tasks, to be able to assess them.

Sources

https://www.celt.iastate.edu/instructional-strategies/teaching-format/14-creative-ways-to-engage-students/
https://www.mindtools.com/a32qxsh/reverse-brainstorming
https://www.mindtools.com/acv0de1/brainstorming
https://www.celt.iastate.edu/instructional-strategies/teaching-format/14-creative-ways-to-engage-students/
*Microsoft Word - 396239.DOC (usp.br)
*Teaching_for_Creativity_in_Universities20220415-1-1om4y4g.pdf (d1wqtxts1xzle7.cloudfront.net)
*International Journal of Instruction (ed.gov)
Research-based Lectures to Improve Students' 4C (Communication, Collaboration, Critical Thinking, and Creativity) Skills | Atlantis Press (atlantis-press.com)
SciELO - Brazil - Teaching Practices for Creativity at University: A Study in Portugal and Brazil Teaching Practices for Creativity at University: A Study in Portugal and Brazil
(PDF) Teaching for Creativity in Universities (researchgate.net)
20 Tips To Boost Student Creativity In The Classroom - elttguide.com

SKILL#3
CRITICAL THINKING

Authors: *Clio Dosi, Roberta Lozzi, Matteo Vignoli [UNIBO]*

Short Characteristic

"Critical thinking is the disciplined mental activity of evaluating arguments or propositions and making judgments that can guide the development of beliefs and taking action" (Ennis, 1992).

Critical thinking is an intellectual capacity to be developed by each individual through a process. In this process, one asks questions to understand the logical foundations on which any statement is based, reasoning and analyzing probabilities.

Abilities connected to critical thinking skill

There are many abilities related to the skill of critical thinking (Ennis, 1992):

- Judge the credibility of sources
- Identifying conclusions, motivations and assumptions
- Judge the quality of an argument, including the acceptability of its reasons, assumptions and evidence
- Develop and defend a position on an issue
- Ask appropriate questions to clarify controversial issues
- Planning experiments and judging the design of experiments
- Define terminology in a context-appropriate manner
- Have an open mind
- Try to be well informed
- Draw conclusions if justified, but with caution

Examples of typical professional tasks supported by the skill

In the modern era, where a wide range of information is readily available with just one click, thinking critically is a fundamental skill for one's professional and personal development.

Here are some tasks closely related to this skill:

1. Context observation and analysis;
2. Decision Making;
3. Problem solving.

Methodologies/learning strategies

Placeholder. List and description of "methodologies/learning strategies" related to skill's development

Below is a list of learning strategies and methodologies that, in the opinion of a considerable number of authors, are employed in higher education to foster critical thinking and can serve as a guide for educators who seek to impart this skill.

1. Writing activities
    a. Writing assignments (writing assignments, essays, and reports) (Especially argumentative of analysis of other authors),
    b. Concept map and Argument mapping,
    c. Practical activities followed by a written reflection, for example, a diary.

2. Debates and cooperative work
    a. Debates,
    b. Dialogue and participation Oral argumentation,
    c. Cooperative/collaborative work,
    d. Posters and interviews.

3. Questions and enquiries
    a. Teacher's questions,
    b. Questions/enquiries/surveys with immediate feedback,
    c. Questioning (enquiry),
    d. Research project.

4. Problem solving (Problem and project-based learning)
    a. A well-designed paper / Project about a concrete issue,
    b. Problem based learning (everyday issues),
    c. Projects,
    d. Solving ambiguous situations set in advance,
    e. Pair work to solve a problem,
    f. Listening to expert reasoning solving a problem,
    g. Analyzing other people's work, including classmate reasoning solving a problem,
    h. Activities to review the media (commercials, YouTube videos).

5. Case study
    a. Case study (when elaborating the case and subsequent analysis).

6. Oral presentations: Teachers and students
    a. Presentations or speeches given by students,
    b. Lectures.

7. Real-world activities
    a. Experiential learning,
    b. Connecting situations with student's own experience (experiential-based),
    c. Civic engagement,
    d. Simulations.

8. Feedback
    a. Feedback

9. Drama
    a. Creative drama.

1. Writing activities

Writing-for-learning activities aid the development of reasoning and reflective thinking skills (Öz, 2015).

Indeed, writing requires being able to differentiate between essential and nonessential information, test one's hypotheses, and handle different inputs such as pictures, graphs, or text. Writing offers students the advantage of thinking critically about content as well (Giroux, 1979)

The writing activity is therefore regarded as a fundamental tool for students to think critically.

Writing and critical thinking are deeply linked since writing is founded precisely on thinking. "Writing is both a process of doing critical thinking and a product communicating the results of critical thinking" (Bean, 1996).

Through the process of writing, students can deepen their thinking, formulate their ideas, clarify their points of view, and develop their intellectual abilities.

2. Debates and cooperative work

Debates are used as a teaching tool in the classroom and can help students become more proficient in critical thinking.

Students can learn new material and apply knowledge by organizing and debating their views on a topic with other students, creating a cooperative environment.

Debate is a useful tool for students to improve their collaboration and communication skills and develop in-depth critical thinking.

During a debate, students must express their agreement or disagreement concerning a specific topic through articulate statements and reasoning, with teacher supervision.

Since an important end goal of debate is to convince other people of one's idea and thus achieve consensus, critical thinking is activated both on the part of those who want to convince and those who need to be convinced. The latter must reflect on what she is told to decide what her position is.

Debate is a useful tool to help students discuss and criticize constructively, analyzing different points of view. It is therefore often used as an active and cooperative learning strategy, as it helps students get involved in friendly competition, and stimulating activities such as critical thinking.

It is possible to use debates in all academic disciplines for many topics.

3. Questions and enquiries

Questions are a great impactful tool to help students develop a deep understanding of certain topics and improve their critical thinking as a result. The challenge is for the student's ability to think deeply and critically to match the complexity of the question. Indeed, the disposition to a question is the initial step in developing critical thinking (Walsh, 1988). What is important is not the topic of the question and the subject matter, but the approach of asking and asking questions.

To help students think critically, students must be asked analysis or synthesis questions, for example, rather than simpler comprehension questions. The quality of questions rather than the quantity is therefore more important for this purpose.

It is up to teachers to carefully organize lessons to offer students this kind of activity. To this end, teachers should receive training in creating complex questions. Questions are frequently used in our everyday life conversations and discussions. For this reason, teachers often do not pay too much attention to developing structured questions that reinforce students' critical thinking.

4. Problem solving

Problem solving refers to those processes used to find the best solution to an unsolved question that is perhaps constrained by certain elements and is often a new and therefore unfamiliar situation.

It relates to the ability to deal with a problem by following a multi-step process.

Effectively solving a problem does not mean going off and finding an answer right away. Using a structured process should help students to think critically through the problem and find the most appropriate solution.

As Woods et al. (1997) state, problem solving skill includes the following 12 attributes:

- being aware of the processes used;
- using pattern matching to quickly decide whether a situation is a problem or an exercise;
- applying a variety of tactics and heuristics;
- emphasizing accuracy (as opposed to speed.);
- being active by writing down ideas, creating charts and figures;
- monitoring and reflecting on the process used;
- being organized and systematic;
- yet being flexible (keeping options open, seeing the situation from many different perspectives and points of view);
- drawing on the pertinent subject knowledge and objectively and critically assessing the quality, accuracy and pertinence of that knowledge and data;

- being willing to risk and cope with ambiguity, welcoming change and managing distress;
- being willing to spend time reading, gathering information and defining the problem (as opposed to equating problem solving with "doing something" despite its pertinence); and
- having an overall approach that uses fundamentals rather than trying to combine various memorized sample solutions.

Project-based learning is a collaborative, learner-centered instructional approach where students work in groups to construct their knowledge and gain mastery of the course content, students have to produce an artefact to demonstrate their mastery of the content.

Problem-Based Learning is a similar approach but, in this case, students have to present a solution to a clearly defined authentic problem.

5. Case study

Case studies are based on the concept of active learning as they offer a student-based experience and through active involvement motivate the student. Students can develop articulate decision making in a protected context.

Through case studies, it is possible to conduct a direct analysis of data including consideration of the results, which helps the development of critical thinking.

A case study is usually a "description of an actual situation, commonly involving a decision, a challenge, an opportunity, a problem or an issue faced by a person or persons in an organization" (Leenders et al., 2001).

Their goal then is to elicit critical thinking rather than simple answers and to bring theoretical concepts closer to a practical implication.

6. Oral presentations: Teachers and students

Oral presentations are a good methodology for asking students to assess which requires students to use speech to express their knowledge and understanding of a topic. Oral presentations are a key tool for students to help develop successful oral communication and participation in debates and exchanges of ideas, which are key features of entering the world of work.

Achieving mastery of the topic allows students to share their knowledge in a structured and planned manner and to be able to interact with others listening to the presentation because of the critical thinking they have developed on the topic presented.

Listening to others' presentations and identifying their strengths and weaknesses also helps students establish their points of view and learn from indirect experience.

Teachers need to teach students how to structure effective presentations to help develop clearer thoughts as well. Teachers must strive to engage students in their learning process as active participants to develop creative and critical thinking.

7. Real-world activities

The classical teaching structure would seem not to help too much in the development of students' critical thinking skills. In fact, in this case, students are in a passive position since the main activity is the teacher's exposition of the topics in a linear and non-critical manner.

To stimulate critical thinking, it might therefore be interesting to introduce a more participatory lecture format, such as active learning.

To implement this type of teaching, it is essential the role of the lecturer. Indeed, she must prepare the students during the lesson by providing the material that will bring the students closer to the topic, but she must understand that the student will not have a completely clear and full understanding until she actively and reflectively approaches the topic.

In this way, the student will not only have a clearer understanding of the topic but through active learning she will more easily retain the knowledge acquired, since it has not only been studied but also discussed and thought about, in fact activating critical thinking.

8. Feedback

The tool of feedback within class discussions or following writing activities can prove very useful in helping students develop critical thinking skills.

Feedback can be defined as "all post-response information that is provided to inform the learner on his or her actual state of learning or performance" (Narciss, 2008).

Feedback can be useful whether it comes from someone more experienced who supervises the student's work, e.g., the teacher at this stage, later she will be her supervisor at work, or from someone who is at the same level as us, such as students, who offers peer feedback.

The teacher should use this tool by involving the student to improve the learning stage, making her aware of her strengths and also weaknesses to help improve them.

9. Drama

Drama is an appealing teaching strategy that promotes cooperation, collaboration, self-control, goal-oriented learning as well as emotional intelligence skills by engaging the brain and physical body in realistic simulation exercises (Ashton-Hay, 2005).

Through theater, students can engage in inquiry through role-playing, which leads them to explore new situations or issues and develop their point of view concerning them, promoting the development of critical thinking.

Thus, theater helps students relate theory and the real world in an active and involved way, experiencing new situations.

Theater helps students learn critical thinking, problem solving, collaboration, communication, creativity and self-awareness (Adiguzel, 2006).

How to?

1. Writing activities

A very important goal of classes should be to help students write through different forms, such as essay writing, letter writing, reflective writing, pre-writing or dialogic position paper writing.

Intervening in the writing process allows us to teach our students the content, concepts, cognitive processes, and communication practices of our discipline more intentionally and effectively.

Teachers have several opportunities to help students with the notions related to the writing process, such as sharing with students the evaluation criteria they will use, providing students with examples of well-written papers, providing feedback and suggestions to drafts, proposing a peer review system, lecturing on specific stages of the writing process to provide practical hints and guidelines, analyzing examples of peer writing to practically explain strengths and weaknesses.

Concerning the forms of writing mentioned earlier, let's see practical pointers that teachers could provide to students:

1.1. Position Paper

Ask each student to write a position paper on a topic that they select as important in the course. Regarding position papers or dialogic essays, that require constructing a historical narrative and reconstructing past events, it is important to explain to students the importance of consulting sources of various kinds to gather information, compare them, and find evidence for one's position to develop one's interpretations of the past event.

1.2. Reflective Writing

The teacher should prepare a list of questions that students could decide to answer in writing. A good exercise is to prepare a list of questions per lecture and ask students to write a response to one question among all in a web platform (e.g. wiki). In reflective writing, the teacher could ask specific questions as input for reflection on a particular

topic, such as a book or author studied, and then students could write reflections also considering their personal experience.

1.3. Restitution Activities

In restitution activities, students respond on a particular topic to a specific person, such as a journalist. The teacher should select a list of controversial papers/articles/media and ask students to prepare a response to the author in writing, expressing their point of view considering the argument proposed. In this way, they use their writing to relate to something and someone real thus opening a window to the real world and understanding the importance of writing to relate to others and express their thoughts.

1.4. Pre-writing

Pre-writing can involve, for example, writing questions in advance about a topic they will address in class and thus provide students with the time and ability to think critically and carefully about a concept.

2. Debates and cooperative work

Students must understand the importance of having sufficient supporting evidence to oppose the views of others convincingly. Therefore, students must learn to find both reasonable evidence to weaken a claim and evidence to support a claim.

2.1. Structured Classroom Debates

An important tool to help students in the development of their critical thinking is Structured Classroom Debates (SCDs), in which students are divided into teams to debate in class on a topic chosen and prepared in advance.

Teachers need to organize such activities so that all students can actively participate in the discussion, even the shyer ones who usually do not intervene.

Therefore, it might be interesting to include the discussion within the course design to make it an integral and fundamental part of understanding and to stimulate reflective learning that helps develop critical thinking. One option is to provide students with questions in advance to work in groups and develop articulate answers. Through group discussion, students can discover new information, develop their points of view and put knowledge into practice.

It is important to point out to students that it is not the outcome of the debate that matters, but the process: the way they present their arguments, their being convincing, and the stage of debate preparation.

Regarding the debate format, it is suggested to use teams or pairs depending on the objectives. The teacher identifies a topic covered in class and asks students to develop a pro and a con position for the topic. During the lesson, two randomly selected teams or pairs must present their arguments, exchanging arguments for and against the topic.

A vote can be taken among peers to decide which of the two teams provided more convincing arguments. It can be applied by assigning students the 'pro' role or the 'con' role and setting up a 'physical' discussion that distributes students around the class (pro vs. con team).

Rules and guidelines must be outlined by the teachers for the students concerning the management of the debate.

It is advisable to choose topics that are stimulating for students to be involved in the debate and on which they are assumed to have their initial ideas.

Teachers should play the role of facilitators of the process by leaving maximum autonomy to the students, mediating the debate to prevent students from bringing false arguments or arguing in an unconstructive manner, and concluding with a final account of what was said by providing input for students to think critically and create their ideas concerning the topic discussed.

2.2. Critical Points

At the end of each class, ask students to write the three most important concepts they identified in the lecture.

Ask the students to share them in a team of 4 and select the three most important for the team.

Share back in class the unique points that are emerging and discuss the most valuable or the missing ones.

3. Questions and enquiries

When developing questions, teachers need to think about the purpose, level of difficulty, and types of questions that can best help students achieve the objective, keeping in mind that all students need experience to answer challenging questions.

When teachers prepare their lessons, they can develop challenging questions to present to students along with the chosen topic.

The most interesting type of question for developing critical thinking is the creative question, which requires organizing studied notions and concepts to structure an answer that brings together both concrete and abstract thinking.

Below are some practical instructions for using the question tool for the development of critical thinking:

- The teacher should prepare questions in advance, linking them to the theme of the lesson and presenting them in a logical and orderly manner.
- Formulate open-ended and accurate questions and avoid vague and imprecise questions.

- It is important that a calm and trusting environment is provided in which students feel comfortable answering questions, even if they make mistakes.
- Alternate between more complex and simpler questions so as not to discourage students.
- Try to provide space for different answers and opinions from each other, avoiding overly praising some students' answers and thereby inhibiting another's different answers.
- Encourage open student dialogue on the question asked, ensuring a calm and positive atmosphere.
- Students' answers can be repeated to summarize their answers and legitimize them.

3.1. Preparing an interview with the teacher

Students prepare at home questions they want to ask the teacher. The questions are shared online with the teacher who can take a first look. In an ad hoc lesson (or at the end of class periodically) the teacher answers students' questions.

It is possible to indicate different types of questions that can be received: what I didn't understand last time, deepening on lesson topics, skills most important with respect to labor market requirements, what skills are activated by the course topics, etc.

3.2. Examiner for a day

During the last lesson of the course the teacher asks students to write down and give her 5 questions that could be exam questions from the subject being studied, pointing out that she will choose some of the questions for a section of the final exam.

This will encourage students to spend time developing structured questions by asking themselves which topics are most important and worthwhile to be asked on the exam.

The teacher can create an exchange time where students share the questions and other students give feedback on the validity of the question.

4. Problem solving

Since it is a situation that has never been encountered before, try to encourage students to be open to all possibilities and to make a great mental effort since it is not possible to use problem solving models that have already been faced and solved in the past.

It is important to point out to students that there are no perfect solutions in the real world but that one must find the best solution for the specific situation.

However, it is possible to provide students with techniques for approaching the problem in a more structured way.

4.1. Six Steps to Effective Thinking and Problem Solving – "IDEALS", (Facione, 2007)

The teacher guides students to reflect on a problem from the lesson, in 6 steps:

- **I Identify the problem**: What are we addressing?
- **D Define the context**: what are the main elements of the problem?
- **E Enumerate the choices**: what options do we have?
- **A Analyze the options**: What is the best alternative available?
- **L List the reasons explicitly**: Why is it the best alternative available?
- **S Self-correction**: looking at the problem again, what did we miss?

This method of problem-solving uses learner participation and leads students through the critical thinking process.

4.2. Six-hat technique, (Edward De Bono, 1985)

The teacher presents a problem to students and guides them to think about it through the six-hat technique. This technique helps to develop reflective and systematic thinking and leads to thoughtful decisions considering all points of view.

The six hats are the metaphor that helps the student see the problem from different points of view, wearing a different hat each time to approach the problem differently. In fact, each hat has a color and each color indicates a different function of thinking:

- WHITE: corresponds to objectivity, pushing to identify figures and data at hand.
- RED: represents the emotional point of view and makes one express without threads the emotions one feels about the problem.
- BLACK: corresponds to logic and negativity, helps to put things in order and understand what can and cannot be done.
- YELLOW: represents *positivity* highlighting the positive aspects of possible solutions.
- GREEN: refers to creativity and helps to create new original solutions to the problem.
- BLUE: corresponds to control and organization and helps to have an overall view of the problem and create order among possible solutions.

4.3. Brainstorming

To stimulate students in solving a problem, the teacher can divide the class into groups and hold brainstorming sessions in which students focus on the problem at hand and pull out as many ideas as they can think of. The teacher goes between the groups and plays the role of the facilitator; she must also:

- Encourage all ideas, even "crazy ideas" as the more ideas the better.
- Create a judgment-free environment in which the flow of ideas is not stopped.
- Encourage building on the ideas of others to develop new, richer ideas.
- Help students maintain focus on the problem at hand.

5. Case study

Through case studies, students can experience situations that in a teaching context they would not otherwise have access to. They can analyze real data and try to provide a potential solution, without being in that situation.

It is also advisable to accompany the case studies with feedback when the cases are addressed in class during the lesson. In fact, by conducting the case studies in this way, it is possible to create resolution groups of students who stimulate each other and exchange different points of view on the problem under consideration

Case studies can be used within different disciplines, including law, economics, nursing, social sciences, health care, and others.

Teachers can use case studies within their lessons to help students make a previously explained topic their own. This tool is great for applying theory to practical cases, testing one's decision-making skills, and identifying the most relevant aspects of the course.

The cases help to develop one's thinking, and the comparison with others helps the student to think actively and critically, analyzing different ideas from different perspectives.

6. Oral presentations: Teachers and students

It can be helpful for students to have guidelines that explain how to develop a well-structured presentation. It is important to explain to students that the most important aspect that makes a presentation effective is not the specific topic of the presentation, but how it is articulated and communicated. It is also not enough to know the topic well, it is necessary to adapt to the situation and the target audience of the presentation by opening an active dialogue with it.

Professors can therefore help students by explaining well the reasons why this activity is being done and its teaching objectives, to increase student participation.

An important guideline for students is to identify the main topics with which to separate the presentation to help the audience follow along.

6.1. Meta-lesson

To help students understand how to prepare a presentation, the lecturer can give a meta-lesson in which she explains a topic but at the same time also explains how she has structured the presentation and what are the key points to keep in mind when developing a presentation.

The most important aspects of an oral presentation are as follows:

1. Introduction - it is important to introduce yourself and present the topic to the audience. Explain in clear language the structure and objectives of the presentation trying to capture the interest of the audience.
2. The main body (methods, results) - the main objective of this phase is to clearly state your ideas using a clear and defined structure (chronological order, order of importance, order of theme). You can use pictures or videos to accompany the speech and to keep the audience's attention high.
3. Conclusion (discussion) - it is very important to finish the speech with structured conclusions that recall the objective of the presentation and the main points. Finally, it is important to engage the audience by inviting them to ask questions or make comments.

6.2. Presentation schedule

The lecturer may ask students to choose a topic she has explained from the course and propose an alternative presentation outline, highlighting how she would modify key aspects of the presentation. The lecturer may ask students to hand over the outline and then may ask some students to develop it and present it to the class.

7. Real-world activities

Experiential activities are an important tool for teachers to engage students in a participatory learning process. This approach can be easily used in a variety of contexts, such as group projects, simulations of real situations, strategic competitions, the guided analysis of case studies, service-learning activities, and small projects with real customers.

Teachers can use two useful dimensions to assess the experiential level of activity, namely, experiential content and task structure.

Content refers to the level of cognitive processes and is characterized by three features: ambiguity, realism and complexity.

Ambiguity refers to the level of clarity and notoriety of the main features of the situation under consideration. This characteristic helps the development of critical thinking because it places the student in a position to think and reflect on the situation under consideration.

Realism means how closely the specific activity approximates situations in reality, for example, classroom exercises have a low level of realism while projects with clients have a high level of realism.

Finally, complexity means the articulation of the characteristics of the situation under consideration. The more complex a situation is, the more the student will be required to think actively and critically.

The structure of the task denotes how well the situation under consideration follows a clear structure or not. In the former case, it is indeed easier for students to approach the problem, but in the latter, more active and critical experience is required of students, promoting learning.

8. Feedback

Following activities such as presentations, debates, focus groups, or written papers, the teacher creates moments where she gives feedback to students.

For feedback to be effective for teaching, it must meet certain conditions (Gibbs and Simpson, 2004):

- sufficient in frequency and detail;
- focused on students' performance, on their learning, and on the actions under students' control, rather than on the students themselves and/or on personal characteristics;
- timely in that it is received by students while it still matters and in time for application or for asking for further assistance;
- appropriate to the aim of the assignment and its criteria;
- appropriate about students' conception of learning, of knowledge, and of the discourse of the discipline;
- attended to;
- acted upon.

8.1. Written Feedback

At the end of the course, the professor can provide written constructive feedback to students that ask for it. It is possible to view feedback as an incentive to increase response rate and response quality.

8.2. Give Feedback

The teacher provides to students an essay from previous years and asks them to write three positive points, three development ones and three suggestions in the form: I like… I wish… what if…

9. Drama

The teaching method, which involves a lot of hands-on activities, starts with a warm-up that relates to the chosen idea and games that reinforce it. The primary teaching portion is then followed by cartoons made with improvisational methods and role-plays.

Students attempt to develop many characters, scenarios, and body types to illustrate the major concept in this section. Students participate in activities that involve evaluating and discussing all events, performances, and cases at the end of the lesson.

Students utilize their bodies, voices, and gestures during the entire teaching process to assume the role.

They also use their minds to think in new ways to comprehend others, solve problems, and come up with workable answers in a particular situation. To solve the problems given to them, they must constantly collaborate and draw on their daily experiences.

9.1. Warm-up: the raft

The teacher must mark out a space that will be the raft. Students have to walk around imagining they are on a raft in the middle of the sea. The goal is to keep the raft balanced and from tipping over.

Students must then occupy it evenly, without leaving holes, without stopping and bumping into each other, and realizing who is walking along with them.

It's a good exercise to break the ice and amplify perception in relation to others and build trust. It is possible to do this exercise before group activities to help team building.

You can only say YES!

The teacher divides students into pairs. In turn, one of them starts to tell the other something by asking questions to which the other can only ever answer YES.

The exercise is repeated with the same dialogue, and this time the student who answers can only say NO.

Then the parties are switched: the one who answered asks questions and vice versa.

This exercise helps students think more critically and reason about the weight and meaning of words.

How to assess skills' development?

- Self-assessment Scale on Active Learning and Critical Thinking (SSACT)

https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-015-0422-2

- California Critical Thinking Dispositions Inventory (CCTDI)
- Collegiate Assessment of Academic Proficiency (CAAP)
- Cornell Critical Thinking Test (CCTT)
- Critical Thinking Assessment Battery (CTAB)

doi:10.1088/1757-899X/349/1/012066

SKILL#4
DIGITAL LITERACY

Authors: Soledad Domene, Juan A. Morales, María Puig, Margarita Rodriguez *[US]*

Short Characteristic

Digital, according to Wikipedia, usually refers to something that uses digits, often binary, and has a wide range of meanings in the fields of technology and computing (digital electronics, digital photography, digital computer, digital recording, digital data, digital signal, digital media), socio-economic phenomena (digital culture, digital divide, digital economy, digital marketing), or other uses (trademarks, fingerprinting, digital footprint...). It is undoubtedly a relevant concept in the world in which we live and has a cross-cutting relevance, as it can be used to designate devices or procedures for the generation, transmission, processing or storage of information (data).

Redecker (2017) offers us a glossary of which the following meanings of digital are worth highlighting:

Table 1: Glossary of digital.

Digital competence	Digital competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society.
Digital communication	Communication via digital technology. There are several modes of communication, e.g. synchronous communication (real-time communication, e.g. via skype or videochat or Bluetooth) and asynchronous (non-concurrent, non-simultaneous communication, e.g. email or SMS), one-to-one, one-to-many or many-to-many.
Digital content	Any type of content in the form of digital data, data encoded in a machine-readable format, and which can be created, displayed, distributed, modified and stored using digital technologies. Examples of digital content are: web pages and websites, social networks, data and databases, digital audio such as mp3 and e-books, digital images, digital video, video games, computer programs and software.
Digital enviroment	A context, or 'place', enabled by digital technology and devices, often delivered through the Internet or other digital media, e.g. the mobile phone network. Digital environments are often used to interact with other users and to access and publish user-created content. Records and evidence of a person's interaction with a digital environment constitute their digital footprint.

Digital resources	The term usually refers to any content published in a computer-readable format. For the purposes of DigCompEdu, a distinction is made between digital resources and data. In this respect, digital resources are any kind of digital content that is immediately comprehensible to a human user, while data are to be analysed, processed and/or interpreted to be useful for educators.
Digital services	Services that can be provided through digital communication, e.g. Internet or mobile phone network, which may include the delivery of digital information (e.g. data, content) and/or transactional services. They can be public or private, such as e-government, e-banking, e-commerce, music services (e.g. Spotify), film and TV services (e.g. Netflix).
Digital technology	Any product or service that can be used to create, display, distribute, modify, store, retrieve, transmit and receive information electronically in digital form. In this framework, the term 'digital technologies' is used as the most general concept, covering ◆ computer networks (e.g. the Internet) and any online services supported by them (e.g. websites, social networks, online libraries, etc.), ◆ any kind of software (e.g. programs, apps, virtual environments, games), whether networked or locally installed; ◆ any type of hardware or 'device' (e.g. personal computers, mobile devices, digital whiteboards); and ◆ any type of digital content, e.g. files, information, data.
Digital tools	Digital technologies used for a specific purpose or to perform a specific function, e.g. information processing, communication, content creation, security or problem solving.

Focusing on the field of competences, Margherita Bacigalupo (2022) provides an overview of European competences frameworks (as a multi-stakeholder consensus) and their possibilities as tools for guidance and lifelong learning, and notes that the European Digital Competence Framework for Citizens (DigComp) originally published in 2013 (Figure 23) (Ferrari, 2013), updated to version 2. 0 in 2016 (Vuorikari,

Punie, Carretero & Van den Brande, 2016), to version 2.1 in 2017 (Carretero, Vuorikari & Punie, 2017) and to version 2.2 in 2022 (Vuorikari, Kluzer & Punie, 2022).

Figure 23. *DigComp, competence areas and competences*

The European Commission (2019), in the framework of key competences for lifelong learning describes digital competence as the confident, critical and responsible use of and engagement with digital technologies for learning, at work and in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), security (including digital well-being and cybersecurity skills), intellectual property issues, problem solving and critical thinking.

Abilities connected to digital literacy skill

The KeySTART2Work Project (Erasmus+) developed a list of key transversal competences for employability, including Information gathering and processing, which they describe as: Being able to responsibly discriminate the source of information in order to obtain only valid and solid information. Being able to classify, compare and analyse information by identifying appropriate strategies and approaches; Research, organisation of information, ability to interpret, compare, verify and critically process information. Competence integrating knowledge, skills and attitudes as presented in the following table:

Knowledge	Abilities	Attitudes
There is a theoretical and fact-based knowledge of the following topics: • Communication technologies. • Sources of information.	• Collect information from various sources, including new media. • Validate sources of information. • Validate information. • Analyse available information. • Compare. • Verify. • Interpret. • Categorise information.	• Search for truth. • Critical approach to information.

Similarly, the European Commission (2019) describes the following elements of digital competence:

a) Knowledge. Individuals should understand how digital technologies can support communication, creativity and innovation, and be aware of their opportunities, limitations, effects and risks. They should understand the general principles, mechanisms and logic behind evolving digital technologies and know the basic functioning and use of different devices, software and networks. Individuals should take a critical approach to the validity, reliability and impact of information and data made available through digital means and be aware of the legal and ethical principles involved in the use of digital technologies.

b) Skills. Individuals should be able to use digital technologies to support their active citizenship and social inclusion, collaboration with others and creativity towards personal, social or business goals. Competences include the ability to use, access, filter, evaluate, create, programme and share digital content. Individuals should be able to manage and protect digital information, content, data and identities, and to recognise and interact effectively with software, devices, artificial intelligence or robots.

c) Attitudes. Engagement with digital technologies and content requires a reflective and critical, yet curious, open and forward-looking attitude to their evolution. It also requires an ethical, safe and responsible approach to the use of these tools.

Examples of typical professional tasks supported by the skill

Bearing in mind the cross-cutting nature of digital competence, we can point to three examples of tasks common to different professional fields:

a) Access to different sources of information. The development of digital competence in terms of Internet use offers us the possibility of having access to up-to-date and diverse information in order to understand and address the demands of our professional work.

b) Availability of tools (software, programmes....) for the organisation and processing of information. In this sense, although there may be specific features in different sectors or professional activities (and of course in institutional or work contexts), it is possible to point out in general terms the importance of mastering office automation tools such as word processing programmes, databases, spreadsheets, programmes for the preparation of presentations, etc.

c) New channels for communication and collaboration. Knowledge and mastery of information and communication technologies offer us new opportunities for communication and collaboration, breaking the temporal and spatial limits of face-to-face (synchronous); and also opening up options for relationships through social networks.

Methodologies/learning strategies

Redecker, C. (2017) provides us with a series of activities that are examples of this competence and that can serve to indicate the type of activities it covers:

- Articulate information needs
- Responsible use

- Enable students to manage risks
- Identifying and solving problems

1. Articulate information needs

Incorporate learning activities, tasks and assessments that require students to articulate their information needs; find information and resources in digital environments; organise, process, analyse and interpret information; and compare and critically evaluate the credibility and reliability of information and its sources.

It involves, among other things, knowing how to navigate the Internet, how and where to search for resources, products and services; knowing how to manage, track and organise information in a personal library of content by means of folders, tabs or subscriptions; identifying the validity, updating and reliability of sources, and distinguishing between different file formats (Pearson, 2021).

For example, we can promote the development of this competence by setting students tasks related to information searching, such as:

a) Identifying, through different search engines and digital platforms (Google, Bing, DUckDukGo, Startpage, Giburu, Qwant, Yahoo Search, Google Scholar, HighBeam Research, Redalic, RefSeek...), information on a specific topic that is going to be dealt with in class, so that students have prior information on the content to be developed. From these sources, they will be able to draw up a concept map.

b) Identify, through different search engines and digital platforms (Google, Bing, DUckDukGo, Startpage, Giburu, Qwant, Yahoo Search, Google Scholar, HighBeam Research, Redalic, RefSeek...), either information on a specific topic that has been dealt with in class, so that students have to go deeper into this topic and improve their knowledge, or specific digital resources on the subject. From these sources they will be able to produce a report on the topic.

c) Students must not only locate documents, resources (textual, audio, images, videos...) but also analyses them, identifying the common aspects in different sources or the 3 most outstanding/relevant ones.

d) Students should distinguish between different typologies of information/resources (advertisements, sponsorships, scientific papers...).

e) Develop a database with information and resources on a specific topic raised in the subject. Identify different sources/resources for which the topics/approaches presented must be identified and catalogued, creating a digital register that will allow their consultation through different descriptors (proposed as relevant/significant from the approach of the subject).

2. Responsible use

Incorporate learning activities, tasks and assessments that engage students in the responsible use of digital technologies for communication, collaboration and civic participation.

Digital communication skills mean being able to create personal and professional relationships in the virtual context, knowing how and when to send messages, information or attachments, from the channel to the right format, and mastering the so-called netiquette or "web etiquette", i.e. the rules of Internet politeness. It also includes familiarity with asynchronous communication, and that which takes place live, but remotely at events, meetings or webinars, being able to use the videoconferencing tool correctly, participate and understand without being distracted by technical details; or the ability to use tools to develop asynchronous or remote work (Pearson, 2021).

For example, we can promote the development of this competence by having students carry out tasks related to the communication of information, such as:

a. Elaborar una presentación (inicial o de profundización) sobre un tema concreto, utilizando algún software específico (Power Point, Canva, Prezi, Google Slides, Visme, Keynote, Slidebean, Swipe…). Esta presentación podrá ser entregada al profesor como documento de evaluación o también previamente presentada al grupo clase, como recurso para compartir/discutir sobre la temática planteada desde la perspectiva desarrollada por los estudiantes (individual o grupos).

b. Formar grupos de trabajo entre un número determinado de estudiantes (3-4) que deberán desarrollar una tarea de búsqueda de información/recursos para un tema de la asignatura, para lo que deberán apoyarse en alguna herramienta digital de trabajo colaborativo (Slak, Trello, Figma, Google Docs Editors, Mural, MindMeister, BinFire, Asana…) o los recursos de una plataforma (Microsoft Teams, Google for Education, Edmodo, Zoho, Google Hangouts, WordPress…). También se puede plantear un trabajo individual y la colaboración a nivel del grupo clase.

c. Cada estudiante/grupo ha de localizar un número determinado de documentos/recursos que habrá de presentar, analizar y valorar con un grupo de estudiantes, que deberán elaborar una síntesis. En una segunda fase se podrán abordar las síntesis de los distintos grupos, que podrán ser compartidas para el grupo clase de forma presencial o bien a través de la herramienta virtual colaborativa utilizada (o plataforma virtual institucional).

d. Los estudiantes, o grupos de estudiantes, deberán elaborar y compartir sus aportaciones (documentos, recursos…) a través de diferentes recursos tecnológicos (redes sociales, mail, espacios compartidos, plataformas…)

3. Enable students to manage risks

Enable students to manage risks and use digital technologies safely and responsibly.

This skill relates to the ability to identify, avoid and/or correct all kinds of common risks or problems in the digital domain. For example, malicious software, attempted scams, vulnerability of personal or sensitive data, loss of information due to lack of backup, identity theft, copyright and license violations, etc. In short, it means that, without needing to be a cybersecurity expert, you know how to keep yourself and your colleagues safe, how to protect your personal data and the data entrusted to you by the company, and how to respond quickly and efficiently to any suspicious situation (Pearson, 2021).

4. Identifying and solving problems

Incorporate learning activities, tasks and assessments that require students to identify and solve technical problems or transfer technological knowledge to new situations.

a) The teacher poses a question/problem on a content/topic of the subject (disciplinary, scientific, technical principle...); and the students, or groups of students, must search for relevant/significant information on the subject through different technological tools, exemplifying for example the uses or applications of these principles in real and concrete situations.

b) The teacher presents a situation/context through a video recording in which a certain technology or a certain relationship/organisation model is used. Students are asked to analyse the recording and identify the underlying principles/theories that have enabled its transfer to a real problem.

c) Use of simulators (driving simulators, flight simulators, train simulators, network simulators, social dynamics simulators, music simulators, business simulators, etc.) as learning experiences.

d) The teacher presents a case or situation, real or simulated, for which the students, individually or in groups, must seek an interpretation and possible solution, making use of different technological resources, both for the search for information and its analysis and organisation, and for the presentation and dissemination of their results and conclusions.

e) Use of specific educational software, for example:

- Dialogue simulators. A type of interactive role-playing game that mimics a conversation in a given situation and time, and allows mastering communication skills in a safe environment (either with other colleagues/colleagues, clients, other groups or individuals). For example: iSpring Suite Max, BranchTrack, Articulate 360.

- Software simulators. A type of software that allows the presentation of its features, details, operation .... and therefore can provide an opportunity to learn how to use it. For example: Adobe Captivate 2021, Atomi ActivePresenter 8.
- Behavioural simulators. Similar to dialogue simulators but can recreate real-life situations and allow learners to practice their skills; these include Virtual Reality or Augmented Reality. For example: ITyStudio, Uptale, Vuforia Enterprise AR Suite.

Bearing in mind that teaching/learning processes focused on the development of key competences emphasise the involvement of people in their learning process (placing the student at the centre and requesting their active participation), collaboration (opportunities for innovation and interdisciplinary learning) and the contextualisation of learning situations (significance of learning, problem solving), we can point out some methodologies/strategies to be considered:

Problem-based learning.
Comic.
Case studies.
Focus groups.
Round table.
Panel.
Philips 66.
Aronson's Puzzle.
Role playing.
Simulation.

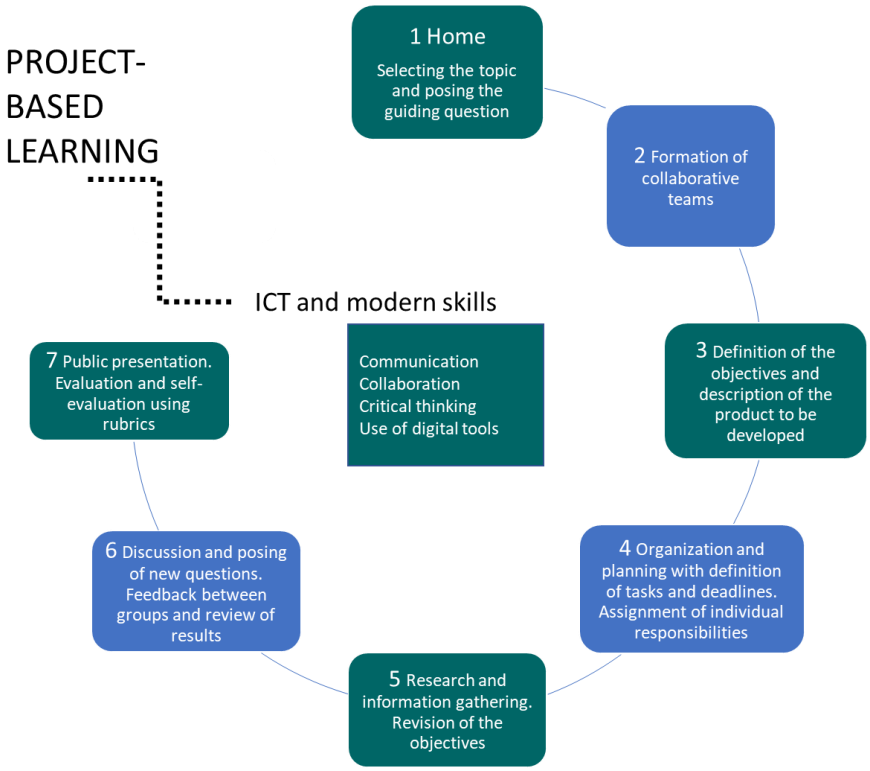
How to?

Competence development is best supported when it takes place in a variety of learning environments. Collaboration between stakeholders in education, training and non-formal learning, as well as cooperation with non-educational partners in local communities and employers, supports this. Cross-sectoral cooperation facilitates the transition from education to work, and from work to education, and establishes a strong link between what is taught and societal change and relevance (European Commission, 2019).

Problem-based learning

This is a method by which students construct their knowledge on the basis of real-life problems. Unlike the case method, in which, in its most generalised format, given the information previously, we solve the problem described in the case by finding the most appropriate solution through the use of the information given, in PBL the problem is presented first, from which learning needs are identified (what we should know or

know how to do to be able to solve it). The necessary information is sought (using all kinds of resources at our disposal: bibliographic, documentary, personal, extracted from the environment...), to finally return to the problem and, using the information obtained, check whether we have achieved understanding and/or can solve it. It does not so much seek the acquisition of knowledge, but rather the way to continue learning (or to act as any practising professional in the case of Vocational Training or university education). In other words, one learns to detect problems, to ask questions that lead to their understanding, to search for and locate relevant information, to use it and to check its validity. The problem posed can be an event, a situation, a task, a question. It is a strategy close to the project method (the project method can take the form of research or study of a problem, the form of construction, creation or elaboration of something or even a mixed format).

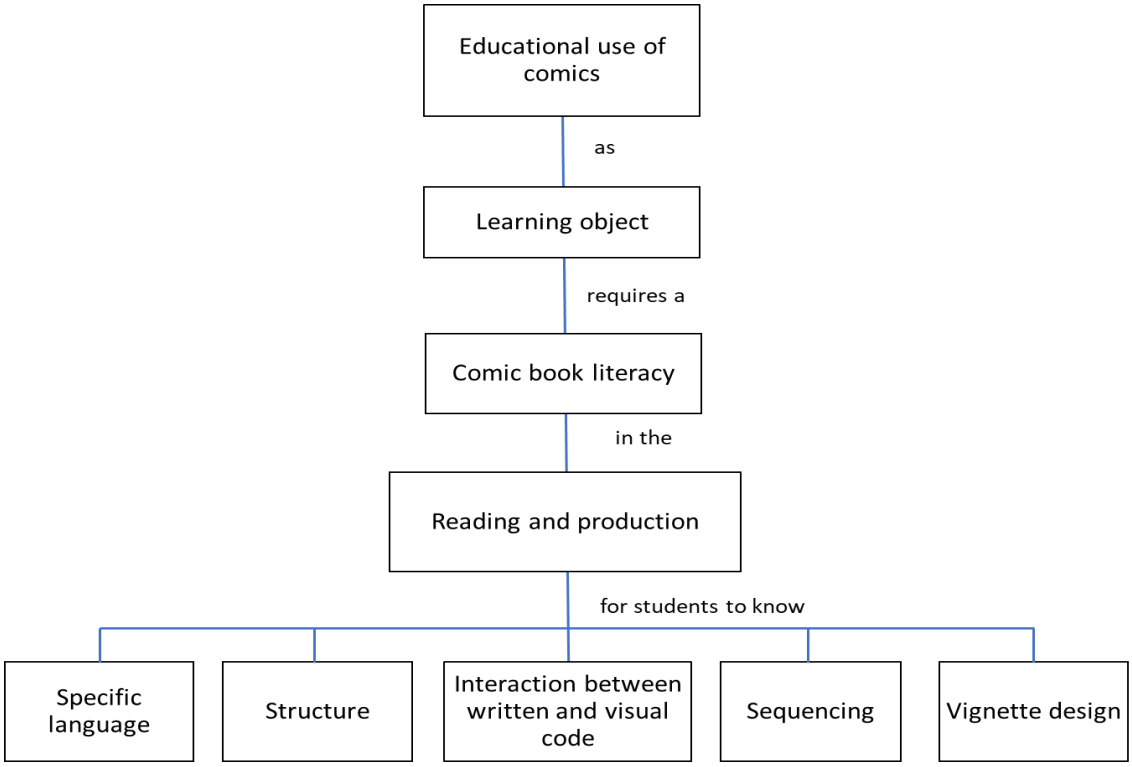


Source: https://gesvinromero.com/2018/08/08/aprendizaje-basado-en-proyectos-un-proceso-de-7-etapas-infografia/

Comic

This is a narrative medium of social communication in which stories or events are told, generally combining images and texts in an overall message. The texts are always subordinate to the images, which can appear without words (silent comics), without losing their communicative value. Each vignette represents a defined moment of the action, placing it in a precise space and time. The story progresses from one vignette

to the next, omitting intermediate events that the reader can only read at the moment of reading.



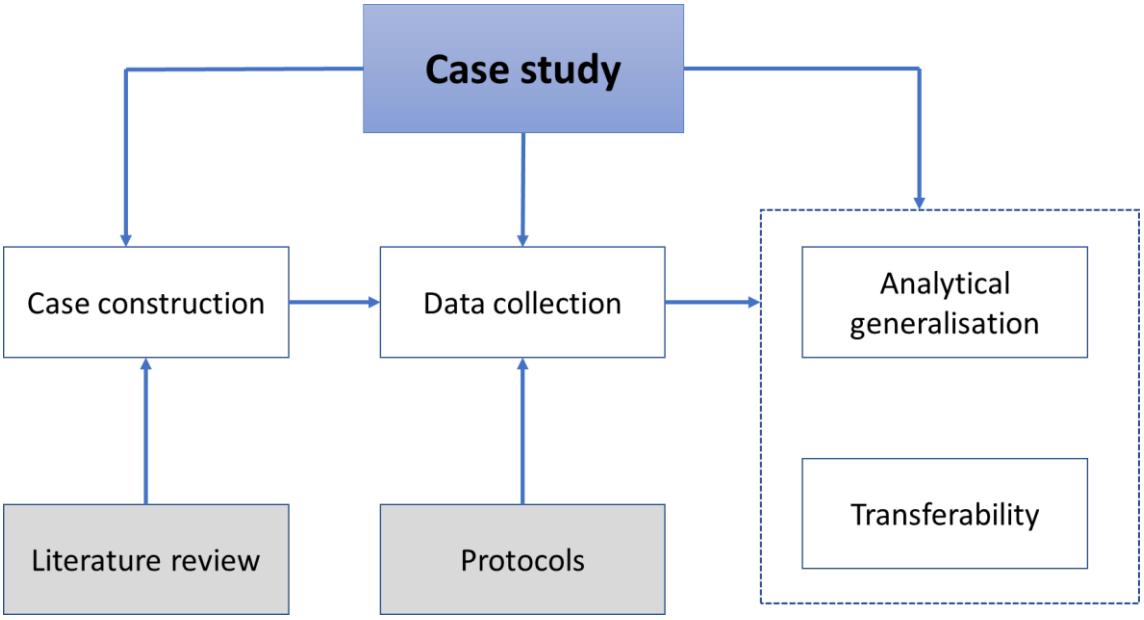
Source: https://www.redalyc.org/journal/140/14064761007/html/

Case studies

Narratives are stories, the oldest and most natural way to make sense of life, experience, events, etc. Narrative knowledge is more concerned with human meaning than with hard facts, more with coherence than with logic, more with understanding than with predictability. The assumption that learning is an act of meaning-making has led to the acceptance of the use of narratives as a learning strategy. We all see our lives as narratives which, in turn, are connected to other narratives. "Telling and thinking stories" is a common means of engaging learners in understanding concepts, principles or problems, in using reflective thinking, in exercising decision-making or in developing attitudes and values. Stories can function as a substitute for direct experience, allowing other perspectives to be adopted, decisions to be weighed up or actions to be evaluated. Of the narrative strategies, we highlight the case study for its didactic potential to teach problem solving, although, depending on the story told, it can be used for any other purpose. Fictional or real narratives (biographies, diaries), narratives of examples of practice or experiences, situations or events, personal testimonies (interviews, for example), oral narratives such as role-playing, narratives that record critical incidents (the latter are used more in professional training), etc. can also be used. It is not just about telling or reading stories; it is about helping to reflect

on them. This process should be guided by the teacher through classroom dynamics (assemblies, brainstorming, debates) and tasks that help to give meaning to the narrative from the objectives set out in our didactic proposal (tasks of understanding, analysis, use of the categories or concepts studied, proposal of alternatives, anticipation of consequences, assessment and judgement, etc.). This strategy can also be used in the opposite direction: the students themselves can create their own narratives (e.g. recounting their experiences, writing autobiographies about some aspect or stage of their lives, making learning diaries (what I have learned today or about this subject, what it has given me food for thought, what I remembered when we were working on it in class, etc.).

Digital technologies used in project-based learning, for example, enhance the study process and support the development of digital competences (European Commission, 2019).



Source: https://www.lluiscodina.com/estudios-de-caso/

The implementation of the case study requires attention to the following phases:

1) 1 Presentation of the case to the students.
2) 2 Sharing of opinions, impressions and alternatives by the students.
3) 3 Building a group consensus of the situation.
4) 4 Relating what has been studied to the situation.
5) 5 Drawing conclusions on the analysis obtained.

Focus groups

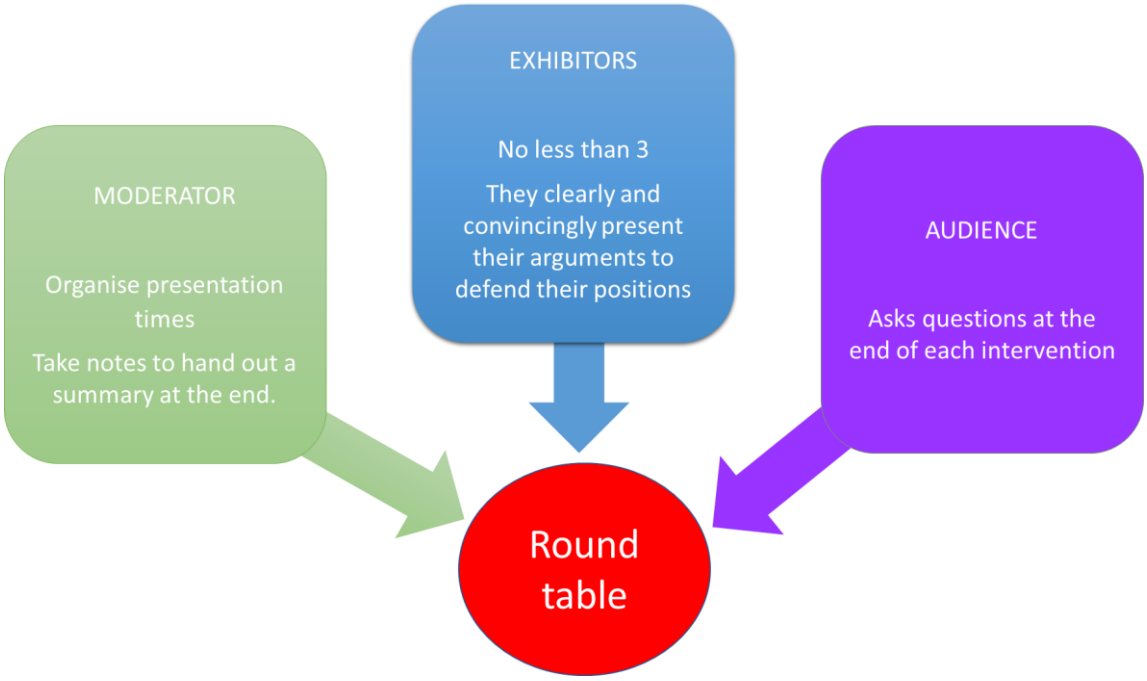
A focus group is a carefully planned conversation designed to elicit information on a defined area of interest in a permissive, non-directive environment. It is conducted with approximately seven to ten people, guided by an expert moderator. The discussion is relaxed, comfortable and often satisfying for the participants as they pool their ideas and comments. Group members influence each other as they respond to the ideas and comments that emerge in the discussion. Mutual face-to-face exchange of ideas and opinions between group members in an informative way, with the active and stimulating help of a facilitator in order to solve a problem, gather information or make a decision.

The main uses include:

- Encouraging group creativity and participation
- Drawing on the group's knowledge and experience
- Stimulating reflection and analysis

Round table

The round table technique consists of a group of experts holding divergent or contradictory points of view on the same topic, which they present to the group in succession.



Source: http://innovacionyensenanza.blogspot.com/2015/10/mesa-redonda.html

Panel

In the panel technique, a team of experts discusses a topic in the form of a dialogue or conversation before the group. As in the case of the Round Table and the Symposium, in the Panel, several people come together to present their ideas on a given topic to an audience. The difference is that in the Panel, these experts do not "expose", do not "speak", do not act as "speakers", but dialogue, converse, debate among themselves on the proposed topic, from their particular points of view and specialisation, as each one is an expert in a part of the general topic.

As a didactic strategy, the teacher can provide the students with orientations in relation to a given topic, presenting different points of view/interpretations/valuations of the topic. Students have to analyse and reflect on these approaches.

A basic sequence might include the following structure or phases:

a) The moderator introduces the members and asks a question about the topic of the session.

b) Table members or panellists make their presentation on the topic.

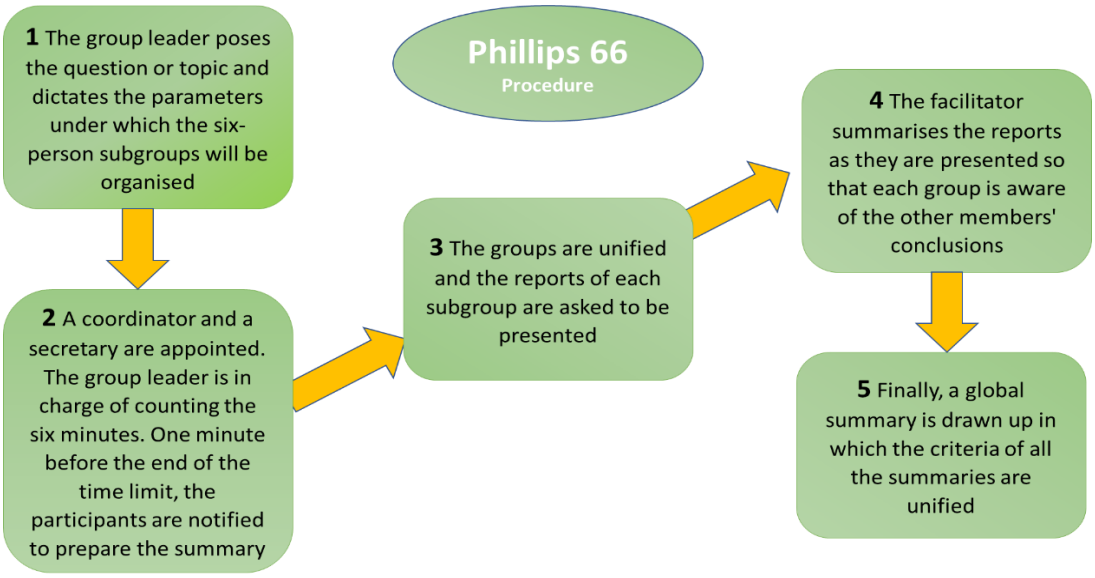
c) The moderator may present further questions to address other aspects of the topic, and may offer to involve the audience by submitting questions.

d) After the presentations, the panellists present a summary or synthesis of their approaches/ideas.

e) The moderator presents final conclusions; or the participants (students) are asked to draw these conclusions, which can be presented to the teacher or shared with the class group.

Philips 66

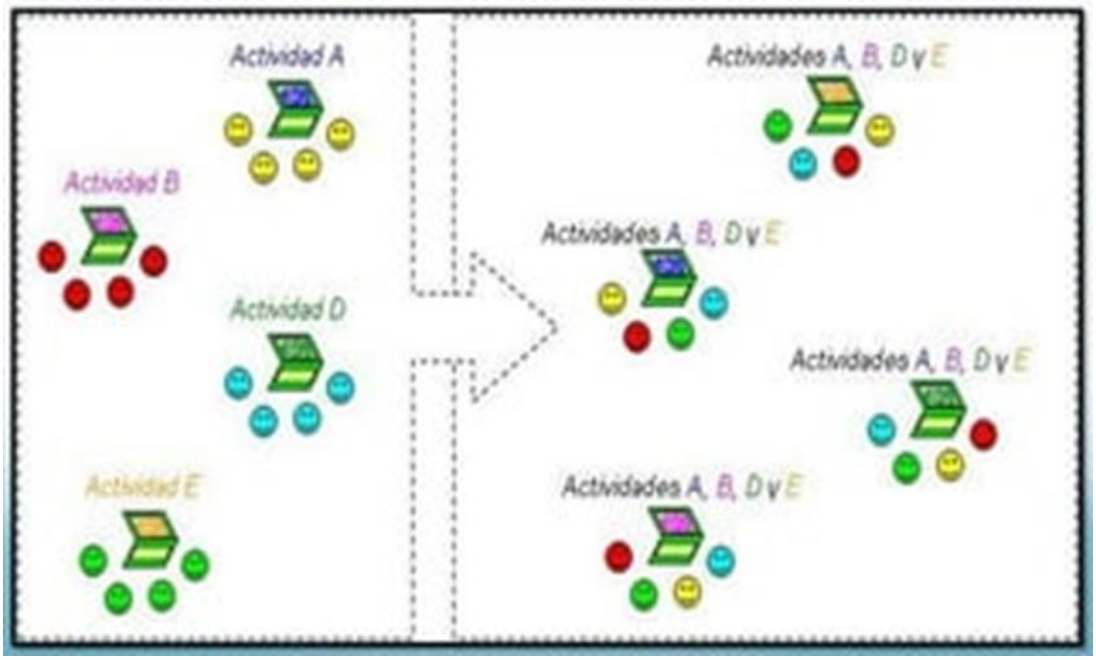
Group dynamics technique based on group organisation to elaborate and exchange information through efficient time management. A large group is divided into subgroups of 6 people to discuss a topic for 6 minutes and come to a conclusion. The overall conclusion is then drawn from the report of all the subgroups.



Source: http://tecnicas-estudio-tics.blogspot.com/2014/11/phillips-66.html

Aronson's Puzzle

This is a cooperative work technique by means of which students, organised in groups, pursue certain learning objectives by tutoring each other on the parts into which a subject is subdivided, in such a way that each student specialises in a part which he/she will explain to his/her group mates.



Source: https://es.slideshare.net/evalopezcano92/el-puzzle-de-aronson

Role playing

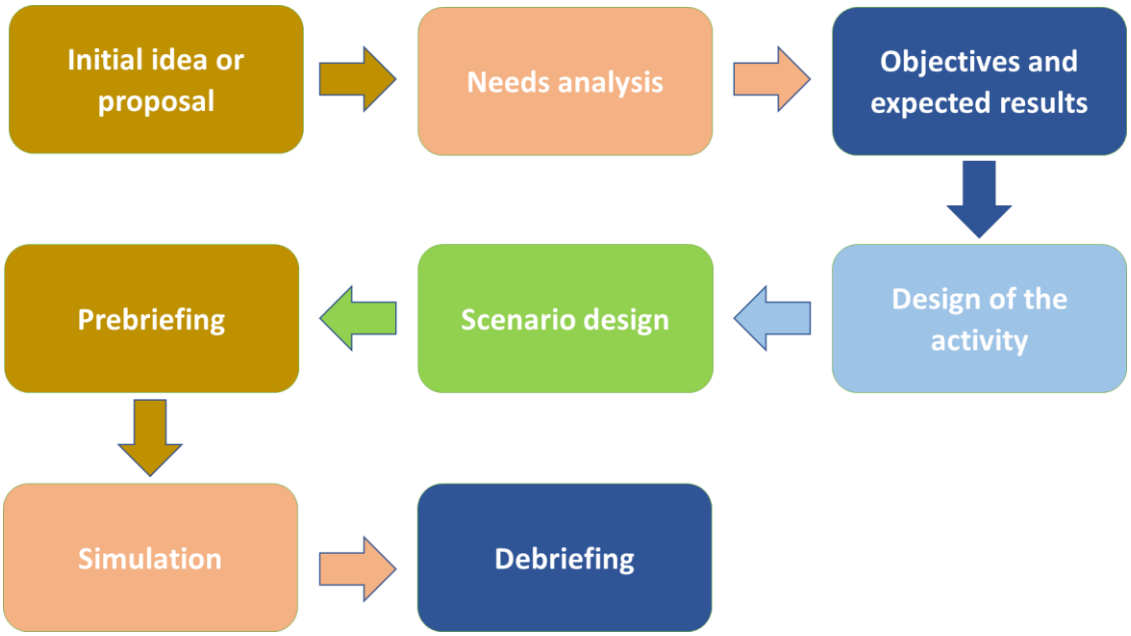
This consists of dramatising, through dialogue and improvisation, a conflict situation in which different positions have to be combined (role playing). Several members of a group take on the role of certain characters to discuss or analyse a case or situation in front of the large group. Developing a topic based on a simple conversation between characters assumed by members of the group. It is less dramatic than socio-drama.

Four phases can be identified for its development:

1. Motivation. The teacher presents general information about the activity to be developed and promotes a climate of trust. He/she presents the topic or conflict to be considered as the theme of the session.
2. Preparation of the dramatisation. The teacher, presenting the conflict, identifies the characters involved and the situation or context to be taken into account.
3. Role play. Students assume the assigned role and prepare their arguments, trying to find a dialogue that evidences the conflict with the roles of their classmates.
4. Debate. The different moments of the situation are analysed and evaluated. Students can ask questions about the dramatised topic, and students could even be asked about their opinions on the subject or how they have felt when assuming the role they have played.

Simulation

Simulation is the reproduction of a process or phenomenon by means of a simpler or more convenient and controlled process or phenomenon that evolves in a similar way to the first. Simulations allow a real or hypothetical situation to be reproduced or represented in a simplified form, while games are also simulations, but with a compression component. Generally speaking, simulation is an experimental approach to solving problems and answering specific questions about the behaviour being simulated.



Source: https://es.slideshare.net/danielgc/estrategias-de-simulacion

Digital competence is a transversal competence that can be developed in parallel to the development of the other key competences, particularly by considering the use of information and communication technologies both to access information and to share information with others.

Notes for specific disciplines

As we said, digital is a relevant feature of the knowledge society and has a transversal presence in the different professional fields, in which we could highlight the following processes/tasks:

a) Access to information. Digital technologies open the doors to a wide world of information and resources, to a huge amount of data that can help us to understand and comprehend, to generate knowledge. For example: online information, websites, platforms, multimedia content (images, audio, video), etc.

b) Possibilities for communication and collaborative work. Use digital technologies to improve communication with other people and professionals, to facilitate collaboration and develop communication strategies with colleagues, with other professionals, with users/clients... For example: platforms, apps, programmes, virtual environments, social networks...

c) Opportunities for training and professional development. Use digital technologies to collaborate with other colleagues and professionals to share

and exchange knowledge and experiences, and to innovate. For example: platforms, apps, virtual environments, professional networks...

d) Content creation. In addition to facilitating access to information, information and communication technologies also allow us to become a source of information, offering us resources to disseminate and share our information with others. For example: software, multimedia content, platforms, apps, programmes...

e) Problem solving.

How to assess skills' development?

Descriptions of key competences are translated into detailed learning outcomes frameworks, such as the Enterprise Competences Framework and the Digital Competences Framework, combined with diagnostic, formative and summative assessment support this process. Digital technologies could contribute to capturing multiple dimensions of learners' progression, as could non-formal and informal learning validation tools such as Europass and Youthpass (European Commission, 2019).

The assessment of digital competences will focus on these five dimensions:

a. Instrumental dimension: knowing how to use technology. It is necessary to acquire the instrumental skills to make effective use of available resources.

b. Cognitive-intellectual dimension: knowing how to transform information into knowledge. Knowing how to pose problems, analyse and interpret information with meaning.

c. Socio-communicative dimension: knowing how to express and communicate with others on the web: knowing how to create textual, hypertextual and audiovisual documents in order to participate in social networks.

d. Axiological dimension: acting with responsibility and values. Development of attitudes, values and ethical and democratic practices on the web.

e. Emotional dimension: building an emotionally balanced web participation identity (San Nicolás, Fariña and Area, 2012, p. 12).

The development of the competence will be assessed more concretely by taking into account how learners manage information, how they identify, locate, retrieve, store, organise and analyse digital information, assessing its purpose and relevance. How they share resources through online tools, collaborate, interact and participate in learning communities and networks. How they create and edit new content in different formats, as well as integrate and rework previous knowledge. Whether they

take digital security into account and are aware of digital rights and duties, personal protection, data protection and digital identity protection. Problem solving by identifying digital needs and resources, making decisions to choose a tool according to the need, as well as the creative use of technology.

In accordance with the assumptions expressed above, the assessment instruments for their possible application will depend on the competence content that we intend to assess, as well as the time of the assessment.

By way of example, for formative or process assessment, a Progress Sheet could be used for each activity programmed with ICT, which could reflect the development of the competence, favouring student self-assessment, as this same sheet could be completed by both the teaching staff and the student him/herself, referring to the following aspects

1. Before starting the activity:
    - how they identify, locate, retrieve, store, store, organise and analyse digital information, evaluating its purpose and relevance
    - how they share resources through online tools, collaborate, interact and participate in learning communities and networks
    - how they create and edit new content in different formats
    - how they consider digital security
    - how they solve problems by identifying and selecting digital resources.
2. Upon completion of the activity:
    - how they identify, locate, retrieve, store, organise and analyse digital information, evaluating its purpose and relevance.
    - how they share resources through online tools, collaborate, interact and participate in learning communities and networks.
    - how they create and edit new content in different formats
    - how they consider digital security
    - how they solve problems by identifying and selecting digital resources.

These Progress Cards could be accompanied by Self-Reflection Guidelines, in which the teacher will design questions to complement the process of reflection that takes place through the Progress Cards.

Assessment rubrics are another suitable instrument for the assessment of competences, indicating the level of mastery of the competence (first, second...), the indicators and the descriptors of each indicator which would grade the degree of acquisition of the indicator.

The Portfolio allows the student to show what he/she has learnt through reflection and decision making, and at the same time, it is a compilation that facilitates the recovery of previous learning in memory.

SKILL#5
ENTREPRENEURSHIP & INITIATIVE

Authors: *Isabel Borges, Luís Cardoso, Gastão de Jesus Marques, Artur Romão, Maria José Varadinov [IPP]*

Short Characteristic

"Entrepreneurship refers to an individual's ability to turn ideas into action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports everyone in day-to-day life at home and in society, makes employees more aware of the context of their work and better able to seize opportunities, and provides a foundation for entrepreneurs establishing a social or commercial activity" in Commission Communication "Fostering entrepreneurial mindsets through education and learning". COM (2006) 33 final.

Entrepreneurship is therefore a key competence for all, helping people to be more creative and self-confident in whatever they undertake. At higher education level, the primary purpose of entrepreneurship education should be to develop entrepreneurial capacities and mindsets. Regardless that the majority of entrepreneurship courses are offered in business and economic studies, innovative and viable business ideas are more likely to arise from technical, scientific and creative studies.

Education programs can focus in different objectives, such as: developing entrepreneurial drive among students (raising awareness and motivation), training students in the skills they need to set up a business and manage its growth or developing the entrepreneurial ability to identify and exploit opportunities and its goal is to promote creativity, innovation and self-employment.

Abilities connected to entrepreneurship & initiative skill

Entrepreneurial skills can encompass a broad range of various skill sets, like technical skills, leadership and business management skills, behavioral skills and creative thinking, both soft and hard skills.

The personal attributes and skills connected to entrepreneurship and initiative are (among others):

1. Creativity;
2. Analytical and problem-solving;
3. Sense of initiative;
4. Risk-taking;
5. Autonomy;
6. Self-confidence;
7. Teamwork and leadership;
8. Communication and listening;
9. Business management;
10. Customer service skills;
11. Financial skills;
12. Branding, marketing and networking;

13. Time management and organization.

The first 8 skills fall in the field of soft skills while the remainder 5 skills are hard skills, which development should be matter for specific disciplines.

Development of some skills mentioned above:

Creativity

Creativity is defined in as "the production of novel, appropriate ideas in any realm of human activity, from science, to the arts, to education, to business, to everyday life" (Amabile, 1997: p. 40, in Al-Ababneh, 2020: p. 245), thus the ideas have to be new and appropriate to the opportunity or problem presented (Al-Ababneh, 2020: p. 245).

Is the ability to see things differently and to provide solutions where there are gaps. Is to try something new or to what others won´t yet do. Building a business or a brand can require sometimes difficult decisions, finding strategies and solutions to overcome obstacles, and use creative thinking to develop plans and strategies. To improve creativity students could for instance read unusual books, watch a movie in a different language, travel to an unexpected place or talk to people out of usual friend's circle.

Exercise focused in entrepreneurship: have each student find one thing they discovered after class about business, product, service or process that another student did not discover.

Analytical and problem-solving

Problem-solving is considered a soft skill (a personal strength) rather than a hard skill that's learned through education or training. Accordingly with Mayer (Runco et al. 1999, p. 437) "Problem solving is cognitive processing directed at transforming a given situation into a goal situation when no obvious solution method is available to the problem solver. This definition is broad enough to cover a broad array of directed thinking activities".

Problem-solving starts with identifying the issue, then there are five steps typically used in problem-solving (https://www.thebalancemoney.com/problem-solving-skills-with-examples-2063764).

1. Analyze of Contributing Factors, using tools like:
   - Data gathering;
   - Data analysis;
   - Fact-finding;
   - Historical analysis;
2. Generation of Interventions, involving tools like:
   - Brainstorming;
   - Creative thinking;
   - Prediction;
   - Forecasting;

- Project design;
- Project planning;

3. Evaluation of Solutions, with tools including:
   - Analysis;
   - Discussion;
   - Corroboration;
   - Teamwork;
   - Test development;
   - Mediation;
   - Prioritizing;
4. Implementation of a Plan, using:
   - Project management;
   - Project implementation;
   - Collaboration;
   - Time management;
   - Benchmark development;
5. Assessment of the Solution's Effectiveness, with:
   - Communication;
   - Data analysis;
   - Surveys;
   - Customer feedback;
   - Follow-through;
   - Troubleshooting.

Problem-solving skills can be improved by familiarizing with common issues in the industry and learning from more experienced people, and it is a subject always present in entrepreneurs work.

Exercise focused in entrepreneurship: ask students to define a different way to get costumers for a specific business.

Sense of initiative

The expression "to turn ideas into action" represents the definition of a sense of initiative and entrepreneurship as from the European Commission (2007).

Exercise focused in entrepreneurship: how can students make money in the moment? Make them think and define an idea in the class.

Teamwork and leadership

"Teamwork can be defined as the ability of team members to work together, communicate effectively, anticipate and meet each other's demands, and inspire confidence, resulting in a coordinated collective action." (International Encyclopedia of the Social & Behavioral Sciences, 2001) (https://www.sciencedirect.com/topics/medicine-and-dentistry/teamwork; accessed 21.01.2023).

Being a business owner involves act as both a supervisor and as part of a team, and an entrepreneur need to rely on effective leadership skills to help motivate a team.

Exercise focused in entrepreneurship: ask students organized by groups (3/4 students) to build an organizational chart (https://www.lucidchart.com/pages/tutorial/organizational-charts) for a small business (explained in class) and distribute responsibilities among them.

Communication and listening

Communication is "a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior." (Merriam-Webster Dictionary) (https://www.merriam-webster.com/dictionary/communication; accessed 21.01.2023).

Listening means "to hear something with thoughtful attention**:** give consideration." (Merriam-Webster Dictionary) (https://www.merriam-webster.com/dictionary/listening; accessed 21.01.2023).

These are two main skills related with entrepreneurship and initiative, from active listening to argue during meetings to correctly convey point of view. Effective communication can help to promote awareness of a brand or influence how the entrepreneur reach a target market. Communication skills are more important than ever. It's challenging to deliver the kind of message and tone you want through email, phone communication, and social media. Entrepreneurs today have to make extra effort to communicate effectively online in order to build the relationships that would have once happened organically in person.

Exercise focused in entrepreneurship: make students organize in couples and ask them to tell each other a story during 3 mn (sequentially). After that each student have to report (writing) the story of the other. At the end each student has to point the missing situations of his/her story in the report of the other.

Customer service skills

"Customer service is the direct one-on-one interaction between a consumer making a purchase and a representative of the company that is selling it. Most retailers see this direct interaction as a critical factor in ensuring buyer satisfaction and encouraging repeat business." (Grant, 2022, p. 1)

It´s an ability that comprehends for instance talking to potential clients or discuss opening partnerships. This skill helps to connect with a customer base and ensure that a brand is providing the products or services that the market target needs.

Financial skills

"Skills related to the understanding, evaluation and management of the financial resources needed to set up a firm and develop successful, innovative, and sustainable initiatives within it." (Valenzuela et al., 2021, p. 5).

These skills comprehend soft and hard skills that enable stakeholders to manage and navigate financial decision-making and problem-solving. Learning from a financial planner, using financial software, or reading financial guidebooks can help develop these skills.

Branding, marketing and networking

A brand is a name, term, design, symbol, or any other feature that identifies one seller's good or service as distinct from those of other sellers" (American Marketing Association) (https://www.thebrandingjournal.com/2015/10/what-is-branding-definition/ ; accessed 21.01.2023).

In 2012 Kotler defined marketing as "The science and art of exploring, creating, and delivering value to satisfy the needs of a target market at a profit. Marketing identifies unfulfilled needs and desires. It defines, measures and quantifies the size of the identified market and the profit potential" (2012).

"Networking is the exchange of information and ideas among people with a common profession or special interest, usually in an informal social setting. Networking often begins with a single point of common ground. Professionals use networking to expand their circles of acquaintances, find out about job opportunities in their fields, and increase their awareness of news and trends in their fields or the greater world." (Kagan, 2022, p. 1)

Marketing and networking with others professionals of the same brunch to promote and grow a brand it´s an almost daily task for an entrepreneur. In nowadays networking is common to work as a team at a distance, for instance when a geographical distance is present among the different elements of the team. Effective and clear messages through emails, social media and other advertising methods can positive influence how an entrepreneur reach a target market.

Time management and organization

"Time management is the process of organizing and planning how to divide your time between different activities. Get it right, and you'll end up working smarter, not harder, to get more done in less time – even when time is tight and pressures are high." (https://www.mindtools.com/arb6j5a/what-is-time-management; accessed 21.01.2023).

Organization is an "association of people who interact with each other and use resources of various kinds in order to achieve certain objectives or goals." (Garzón et al, 2022, p.3).

These abilities are also important for entrepreneurs. They must be capable of breaking down tasks into manageable to-do lists and setting deadlines to achieve objectives for themselves and for the team.

Examples of typical professional tasks supported by the skill

Creativity

An engineer's day-to-day typically revolves around solving complex problems. When working on these intricate issues, however, it's sometimes easy to get lost in the details and set the bigger-picture, creative thinking aside. Engineers with a design vision, who can think "outside the box" and visualize several alternative solutions to a problem—or create new solutions altogether—will have a competitive advantage.

In all design branches creativity is essential to get new and effective outputs, e.g. products, contents, etc.

Marketing activities in general are creative ones, because there are a continuous need to differentiate from competitors, e.g. in products, price, place and promotion.

Creating and launching a new entrepreneurial endeavor usually is a creative activity, because beyond the solution of problems when they arise the quest for differentiation and innovation means creating new solutions.

Effective communication

In a reunion in the field of civil engineering regarding a major project, and because the work of a civil engineer is so technical, it can sometimes be harder for others in the organization to understand engineers' true impact. So effective communication comprehends knowing how to translate technical topics into more simplified terms and properly articulate and support their ideas across the others members of the team (architects, geologists, etc.).

In the marketing areas communication is essential to reach properly costumers and the community.

In entrepreneurship communication with suppliers, banks, new workers and potential customers is essential to emerge successfully as a new business, because is a start from scratch without previous references.

Financial Skills

Having a basic understanding of financial accounting, for instance, can help engineers measure the impact of their work in terms of revenue, but also control the cost of particular projects and better understand the organization's overall budget.

Designers need to be aware about the financial limits for their creations, both in prototyping and production phases.

In marketing the definition of price involves to know the dynamic of production, logistic and structure costs.

Any entrepreneurial initiative should deal properly with financial matters, if they are to survive and develop. Questions about offers' prices, costs of operations and loans, among others.

Methodologies/learning strategies

Using experience-based teaching methods is crucial to developing entrepreneurial skills and abilities. Traditional educational methods (like lectures) do not correlate well with the development of entrepreneurial thinking. In this way some initiatives fit well with this context:

1. Giving assignments (https://www.depts.ttu.edu/tlpdc/Resources/Teaching_resources/TLPDC_teaching_resources/CreatingEffectiveAssignments.php) to students to create value to external stakeholders based on problems and/or opportunities the students identify through an iterative process they own themselves and take full responsibility for. To alleviate the levels of difficulty and uncertainty such an assignment can result in, a team-work approach should be applied giving the students access to increased creative ability and peer learning opportunities. Sufficient time allowing for establishing fruitful relationships with external stakeholders should also be given to the students, preferably months or years. Entrepreneurs need to study in deep and experiment/test/prototype many matters related with their venture.
2. Turn class participation into speaking events. Instead of standard class discussions, give students a chance to practice public speaking. Teachers can make this shift by integrating Ignite Talks (https://orise.orau.gov/resources/stem/professional-development/during-the-internship/ignite-talks.html) (an innovative and fast-paced style used to deliver a concise presentation) or Pop-up Debates (https://secondarycoaching.weebly.com/uploads/4/9/6/4/49644239/ttl_pop-up_debate.pdf) (a method for engaging students in active learning and facilitating in class discussions and debates). These work in any subject area. With these activities, students feel positive pressure as they speak to an audience. Entrepreneurs do this when pitching to investors or speaking to customers.
3. Introduce project-based learning (https://www.pblworks.org/what-is-pbl) (PBL - a teaching method in which students learn by actively engaging in real-world and/or personally meaningful projects). When entrepreneurs launch a startup, they often begin by attempting to solve a narrowly-defined problem. Teachers can launch a PBL initiative that empowers students to define real-world problems and create solutions for those problems.

How to?

Some highlights about the proposed learning strategies follows.

Assignments

Accordingly with Boye (from page of site in footnote # 8) some situations have to be considered:

- Starting points for teachers:
  - Inform about your goals for the assignment, both about results and gains for students;
  - Take in consideration the level of the students, what they can improve or what is beyond their level of knowledge and experience;
  - To help teachers in this approach some rules from Bean (1996, in Boyd):
    - What are the main units/modules in the course?
    - What are the main learning objectives for each module and for the course?
    - What thinking skills are to be developed in each module and in the course?
    - What are the most difficult aspects of the course for students?
    - Which student´s study habits I would like to change?
    - What difference I want the course to make in students' life?
- What the students need to know:
  - The purpose of the assignment;
  - In writing assignments, the rhetorical or cognitive modes they have to employ;
  - The audience addressed;
  - Which are the logistics or business aspects of the assignment;
  - Which is the evaluation criteria;
- Do's and Don'ts:
  - Do provide detail in the assignment description;
  - Do use open-ended questions;
  - Do direct students to appropriate available resources;
  - Do consider providing models;
  - Do consider including a way for students to make the assignment in their own;
  - If the assignment is substantial or long, do consider sequencing it;
  - Do not ask too many questions;
  - Do not expect or suggest that there is an "ideal" response to the assignment;
  - Do not provide vague or confusing commands;
  - Do not impose impossible time restraints or require the use of insufficient resources.

There are many options for effective yet creative ways to assess students' learning. Just a few: Journals, Posters, Portfolios, Letters, Brochures, Management plans, Editorials, Instruction Manuals, Imitations of a text, Case studies, Debates, News release, Dialogues, Videos, Collages, Plays, Power Point presentations…

Speaking Events - Ignite Talks

Accordingly with the definition and recommendations of Oak Ridge Institute (https://orise.orau.gov/resources/stem/professional-development/during-the-internship/ignite-talks.html) "Ignite is an innovative and fast-paced style used to deliver a concise presentation.

During an Ignite Talk, presenters discuss their research/project using 20 slides which automatically advance every 15 seconds. The result is a fun and engaging five-minute presentation.

Powerful Ignite Talks:

- Start with strong introductions that pique the audience's interest;
- Explain why the topic is interesting and important;
- Lay out what the audience will learn during the presentation;
- Summarize the main points that were covered and what the audience learned;
- End with a powerful call to action to further promote your research/interest." (from page of site in footnote # 12).

Speaking Events – Pop-up Debates

Accordingly with Palmer (https://secondarycoaching.weebly.com/uploads/4/9/6/4/49644239/ttl_pop-up_debate.pdf; https://pvlegs.com/) in Pop-up Debates "students use a content material or text to respond to a debatable prompt provided by the teacher, using the guidelines below to facilitate:

1) Set a time limit based on student needs. Every student should speak at least once;

2) To participate, a student "pops-up" at their desk and begins speaking. Whoever is standing has the floor. When multiple students pop-up, lessons can be given on respectfully yielding the floor. Students quickly learn these debates are a collaborative endeavor.

The Why:

1) Gets all students active, listening, and speaking about your content;

2) Teaches students to argue appropriately, an essential life skill and a critical part of being college and career ready;

3) Explicitly teaches students how to speak and listen within an authentic context." (from pdf in footnote # 13).

Project-based Learning (PBL)

Accordingly with Buck Institute for Education (https://www.pblworks.org/what-is-pbl) "Project Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge." (from home page of site in footnote # 15).

With the following advantages: "Students work on a project over an extended period of time – from a week up to a semester – that engages them in solving a real-world problem or answering a complex question. They demonstrate their knowledge and skills by creating a public product or presentation for a real audience.

As a result, students develop deep content knowledge as well as critical thinking, collaboration, creativity, and communication skills. Project Based Learning unleashes a contagious, creative energy among students and teachers." (from home page of site in footnote # 15).

Courses on Entrepreneurship

Most of the possible contents of entrepreneurship courses are relevant for students from all fields of study.

However, in order for the teaching to be tailored to the specific needs of different categories, more emphasis is placed on one aspect or another, for instance:

1. **Entrepreneurship within business schools and economics studies** focuses on business start-up and new venture creation, and on the management and growth of SMEs. Students of economics learn to work with students from different fields (engineering, scientific studies, etc.):

    1.1. To find a market failure or a new opportunity in a field of interest;

    1.2. Idealize the characteristics of a product, service or process to fulfill this;

    1.3. Fill in a SWOT (Strengths, Weakness, Opportunities and Threats (SWOT), see Appendix I) analysis template and a Business Model CANVAS (https://www.strategyzer.com/canvas, see Appendix II) template.

2. **Entrepreneurship within science and technology studies** is especially concerned with exploiting intellectual property, creating spin-off companies and venturing, and offers courses on issues such as: − management techniques; − marketing, commercializing and selling of technology-based ideas; −

patenting and protecting technology-based ideas; − financing and internationalizing high-tech ventures:

2.1. Idealize the characteristics of a product, service or process within their field of interest;

2.2. Classify this idea accordingly with TRL (Technology Readiness Level (TRL), see Appendix III) reference and plan the development of the next TRL phase;

2.3. Fill in a SWOT analysis template and a Business Model CANVAS template.

3. **For students in humanities**, the focus will be on self-management and on social entrepreneurship, which is an emerging area of growth and provides opportunities to make a difference to social and community contexts:

3.1. To find a need or a new opportunity in a social/community field of interest;

3.2. Idealize the characteristics of a product, service or process to fulfill this;

3.3. Fill in a SWOT analysis template and a Business Model CANVAS template.

4. **Entrepreneurship for the creative arts and design** focuses on opportunities emerging through creativity and creative working, preparing graduates to work as freelancers or self-employed people, or creating small enterprises and ventures. It follows that in humanities and in creative studies alike, the following topics are particularly relevant: − social entrepreneurship; − self-management; − user-driven innovation; − part-time and freelance entrepreneurship:

4.1. Idealize a product, service, process or artistic creation within their field of interest;

4.2. Idealize the characteristics of this product, service, process or artistic creation;

4.3. Fill in a SWOT analysis template and a Business Model CANVAS template.

Notes for specific disciplines

This form is for collecting insights for learning strategies applied to specific subjects and hints that may be used for other teachers or for improvement.

In this way, we apply the examples by scientific area listed in the previous section.

Discipline/Major:	Entrepreneurship
Subject (course name):	Any
Learning strategy name #1:	Giving assignments
Insights/hints:	1. To find a market failure or a new opportunity in a field of interest 2. Idealize the characteristics of a product, service or process within their field of interest 3. To find a need or a new opportunity in a social/community field of interest 4. Idealize a product, service, process or artistic creation within their field of interest
Learning strategy name #2:	Speaking events + Team work (https://weje.io/blog/what-is-teamwork, see Appendix IV)
Insights/hints:	1. Idealize the characteristics of a product, service or process to fulfill this 2. Classify this idea accordingly with TRL reference and plan the development of the next TRL phase 3. Idealize the characteristics of a product, service or process to fulfill this 1. Idealize the characteristics of a product, service, process or artistic creation
Learning strategy name #3:	Project-based learning + Team work
Insights/hints:	1, 2, 3 & 4. Fill in a SWOT analysis template and a Business Model CANVAS template

How to assess skills' development?

The following are some proposals for exercises and activities aimed at assessing the development of entrepreneurial skills and increasing the spirit of initiative, carried out autonomously, in a perspective of self-assessment, carried out under supervision, individually or in groups:

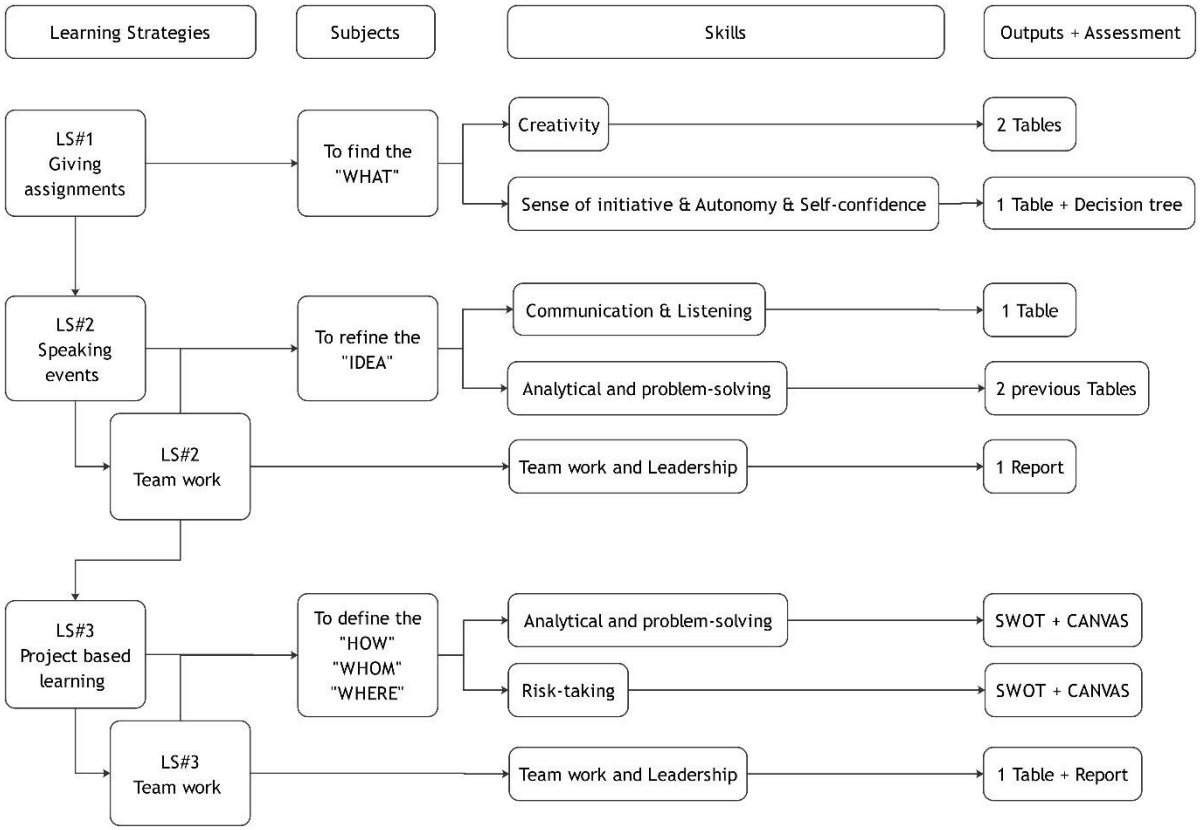
- With Learning strategy #1 – Giving assignments:
  - Creativity:
    - Compare the findings with the offers in the market/society. Are their innovative in some way?

        - Ask for a table with the comparison between students ideas and similar offers (products, services, processes or artistic creations and respective characteristics);
        - Ask for a table with the characteristics of the intended idea (named A);
    - Sense of initiative & Autonomy & Self-confidence:
        - How far and in dep was the effort made by students? Tried to find solutions in different areas? Collected a relevant quantity of data? Tried different scenarios?
        - Ask for a table summarizing the work done and a decision tree (https://www.geeksforgeeks.org/decision-tree/, see Appendix V) to show the paths selected;
- With Learning strategy #2 – Speaking events + Team work:
    - Communication and listening:
        - How rich and fruitful was the discussions/brainstorming sessions?
        - Ask for a table (individual tables) summarizing the subjects brought by the students to discussion and the new subjects/themes/insights collected by them from the sessions;
    - Teamwork and leadership:
        - The students organized in groups worked effectively?
        - Ask for a table (B) with the improvements relative to the information presented in table (A);
        - Did each student leaded any situation (team motivation or direction, technology, business, social or artistic matters)?
        - Ask for a report about the situations students think they leaded. Identifying themes, decisions and initiatives made;
    - Analytical and problem-solving:
        - Tables (A) and (B) richness of information and levels of development and innovation;
        - Definition of objectives;
- With Learning strategy #3 – Project-based learning + Team work:
    - Analytical and problem-solving:
        - SWOT and Business Model CANVAS tables' level of integration, consistency and innovation;
        - Definition of objectives;
    - Risk-taking:
        - Level of innovation in the previous tables;
    - Teamwork and leadership:
        - The students organized in groups worked effectively?
        - Ask for a table (C) with the improvements relative to the information presented in table (A) and (B);
        - Did each student leaded any situation (team motivation or direction, technology, business, social or artistic matters)?
        - Ask for a report about the situations students think they leaded. Identifying themes, decisions and initiatives made;
    - The planning of the entrepreneurial initiative takes the form of a case study.

In all the learning strategies students have to present their final outputs to the class followed by a feedback session from the remainder students.

Framework

The proposed methodology is summarized in the following picture.



Appendix I

Accordingly with Mind Tools[21] "SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT analysis is a technique for assessing these four aspects of your business.

SWOT Analysis is a tool that can help you to analyse what your company does best now, and to devise a successful strategy for the future. SWOT can also uncover areas of the business that are holding you back, or that your competitors could exploit if you don't protect yourself.

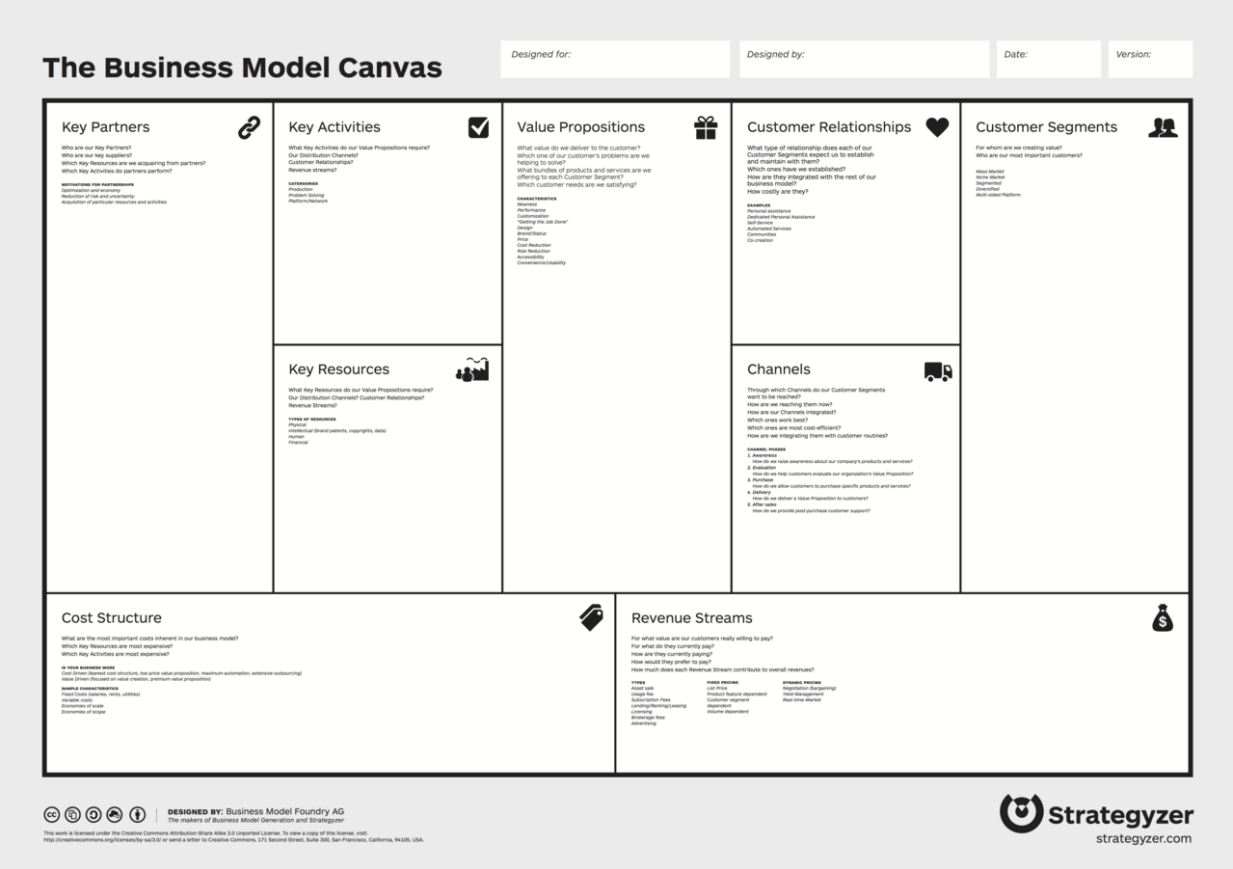
A SWOT analysis examines both internal and external factors – that is, what's going on inside and outside your organization. So some of these factors will be within your control and some will not. In either case, the wisest action you can take in response will become clearer once you've discovered, recorded and analyzed as many factors as you can." (from page of site in footnote # 21).

Source: https://www.wordstream.com/blog/ws/2017/12/20/swot-analysis

Appendix II

Accordingly with Strategyser[22] "The Business Model Canvas is a strategic management and entrepreneurial tool. It allows you to describe, design, challenge, invent, and pivot your business model." (from page of site in footnote # 22)

It is divided in 9 areas as shown in the following picture.



Source:
https://en.wikipedia.org/wiki/Business_Model_Canvas#/media/File:Business_Model_Canvas.png

Appendix III

This typology classifies the degree of technological development of a product or project.

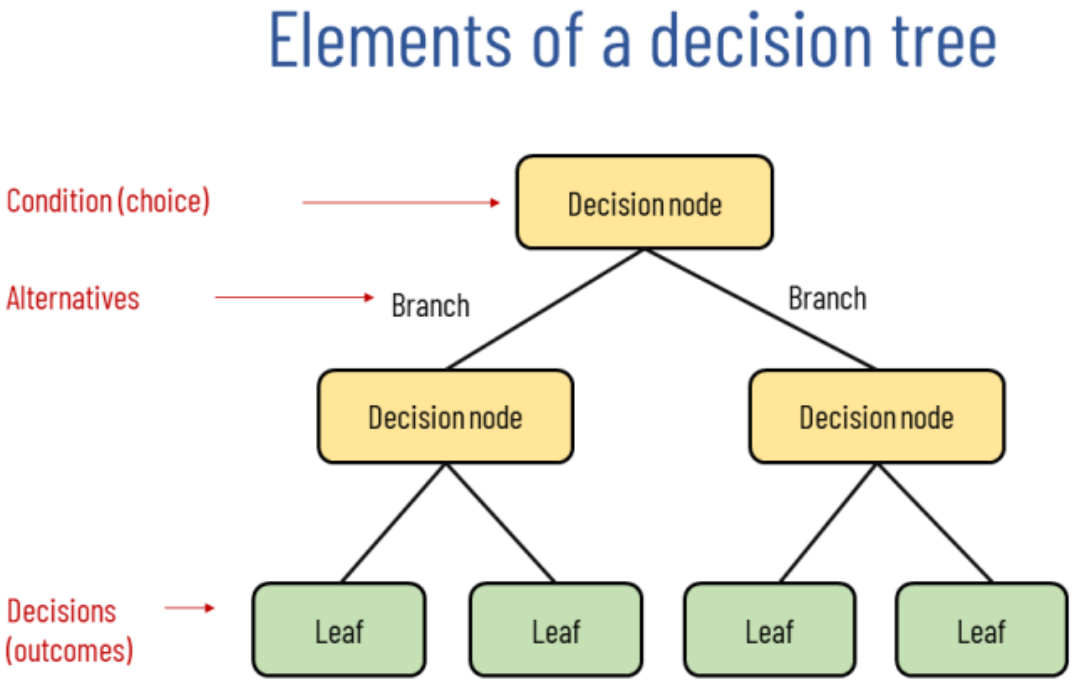
Source: https://www.twi-global.com/technical-knowledge/faqs/technology-readiness-levels

Appendix IV

Accordingly with Weje[23] "Teamwork is not just a group of people doing something. It's the ability to work with others and to help others attain their full potential and achieve the shared goals. As well, teamwork is one of the most desirable skills an employer can seek in its employees. The main reason why teamwork is so important in the workplace is that it builds trust among co-workers. This is true for a variety of reasons. Good teamwork increases productivity and makes your employees happier. It helps foster a sense of community within the workplace and it creates more opportunities for training and advancement." (from page of site in footnote # 23).

Appendix V

Accordingly with Geeks for Geeks[24] "Decision Tree is the most powerful and popular tool for classification and prediction. A Decision tree is a flowchart-like tree structure, where each internal node denotes a test on an attribute, each branch represents an outcome of the test, and each leaf node (terminal node) holds a class label." (from page of site in footnote # 24).



Source: https://why-change.com/2021/11/13/how-to-create-decision-trees-for-business-rules-analysis/

SKILL#6
LEARNING TO LEARN

Authors: *Clio Dosi, Roberta Lozzi, Matteo Vignoli [UNIBO]*

Short Characteristic

"Learning to learn is the ability to pursue and persist in learning, to organize one's own learning, including through effective management of time and information, both individually and in groups.

This competence includes awareness of one's learning process and needs, identifying available opportunities, and the ability to overcome obstacles in order to learn successfully. This competence means gaining, processing and assimilating new knowledge and skills as well as seeking and making use of guidance.

Learning to learn engages learners to build on prior learning and life experiences in order to use and apply knowledge and skills in a variety of contexts: at home, at work, in education and training. Motivation and confidence are crucial to an individual's competence." [European Communities, (2007). Key competences for lifelong learning: European reference framework]

With the increasingly rapid changes in today's world, due to both the new demands dictated by globalization and the evolution of technology, it is necessary to develop the ability to learn how to learn. This will allow people to be self-reliant and continue to learn what is necessary for one's personal and professional development.

This skill involves both cognitive processes and personality traits. Learning to learn represents the ability to succeed in organizing one's learning, setting goals, self-motivating, becoming aware of one's strengths and weaknesses and the best ways to learn, through effective management of information and time. To learn to learn, it is therefore very important to develop an awareness of one's own learning process and needs and take responsibility for it.

There is no one method of learning that is more valid than the other; each person is different and prefers a distinct method of learning, the important thing is to identify the one that best suits her.

Learning to learn thus involves students acquiring, processing, and then assimilating new knowledge. For learning to learn to be effective, students should connect what they have learned with their life experiences so that they can apply the knowledge they have acquired in all the real-life contexts with which they relate.

Concerning the ability of learning (the acquisition of knowledge or skills through study, experience, or being taught) learning to learn includes awareness of one's learning process and planning the different stages of learning, managing material and time.

The student plays an active role in the learning process: in fact, teaching promotes and focuses on building a positive context for learning, active and constructive student participation, special attention to the context in which learning takes place, a positive relationship between teachers and students, and constant research and

experimentation of innovative methods. The world of education and training must provide a learning environment to help people develop the learning to learn competence.

In the world of work, the skill of learning to learn is also very important to be able to develop another equally important skill, that of continuing to learn and developing effective lifelong learning.

Abilities connected to learning to learn skill

There are many abilities related to the skill of learning to learn:

- Employability;
- Critical analysis;
- Planning;
- Goal setting;
- Ability to self-manage;
- Study skills;
- Lifelong learning.

Examples of typical professional tasks supported by the skill

The ability to learn how to learn is crucial in today's world because it allows one to develop a disposition to keep up to date, to be curious, and to ask questions even while working. Students need to be clear that finishing their studies does not mean finishing learning but simply changing the context and how they learn.

Here are some tasks related to this skill:

1. Plan and achieve goals;
2. Context and needs analysis;
3. Communication;
4. Decision making;
5. Time management;
6. Problem-solving.

Methodologies/learning strategies

To address the new problems that will develop and to adapt to a changing environment in the knowledge that their employment will change, students entering the workforce today must be able to maintain continuous learning. Therefore, it is crucial to have a disposition toward learning, considering it as a continual flow in which one may actively participate rather than as something static. So many activities can assist one in considering learning in this way:

1. Set up an appropriate learning environment for the learning process;
2. Writing activities;
3. Debates and cooperative work;
4. Questions;
5. Real-world activities;
6. Planning learning.

1. Set up an appropriate learning environment for the learning process

As stated earlier, the current world of work is constantly changing, and what is required of new entrants is to have an aptitude for learning new things, acquiring new skills, and seeking opportunities for growth while doing their jobs.

Learning to learn is a very important competence for both a person's personal and professional life.

The presence of autonomous and aware learners who take a more active role creates an advantage for the world of work in terms of improved productivity.

Thus, this competence invokes the study skills of knowing how to organize one's learning, the personal and emotional dimensions, i.e. character skills, the transfer possibilities of learning to learn from one context to another, and the motivation to study.

In this view, the provision of an appropriately designed learning environment to enable the learning process plays an essential role. In this case, the environment consists of several elements that interact with each other in the learning process, namely students, teachers, objects of study, mutual interactions, emotions, expectations, and motivation.

2. Writing activities

Writing does require the ability to distinguish between important and irrelevant information, to evaluate one's assumptions, and to work with various inputs including text, graphs, and pictures. Writing thereby supports students in information research, selection, and analysis, which aids in learning.

The ability to think critically and the learning process are strongly intertwined. Writing can aid students in better understanding what they are learning and memorization since it encourages intentional and critical learning, which is crucial for constructive learning.

Students get the chance to refine their arguments, reflect more deeply, and construct their thoughts through the writing process.

3. Debates and cooperative work

It's crucial to make learning active to promote mindful learning. Group projects and discussions are undoubtedly beneficial activities toward this objective.

Students can study new information and apply knowledge by creating a cooperative environment by organizing and debating their opinions on a topic with others.

All academic areas can use debates to cover a wide range of issues.

Debate encourages educated conversation so that students can create their own opinions about the subject at hand and is a useful tool for developing students' reasoning and cooperative abilities to better learn.

Debate is an effective tool for fostering positive discussion and criticism among students while they examine various points of view. Therefore, it is frequently employed as an active and collaborative learning technique.

4. Questions

To be able to develop a deep understanding of the topics they are learning, students can use the tool of questions.

Asking questions means thinking critically about what one is trying to learn and thus having an active approach toward learning. The most interesting aspect of questions is the attitude with which the student tends to ask them and not so much the object of the question itself.

Questions are a very powerful tool for students to understand their curiosity better and open new exploration areas.

5. Real-world activities

The learning process of the students is greatly stimulated by having to face real world problems. As they are open problems that are not known a-priori, each student has to develop its own learning strategy.

Consolidating knowledge and understanding it requires putting it into action.

Of course, the learner needs prior theoretical knowledge that enables her to relate to the subject matter to put what they are learning into practice.

Therefore, the teacher's role is crucial at this point. While she must recognize that the student won't fully grasp the subject until she approaches it actively and reflectively, she must also prepare the student during the lecture by giving her readings and other materials that will bring her closer to the subject.

In this way, the student will not only have a clearer understanding of the topic, but through active learning, she will learn more thoroughly and retain the knowledge

gained more easily since it has not only been studied but also discussed and thought about.

6. Planning learning

As most of the learning has already a structure given by the professors, most students find it very difficult to organize their mind around a new unstructured learning activity. Most of the learning outside formal education has this unstructured form that requires the learner to know how to plan the learning journey. Learning to learn includes organizing information, determining what is important, structuring an interpretation of what has been read versus what has been defined as important, and then learning begins. When learning begins the learning-to-learn phase is actually almost completed. It is therefore important to support students in the planning phase of learning.

How to?

1. Set up an appropriate learning environment for the learning process

In this view, the provision of an appropriately designed learning environment to enable the learning process plays an essential role. In this case, the environment consists of several elements that interact with each other in the learning process, namely students, teachers, objects of study, mutual interactions, emotions, expectations, and motivation.

A key role in creating a favorable learning environment is that of the emotional and social dimensions. The teacher must consider this aspect and build a safe learning environment by creating a relationship of trust and respect with the student. It is important to pose as a figure who facilitates the learning process and appreciates the cognitive efforts that the students make, without making them feel judged but rather supported and guided.

Another important aspect of creating a supportive environment is to recognize that there are different learning styles among students.

Of course, it would be unthinkable for a teacher to personalize teaching for each student, but the important thing is to be aware of this diversity to help students' motivation to study and facilitate the learning process.

Teachers therefore should guide students in becoming aware that each of them is different and is driven into the study by different motivations and that it is important to build their method of learning.

1.1. Provide a list of references

Teachers can create a list of papers, books, videos and links to online material that the students can access to deepen the subject.

The professor can ask to read at least one (or more) reference on a topic that the students particularly like and present it in class to a colleague in an exchange.

1.2. Connect with society

Teachers can invite in class Alumni or interesting speakers from society to enrich the connections the students can make and open new interesting avenues of learning.

1.3. Present past projects/final outcomes

Teachers can provide to students past projects/final outcomes of the class to students so that they develop a connection with past results of the class. Doing this creates a baseline for the students for their activities.

2. Writing activities

Helping students write in a variety of formats, such as essays, letters, reflections, pre-writing, or dialogic viewpoints, should be a key objective of classes.

Students learn about and experience the various roles that writing can play in the learning process, including collecting knowledge and also exposing, reflecting, discussing, debating, and communicating.

Teachers can aid students with their writing by teaching them the concepts, content, cognitive processes, and communication techniques.

Explaining to students the value of consulting sources of various kinds to gather information, compare them, and find evidence to support one's position to develop one's interpretations of the past event is important when it comes to dialogic essays or position papers that call for the construction of a historical narrative and reconstruction of past events.

This fosters the process of active learning that involves students as key players. In reflective writing the teacher could ask specific questions as food for thought on a particular topic, such as a book or author studied, and then students could write reflections considering their personal experience as well. This encourages the transfer of the notion to real life and reflection on it.

Writing can thus become a tool for thinking and reasoning to transform and test knowledge.

2.1. The missing lecture

Teachers can invite students to write a short abstract to propose a lecture that they feel is missing from the course. The teacher can collect all the abstracts and prepare one extra lecture based on the proposition.

2.2. Pre-writing

Pre-writing can include, for instance, formulating questions in advance regarding a subject that will be taught in class. This gives students the chance and opportunity to reflect thoughtfully and critically on an idea and, as a result, better grasp it.

The professor can ask students to come in class with one written question that will be collected in advance. The professor can then draw some questions randomly to answer them before starting the normal lecture.

2.3. What's new

The professor can give a list of references to a team. Each participant should read only one article based on their preference. Then each student writes a list of (at least) three important points that the article brings forward and three open questions. At this point, in a team the students should discuss the important points and cluster them into two categories: known and new.

The final output is a list of three new important points and new open questions.

3. Debates and cooperative work

Actively participating in the learning process helps students better understand the subject matter and make it their own.

Therefore, moving learning to an environment where the teacher plays the role of a coach or mentor and no longer a teacher is very good for conveying to students the idea that learning happens in every place and time.

Structured Classroom Debates (SCDs), in which students are separated into teams and argue in class on a topic selected and prepared in advance, are a crucial technique for students to create their own views and better understand a topic. A topic can be chosen, and groups or couples can be formed to discuss it.

Teachers must plan these activities so that all students, even the more reserved ones who typically do not speak up, may actively participate in the debate.

As a result, it can be fascinating to incorporate the conversation into the course structure to make it a crucial and essential component of comprehension and learning.

Students can learn new material, make their own opinions, and apply knowledge through group discussions.

Professors must act as discussion facilitators by outlining norms and regulations for students to follow.

Each student may be asked to select a class topic and write an argument on what's known and what's new. Two randomly selected teams or pairs will present their arguments in-depth during the course, exchanging arguments and arguments on what's already known and what is yet to be discovered. A vote may be proposed to determine which of the two teams has made a stronger case.

It is wise to use arguments that will pique students' interest in the discussion and connect academic subjects with current events, on which they are presumptively knowledgeable.

4. Questions

Questions can play a very important role in student learning. Both questions that teachers ask students and questions that students can ask teachers are useful.

In the former case, teachers need to develop questions to accompany the explanation of a topic in class as they prepare on the topic. Questions should be well structured and have a level of complexity appropriate to the context.

4.1. Creative questions

The creative question is a very useful type to help students develop their own idea concerning the topic and thus understand it better. Indeed, it requires organizing the notions and concepts conveyed by teachers and developing critical thinking. Critical thinking is a fundamental prerequisite for learning because it helps the student develop awareness concerning the topic being studied.

In terms of questions that students can ask teachers, in this exercise the challenge in class is to find questions the teacher does not know how to answer. If this is found, then the teacher should explain the strategy she would use to find out the answer. Note: it is important to provide a safe environment without judgment, where students feel comfortable asking questions that might be "trivial."

4.2. Question Time!

It is suggested that teachers encourage students to ask questions by creating specific moments within the lesson. Online platforms that allow students to ask questions anonymously via the phone could also be used to break the ice so that they feel freer to resolve all their doubts.

Whether questions are asked by students or faculty, the creation of a calm and trusting environment for students is a key component. It is also important to avoid overly praising both questions and answers formulated by students to discourage any different interventions by other students.

It is also suggested that teachers encourage classroom dialogue on the topic with other students to enable active learning.

4.3. Research questions

After reading five articles on their choice, focusing on the "Future Research Direction" section of the papers, each student should produce one interesting Research Question to be presented in class with a short paragraph explaining why.

The professor should rank the research questions in terms of innovativeness for the subject and provide guidance on how she would structure a research project to approach the answer to the question.

5. Real-world activities

To teach by doing, the teacher needs to set up various possible scenarios of real-life situations that allow for the learning of the skills to be taught. It is important, therefore, to set up an objective-based scenario in which the student must achieve an end goal by playing a role.

The objective must be credible; it can be real or a simulation. The teacher decides on the most appropriate type of scenario, obviously also depending on the subject of study. It's possible to use different structures like group projects, strategic competitions, case studies, service learning activities and small projects with real customers. Either simulation software or paper-based tools, such as case studies, or combined solutions can be used to set the scenario and objective.

One aspect that should not be overlooked in designing a scenario is the focus of the objective. The teacher needs to make it clear and not confuse the constructs she wants to teach. The teacher must be able to distinguish between a specific teachable skill and not confuse it with an overly vague set of activities that in itself cannot be conveyed with ease but only generates confusion. In this case, the most important part to support is the planning of the (learning) process. Dedicate a specific deliverable (hunting plan) on how each student or team would approach the challenge.

6. Planning learning

6.1. Topic learning planning

Given a certain topic, the teacher may ask the student to present how she would organize for learning in the absence of material provided by the teacher. The goal is not to do a paper on that topic but to present what the activities are for organizing learning: where to read, what to look for, how to choose information, etc.

The teacher may ask to structure this exercise in different time frames: "how do you organize yourself to learn this topic in two days?", "how do you organize yourself to learn this topic in a week?", "how do you organize yourself to learn this topic in a month?".

(Example "I do research for two hours, then for two hours I define the important things and make a concept map, then on the important things I do another in-depth research and read a paper in depth etc.").

6.2. Structuring an outline

The goal of this exercise is to support students in planning how they will approach learning about the teacher's subject. The professor can then ask students to determine a topic they really liked about the course in question and create a reasoned outline (about two pages) of an essay they could write on that topic. The teacher should specify to them that they do not have to write the text of the essay but only structure the index; in fact, the goal is for students to organize their information.

6.3. Professor for a day

The teacher may ask one or more students (in a group or alone) to prepare a lesson on a topic that is part of the syllabus that she has not yet explained.

The student will then be in the situation of first organizing her learning to understand the topic and in turn be able to explain it to the rest of the class. The teacher might also ask the student what steps she followed to prepare the lesson, what made it more difficult for her and what was easier instead.

6.4. Choosing sources

This exercise is intended to help students search for their own sources. In fact, the lecturer may ask students to search for and choose three papers that are not in the course syllabus but are consistent with it and with the topic discussed in class. Each student briefly presents the papers to the class and explains why she thinks it would be important to add them to the lesson.

How to assess skills' development?

- The Finnish Learning to Learn Studies;
- The Dutch Development of Tests for Cross-Curricular Skills (CCST);
- The Effective Lifelong Learning Inventory (ELLI);
- The Framework for a European Test to Measure Learning to Learn.

Hoskins, B., & Fredriksson, U. (2008). Learning to learn: What is it and can it be measured?. European Commission JRC.

DOI: 10.2788/83908

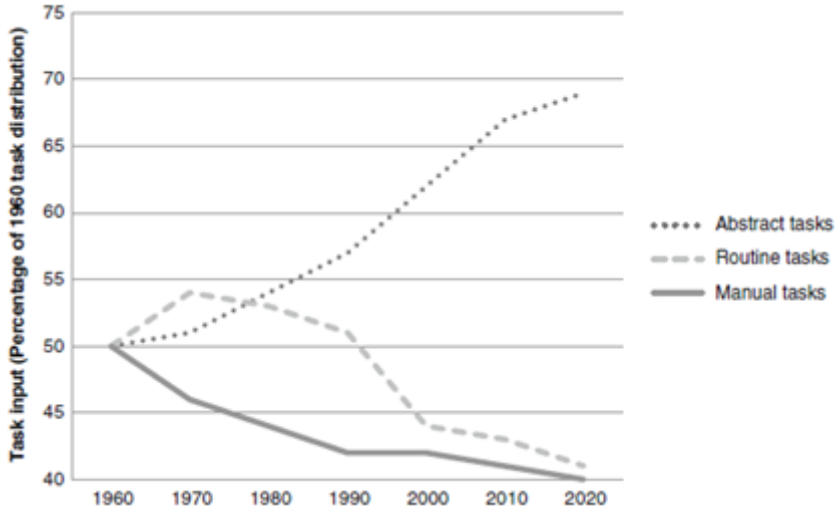
SKILL#7
PROBLEM SOLVING & DECISION MAKING

Authors: *Joanna Wójcik [UITM]*

Short Characteristic

Solving complex problems is a highly valued skill in today's rapidly changing and complex world. These types of problems are characterized by multiple interconnected variables, a dynamic and unclear nature, and the need to balance multiple conflicting objectives. Successfully addressing complex problems requires careful consideration and strategic thinking, as the outcome of one's actions may not be immediately apparent.

For individuals and organizations alike, sharpening problem-solving skills can lead to increased productivity, efficiency, and effective decision-making. The ability to tackle complex problems can provide a competitive advantage in the marketplace and help drive success in both personal and professional endeavors.



Source: Griffin, P., Care, E., & McGaw, B. (2012). The *changing role of education and schools. In Assessment and teaching of 21st century skills* (pp. 1-15). Springer, Dordrecht.

The workforce of the 21st century is characterized by rapidly changing and challenging work environments, with technology playing a crucial role.

International assessments such as PISA and PIAAC have recognized the significance of problem-solving skills and measure them in their tests. PISA identifies four key processes involved in effective problem-solving (Binkley et all, 2012): *information search*, *model building*, *foresight*, and *monitoring and reflection*. These processes highlight the importance of understanding information, making connections between variables, setting and executing a plan, and continually assessing and adapting to changing circumstances While problem-solving is a highly sought-after skill in the modern workforce, it is also recognized as one of the most difficult skills to acquire and develop. Thus, curricula across the world have started to place a greater emphasis on problem-solving and decision-making skills, especially in the area of science, where these skills are regularly tested and evaluated.

Abilities connected to problem solving & decision making skill

Problem-solving success is highly dependent on an individual's attitude and approach. An effective problem-solver should possess the following qualities (Woods et all, 1997):

- Confidence in reason and decision-making abilities.
- Open-mindedness and impartiality.
- Willingness to embrace ambiguity and change, and handle uncertainty with courage.
- Flexibility and transparency in thoughts and actions.
- Curious nature and desire to stay informed.
- Proficiency in using information and communication technology.
- Self-awareness of personal biases.
- Ability to reassess and adjust views as needed.
- Preference for accuracy over speed.
- Proactive approach to problem-solving by documenting ideas, creating visual aids, and reflecting on the process.
- Organized and systematic approach to problem-solving.
- Flexibility in considering multiple perspectives and viewpoints.
- Willingness to invest time in researching and clearly defining the problem.
- Continuous self-reflection to evaluate the effectiveness of the problem-solving process.

Successful problem solving requires a combination of cognitive abilities and personal traits. Here are some key factors to consider (National Research Council, 2011):

- **Expertise**: Having a deep understanding of the subject matter is crucial for collecting and analyzing relevant information.
- **Pattern recognition**: The ability to identify patterns and relationships in the data is essential for uncovering the root cause of the problem.
- **Prioritization**: The ability to sift through information and determine what is most important is an important step in problem solving.
- **Holistic thinking**: Effective problem solvers are able to go beyond just diagnosing the issue and instead, see how all the information fits together in a larger picture.
- **Conceptual understanding**: A deep understanding of how information is related allows for more effective problem solving.
- **Self-reflection**: Regular reflection on the chosen strategy and its effectiveness is crucial for continuously improving problem solving skills.

These abilities and traits, when combined, lead to a well-rounded and effective problem solver.

Examples of typical professional tasks supported by the skill

Problem solving & decision making skills are essential in all areas of work. The following tasks are highly dependent on these skills:

- identifying problems in processes or systems,
- developing and implementing solutions,
- evaluating the effectiveness of those solutions,
- analyzing responses,
- implementing the best solutions,
- negotiating,
- preparing strategies,
- presentations,
- creating reports.

Related 21st century skills without which it is impossible to be effective in solving problems:

- Creativity and innovation,
- Critical thinking,
- Teamwork.

Methodologies/learning strategies

Learning strategies should develop problem-soliving skills in all of the areas, such as:

- Asking relevant questions that clarify different points of view and lead to better solutions,
- Identifying gaps in knowledge,
- Using different types of reasoning (inductive, deductive, etc.) depending on the situation,
- Researching ideas, identifying and analyzing arguments,
- Presenting the results of one's explorations,
- Effectively analyze and evaluate evidence, arguments, claims and beliefs,
- Inferring, asking for evidence, considering alternatives and drawing conclusions,
- Explaining, presenting results, justifying procedures and making arguments,
- Analyzing how parts of a whole interact with each other to produce overall results in complex systems
- Using relevant factual knowledge and objectively and critically evaluating the quality, accuracy and usefulness of that knowledge and data.

General strategies play an important role in the problem-solving and decision-making process. When used in conjunction with specific strategies, they can greatly enhance the effectiveness and efficiency of the process.

Group work is a fundamental strategy in this regard. It allows individuals to work together towards a common goal, utilizing their diverse perspectives and skills. Collaborative problem solving involves recognizing the perspective of others, contributing one's own knowledge and expertise, managing input, recognizing problem-solving structures and procedures, and building knowledge and understanding as a group.

Problem-based learning (PBL) is another effective strategy. It involves rethinking the curriculum so that teachers design entire units around complex, real-life problems. These problems embody the core concepts to be mastered and understood and are considered "*ill-structured*" or "*ill-defined*" due to their complexity and lack of a right or wrong answer. Research has shown that students who are taught using PBL methods score higher on performance-based, skill-based, or knowledge and skill-based assessments compared to those taught using traditional methods. In conclusion, utilizing general strategies such as group work and problem-based learning in conjunction with specific strategies can greatly enhance the effectiveness and efficiency of the problem-solving and decision-making process.

Learning strategy: Concept map

Concept maps serve as a visual representation of the relationships between different ideas and concepts. Concept map helps to capture the structure of knowledge within our minds. The concept map was first developed in 1972 as a solution to better represent children's conceptual understanding. Since then, it has grown in popularity and is now widely used in education, research, and even business. With the ability to represent complex relationships between ideas and concepts, concept maps have become a valuable tool for visualizing and organizing knowledge. Concept maps bring concepts and relationships to life, allowing for a deeper understanding of the structure of knowledge. By visually representing the relationships between ideas and concepts, concept maps make it easier to grasp the big picture and understand the interconnections between different concepts.

Learning strategy: Problem Tree

With a tree diagram, it's easy to visualize the interrelatedness of different parts of a problem. By breaking down complex issues into smaller components, we can identify the root causes and possible solutions with greater clarity and precision. Additionally, a tree diagram can help facilitate group collaboration and decision-making. As all the information is presented in an organized and structured manner, it is easier for team members to see the big picture, understand their role in the problem-solving process,

and contribute their own ideas and perspectives. Overall, a tree diagram is a valuable tool for anyone looking to approach problems in a systematic and effective manner.

Learning strategy: Thought experiments

Thought experiments have been a staple of philosophical and scientific inquiry for centuries, from Galileo Galilei to the present day. Although there is some disagreement among theorists about the exact definition and classification of thought experiments, there are some general principles that can be applied in the classroom. At its core, a thought experiment is a "*what if*?" scenario imagined in the mind. It's a way of exploring a hypothetical situation, without having to conduct a real-life experiment. These experiments can be used to introduce new concepts, challenge assumptions, and encourage critical thinking.

Learning strategy: Decision-Making Map

The process of making a decision can be quite difficult, particularly for students who are still honing their critical thinking abilities. That's where the decision-making map comes into play. This strategy aids students in carefully considering the steps involved in selecting a course of action, enabling them to make knowledgeable decisions with self-assurance.

Learning strategy: Brainstorming

The Brainstorming Technique:

- Encourages free-flowing ideas and out-of-the-box thinking.
- Provides a safe space for students to share unconventional and unconventional ideas.
- Promotes collaboration and teamwork among students.
- Stimulates creativity by embracing the diversity of thought and perspective.
- Helps identify potential solutions that may have been overlooked otherwise.
- Breaks down communication barriers, fostering an inclusive environment.
- Supports problem-solving and decision-making by gathering a wide range of potential solutions.

Learning strategy: The Journalistic Six or the Five W's

The *5 Whys* method is a simple and effective problem-solving tool that can be used in any situation where a problem needs to be solved. By asking five consecutive "*Why*?" questions, students can quickly drill down to the root cause of the problem, allowing students to focus your efforts on solving it effectively. By using the *5 Whys* method, students can quickly and effectively get to the root cause of a problem, making it easier to solve and prevent from happening again.

Learning strategy: Lego serious play

LEGO SERIOUS PLAY is a unique and innovative approach to problem-solving that leverages the power of play. Developed by The Lego Group, this methodology uses Lego bricks to facilitate creative thinking and communication. The goal of LEGO SERIOUS PLAY is to help people overcome limiting beliefs and think more creatively. By building 3D models of their ideas and telling stories about them, individuals can gain a better understanding of their problems and generate potential solutions.

Learning strategy: Venn diagram

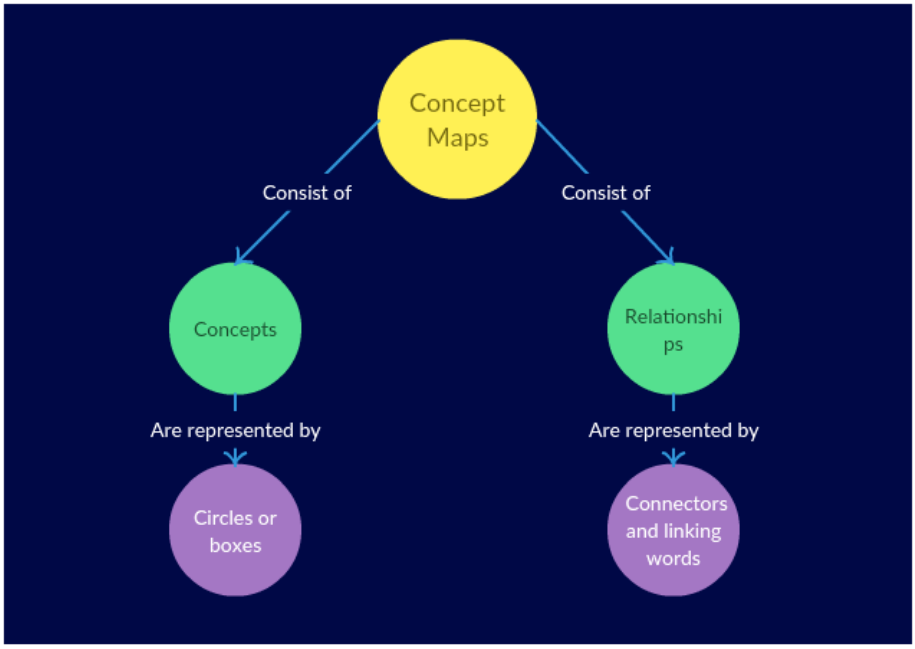
A Venn diagram, also referred to as a basic diagram or logic diagram, is a representation that displays all the possible logical connections between a variety of data sets. These diagrams can be utilized in a variety of fields for the purpose of illustrating the connections between sets. The Venn diagram is a simple yet potent tool for organizing and visualizing data. It is a flexible tool that can be utilized to enhance a range of abilities in students, from logical thinking and numerical reasoning to the recognition of features and differentiation of data.

Learning strategy: Fishborn analysis

The Ishikawa diagram, also known as a Fishbone diagram, is a powerful tool for identifying the root causes of a problem. It is a visual representation of cause and effect relationships, starting with the definition of the problem or effect and working backwards to identify all the potential causes that led to it. This technique is particularly useful in situations where there is a suspicion that multiple factors are contributing to the problem. By breaking down the problem into smaller components, the Ishikawa diagram helps to focus the group's attention on the actual causes rather than allowing personal opinions or accusations to dominate the discussion.

How to?

Learning strategy: Concept map



Source: https://creately.com/blog/pl/diagramach/samouczek-mapy-koncepcyjnej/

Steps for drawing concept maps (https://www.lucidchart.com/blog/how-to-make-a-concept-map)

- **Step 0**: *Choosing the Right Drawing Medium* - While pen and paper or a whiteboard might be the go-to for many, they often lack the professional touch you may be after. To create a diagram that truly impresses, you may want to consider alternative mediums that allow for better detail, accuracy, and preservation.
- **Step 1**: *Define a Central Concept* - The first step in creating an effective concept map is to define the central question or issue it will help address. This focus question will serve as the foundation for your entire diagram, providing a clear path for your ideas to follow.
- **Step 2**: *Identifying Key Concepts* - Once you've established your main concept, the next step is to identify the key subordinate concepts that will support it. Start by brainstorming related ideas, then rank them in order of relevance and specificity.
- **Step 3**: *Organizing Your Diagram* - With your key concepts in hand, it's time to organize them in a way that makes sense. Create a hierarchical format, with the most general ideas at the top and the most specific ones at the bottom. Then,

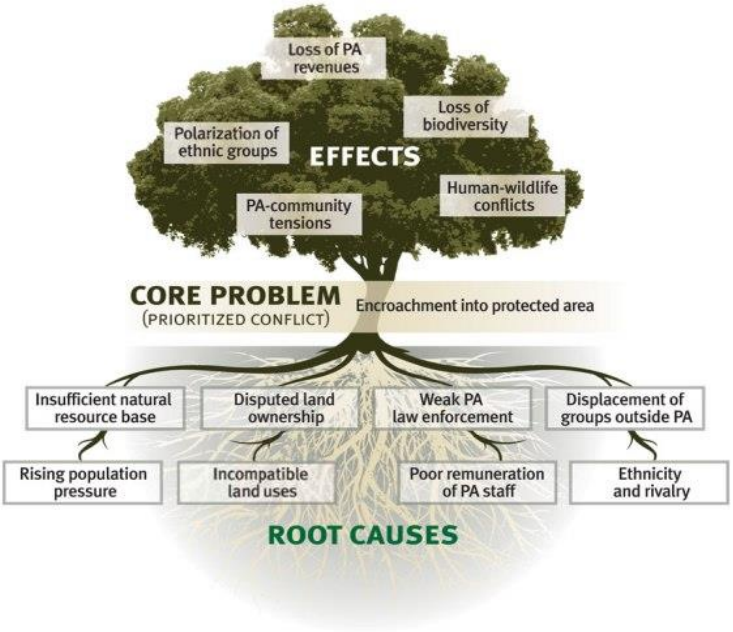
use shapes and lines to connect each concept and create a visual representation of your ideas.

- **Step 4**: *Refining Your Concept Map* - As you add more detail to your concept map, take time to fine-tune the relationships between each idea. Consider the placement of each concept and whether it fits within the overall structure of your diagram. You may also want to experiment with different linking words or phrases to ensure that the connections between each idea are accurate and clear.

In the realm of education, concept maps serve as a powerful tool in both teaching and assessment. The benefits of using concept maps are numerous:

- Concept maps help to create meaningful connections between students' prior knowledge and the new information they are learning, leading to more effective learning.
- They can help to organize teaching materials and provide a clear structure for courses or curricula.
- With its visually appealing format, complex concepts can be easily presented and understood by students;
- They provide a useful alternative to traditional note-taking and writing assignments, allowing students to engage with the material in a more interactive and engaging way.

Learning strategy: Problem Tree



Source: https://mspguide.org/2022/03/18/problem-tree/

Problem tree analysis is best done in a small focus group of about six to eight people, using flipchart paper or an overhead projector. It is important that factors can be added as the conversation progresses.

- **Step 1**: Discuss and agree on the problem or issue to be analyzed. The problem can be broad, as the problem tree will help break it down. The problem or issue is written in the middle of the flipchart and becomes the "trunk" of the tree. It becomes the "main problem". The problem should be a real issue that everyone is passionate about, described with general key phrases.
- **Step 2**: Identify the causes of the main problem - these become the roots - and then the consequences, which become the branches. These causes and consequences can be created on post-it notes or on cards, perhaps individually or in pairs, so that they can be arranged in a cause-and-effect logic.
- **Step 3**: Arrange the branches and roots in a logical cause-and-effect order, grouping similar causes together and making sure each root is linked to a consequence and each consequence to a root. It's important to avoid premature judgment or jumping to conclusions.
- **Step 4**: Identify and prioritize the key causes. This can be done by considering the frequency and severity of each consequence, or the impact of each cause on the main problem.
- **Step 5:** Evaluate the results of the analysis. Does the problem tree accurately reflect the main problem and its causes? Does it suggest new ideas for addressing the problem? Does it clarify the relationships between different elements of the problem and make it easier to identify potential solutions?
- **Step 6:** Refine the problem tree and its elements as needed, taking into account any new information or insights that have emerged during the process.
- **Step 7**: Identify and develop potential solutions, either by focusing on ways to remove or reduce the key causes, or by developing alternative approaches that address the main problem directly.
- **Step 8**: Implement the chosen solution and monitor its impact, regularly checking the progress and making adjustments as needed.

By following these steps, problem tree analysis can be a powerful tool for understanding complex problems, developing effective solutions, and promoting collaboration and decision-making.

Learning strategy: Thought experiments

Thought experiments can be a powerful tool for teachers and students in the classroom. By exploring hypothetical situations in the mind, students can gain a

deeper understanding of new concepts, challenge assumptions, and develop critical thinking skills. Whether in mathematics, biology, physics, or other disciplines, thought experiments can bring new perspectives and insights to learning.

Examples of Thought Experiments Across Different Disciplines

Subject	Example
Mathematics	*Exponential Growth*: Imagine you receive a penny today, and every day thereafter, the amount of money you have is doubled. This thought experiment can help students understand the concept of exponential growth. *Base 3 System*: Imagine there were only three numbers. How would that change the way we think about and perform mathematical operations? This experiment can introduce students to systems with bases other than 10.
Biology	Animal Design: Imagine you could invent an animal. How would its digestive system work, and how would it compare to the body systems of other animals? This thought experiment can be used to explore the design and function of different body systems.
Physics	Laws of Physics: Imagine a certain law of physics did not apply, such as gravity or the behavior of matter. How would that affect other laws and the world around us? This experiment can be used to teach cause and effect and the interrelated nature of the laws of physics.

Source: https://timvangelder.com/2009/09/08/what_is_decision_mapping

Learning strategy: Decision-Making Map

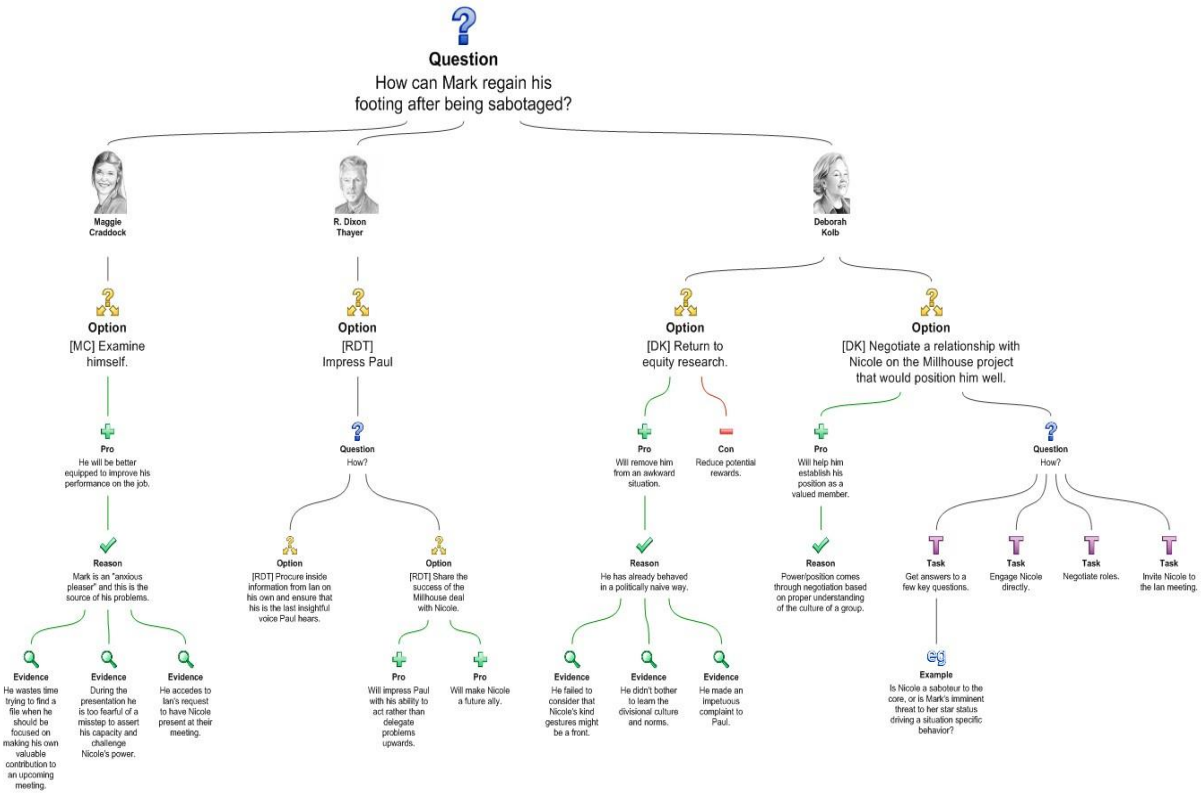
The task of making a choice can be quite daunting, particularly for students who are still honing their analytical skills. That's where the decision-making map comes in to help. This tool walks students through the steps involved in selecting a course of action, empowering them to make knowledgeable decisions with self-assurance. Here's how the decision-making process operates:

- **Step 1**: *Identifying the Choice*: The initial step is to define the decision that needs to be made. This guides students to concentrate their thoughts and initiate the process.
- **Step 2**: *Exploring Alternatives*: Then, students must create a list of alternatives - the various options they're deciding between. This stage challenges students to think out of the box and explore different possibilities.

- **Step 3**: *Establishing Criteria*: In order to make a decision, students must determine what's crucial to them. This is where they choose criteria - the things that will impact their choice.
- **Step 4**: *Evaluating Options*: With their criteria set, students then assess each alternative based on these factors. They give each option a score and add the scores together to create a total for each alternative.
- **Step 5**: *Finalizing the Decision*: Finally, students use the information they've collected to make a decision. If a clear winner does not emerge, students may need to narrow down their list of alternatives or add extra criteria to the evaluation process. It's essential for students to comprehend that the decision-making map is just a tool to help them represent their reasoning. They are not limited by the results generated by the map. If they do not agree with the top choice, they can repeat the process with different criteria or alternatives until they feel confident in their decision. As an added activity, students can also rate the significance of each criterion using the following scale.

Criteria	**Alternatives**						
1. Not important 2. Slightly important 3. Moderately important 4. Highly important	A1 …….	A2 …….	A3 …….	A4 …….	A5 …….	A6 …….	A7 …….
Criterion 1							
…….							
Criterion n							
TOTAL							

Decision-Making Map - Example



Source: https://timvangelder.com/2009/09/08/what_is_decision_mapping/

Learning strategy: Brainstorming

The steps of brainstorming are a well-structured process for collecting ideas, analyzing them, and selecting the best solution to a problem. In order to ensure the success of this process, it is important to follow the rules of brainstorming. First, the problem is clearly defined and formulated. During the idea production stage, the goal is to collect as many ideas as possible, without evaluating or criticizing them. Each idea is written down as it is given by the author.

Once all ideas have been collected, the critical analysis stage begins. Evaluation criteria are set and the ideas are evaluated based on these criteria, such as feasibility, potential gains or losses, or majority acceptance.

Finally, the best solution is selected and a decision is made to implement it. By following these steps and adhering to the rules of brainstorming, the process can lead to a successful outcome and innovative solutions.

Learning strategy: The Journalistic Six or the Five W's

The 5 Whys method is a powerful tool for uncovering the root cause of problems, but to use it effectively, it's important to follow certain rules and guidelines.

- **Step 1**: Identify the problem: Clearly define the problem you're trying to solve.
- **Step 2**: Ask "Why?" question: Ask the first "Why?" question to get to the root cause of the problem.
- **Step 3**: Repeat: Continue asking "Why?" questions until you reach the root cause of the problem. Usually, it takes 5 "Why?" questions to get to the root cause.
- **Step 4**: Identify the root cause: Once you've reached the root cause, take action to solve the problem.
- **Step 5**: Implement a solution: Implement a solution to prevent the problem from happening again in the future.

Proper formulation of the problem and clear understanding by participants is crucial. The analysis should be done step by step, avoiding jumping to conclusions, and asking "why" until the root cause is identified. Writing down the analysis on paper or a blackboard, with teacher involvement, is also recommended. It's important to create an atmosphere of honesty and trust for the 5 Whys analysis to be effective. However, it's important to note that the 5 Whys method involves deduction, which can sometimes lead to wrong conclusions. If the analysis becomes looped or the conclusions start to look incorrect, it's recommended to stop asking further questions.

A variation of the 5 Whys method is to write articles using the five *W's principle* (Who, What, When, Where, Why), answering modified 5WHY questions to analyze a given topic. This approach can be applied to essays, poetry, and other types of texts.

Learning strategy: Lego serious play

The LEGO SERIOUS PLAY methodology is a unique approach to problem-solving and creative thinking. In this approach, teachers present a challenge to students, and the students build physical models of the key elements that drive the problem using LEGO bricks. Through this hands-on process, the students gain a deeper understanding of the issue at hand.

Once the models are completed and shared, the group works together to identify potential solutions. Using LEGO bricks, the students construct new models that represent their proposed solutions. These models are then grouped together based on their similarities and evaluated for feasibility, impact, and likelihood of success.

Steps for Using LEGO SERIOUS PLAY:

- **Step 1**: Identify the Problem: Choose one area of focus and take some time to fully understand the problem at hand.
- **Step 2**: Brainstorm: Using Lego bricks, build and play with different models that represent potential solutions to the problem.

- **Step 3**: Decide: After exploring different ideas, narrow down the options to 1-2 potential solutions.
- **Step 4**: Take Action: Decide on the first steps to implement the chosen solution and put the plan into action.

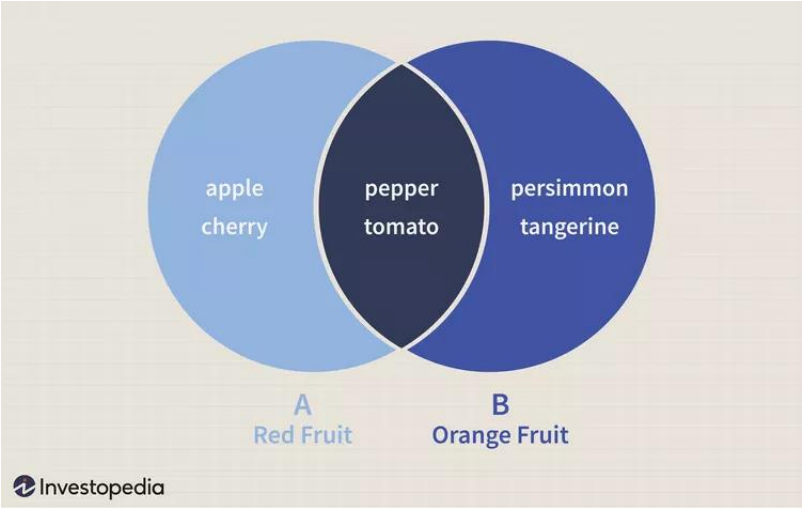
Source: BEAST project documentation

Learning strategy: Venn diagram

The Venn diagram is a versatile tool that enables students to categorize and analyze anything that can be differentiated, including animals, numbers, shapes, or even people. The creation of a Venn diagram entails identifying the similarities and differences between two or more things, then organizing this information into circles that overlap.

In a Venn diagram, closed figures, symbolizing a number of sets of objects, are always positioned in a way that splits the plane into various regions, each representing a distinct combination of belonging or not belonging to each set. Every possible combination is displayed on the diagram.

Example of Venn diagram



Source: https://www.investopedia.com/terms/v/venn-diagram.asp

Some examples of using the Venn diagram in the classroom include:

- *Personal characteristics*: Students can work in pairs or small groups to share information about themselves and arrange it in a Venn diagram. Each individual circle symbolizes what makes each person unique, while the overlapping region represents shared traits.
- *Syllogisms*: Students can practice making inferences based on two premises that share a common element, using a Venn diagram to visualize the relationships between the premises and conclusion.

Whether exploring animal species, personal traits, or solving logical reasoning problems, the Venn diagram can be adapted to a wide range of learning scenarios and is a versatile tool for the classroom.

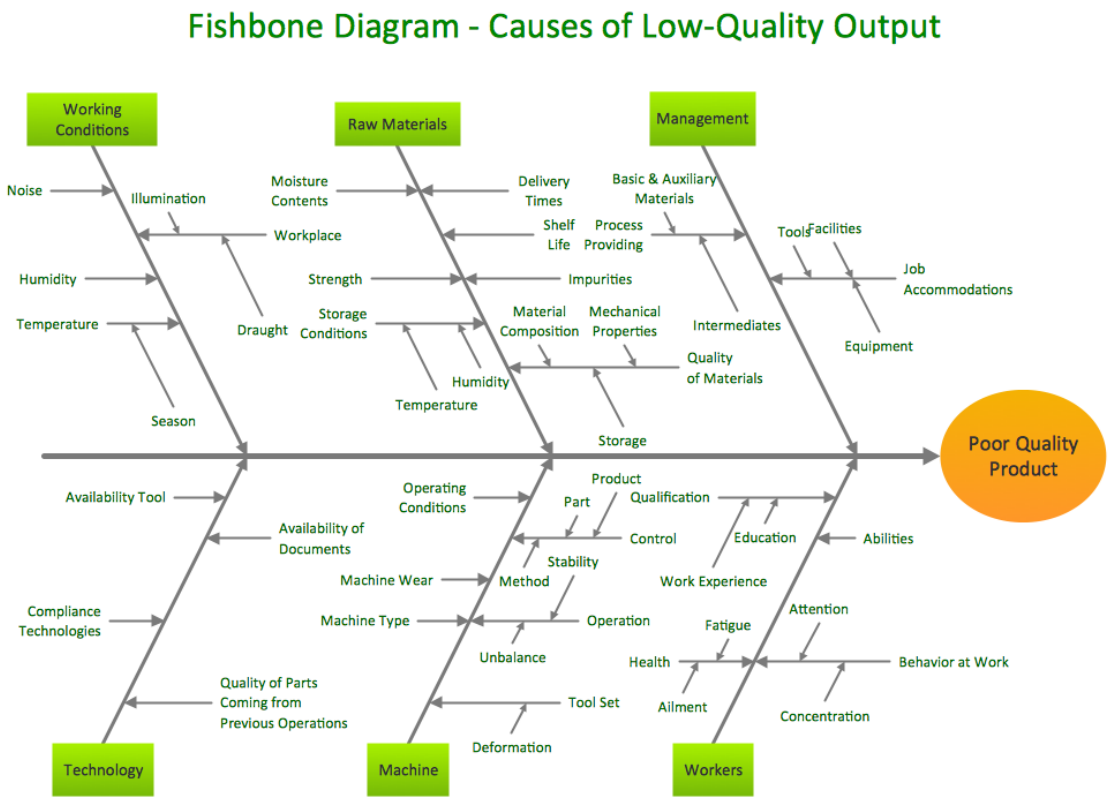
Learning strategy: Fishborn analysis

The Ishikawa diagram should not be used when the root cause of a problem is already known. Instead, it is best suited for situations where there is a need to identify multiple possible causes. While the Ishikawa diagram is a simple and straightforward tool to use, it is important to have a basic understanding of soft skills such as cooperation, open-mindedness, and seeking truth in order to maximize its effectiveness.

- **Step 1**: We start our work on the diagram by drawing the diagram
- **Step 2**: At the top of the diagram we write the problem we want to address, for example, delays in shipments.
- **Step 3**: Marking the different bones with thematic blocks, according to which we will analyze the causes of the problem.

- **Step 4**: Now we start looking for the causes of the problem. A method that supports this process well is the 5xWhy technique. We draw a horizontal line to the bones of where we write down the cause of the problem. Now we draw a vertical line to the "no inspections" line. We wonder what was the reason that they were not carried out. We draw out the diagram until we have exhausted all the causes.
- **Step 5**: In case there are many causes, we choose the five most important ones and create a new diagram. We plot these five on the bones and deepen the analysis.
- **Step 6**: Search for solutions, for example, using the 363 technique (three ideas, six people, three minutes).
- **Step 7**: The final step is to implement the selected solutions and monitor their effectiveness. It is important to regularly check the progress and make necessary adjustments to ensure the desired results are achieved.

The final Ishikawa diagram does not prioritize the causes identified, as it is meant to simply show the relationships between different parts of the problem. In order to determine which causes are most significant, additional analysis may be necessary.



Sample diagram, source: https://sites.ualberta.ca/~yreshef/orga432/fishbone.html

Notes for specific disciplines

STEM

The STEM sciences require students to tackle intricate issues as a crucial part of their education. The wide range of problems they face - analytical, computational, design, and experimental - provide a solid foundation for their studies. But, unfortunately, the exercises in engineering texts often fall short in equipping students with the necessary problem-solving skills to tackle real-world challenges.

Despite the fact that engineering students are required to solve thousands of exercises, research shows that they still lack the proficiency needed to face the complexities of practical problems. Thus, there is a disconnect between the theory students learn and the skills required to put that theory into practice.

Problem solving	**Task solving**
Uses the process to get the best solution due to constraints.	It uses a process to get only one right answer for a given set of data.
The situation is ill-defined, there is ambiguity in the information available, and there is no clear statement of the problem. Students can define the problem themselves. Assumptions must be made about what is known and what is to be determined.	The situation is well-defined. The problem is posed unambiguously with all the necessary information (known and unknown)
The context of the problem is new (the student has not encountered it before).	The student has solved similar tasks in exercises, which are described in books.
There is no clear statement in the problem as to what knowledge, skill, or technique should be used to solve it.	Often it is paired with how the task should be solved, there are hints.
There may be more than one correct approach to solving the problem.	Usually, there is one method that gives the correct solution.
The algorithm for solving the problem is unclear.	The standard method is to get a similar solution to those previously received.
Incorporation of knowledge from different subjects may be necessary to understand all aspects of the problem.	Usually, the task is only from one subject or even one subject from a given subject.
Strong communication skills are required to present the problem and solution proposal.	Communication skills are not crucial, as most of the solution involves mathematical calculations and graphs.

Source: Mourtos, N. J., Okamoto, N. D., & Rhee, J. (2004, February). Defining, teaching, and assessing problem solving skills. In *7th UICEE Annual Conference on Engineering Education* (pp. 1-5)

Problem-solving protocol. Ultimately, problem-solving strategies must be applied to the unstructured and often ill-defined problems we encounter in everyday life. To this end, the following eight-step process can be presented to students.

The steps of this methodology are as follows:

Step 0	Commitment and Motivation: The first step to solving a problem is to have a positive attitude and a willingness to see it through to completion. Students must believe in themselves and have a strong desire to find a solution.
Step 1	Defining the Problem: It's crucial to have a clear understanding of what the problem is and what information is available to solve it. This includes sketching the problem, determining the constraints, and setting evaluation criteria for the final solution.
Step 2	Investigating the Problem: In order to fully understand the issue, students must examine the underlying problems and make reasonable assumptions. They should also determine the real purpose of the problem and estimate the answer.
Step 3	Planning the Solution: With a deep understanding of the problem, students can develop a plan to solve it. This involves breaking the problem down into smaller subproblems, selecting the appropriate theory and principles, and identifying the necessary information to be found.
Step 4	Implementing the Plan: The next step is to try out the solution that has the best chance of success and fits the students' risk comfort level.
Step 5	Testing the Solution: Once a solution has been found, students must test it to ensure it is accurate and works as intended.
Step 6	Evaluation and Reflection: The final step is to critically examine the solution to determine if it is reasonable and makes sense. Students should consider if the assumptions were appropriate, compare their solution to initial estimates, and evaluate its social and ethical acceptability."

Based on: Mourtos, N. J., Okamoto, N. D., & Rhee, J. (2004, February). Defining, teaching, and assessing problem solving skills. In *7th UICEE Annual Conference on Engineering Education* (pp. 1-5)

Foreign language

Learning a foreign language can be an enjoyable and enriching experience, particularly when combined with problem-solving activities such as puzzles and riddles. For instance, consider a comic strip or short story with a mystery at its core. During the discussion, various questions can be posed to challenge and engage the learner, such as:

- What is the situation at hand?
- What options are available for resolution?

- Which solution is deemed the most effective?
- What is the reasoning behind that choice?
- How did you arrive at your selected solution and why did you choose it over the others?

Literature

Discussing literary texts is an ideal situation to work on all steps of the problem-solving protocol. Using the 5W method, questions can be asked about all aspects of the literary text under discussion.

Journal of the Five W's

- The "W" is **who**. *Who is behind the action?* Who, simply defines who the characters are in the mystery and what their role is.
- "W" is **what**. *What was done to solve the mystery? What happened to the main characters?*
- "W" is **when**. Asking questions about "when" is important in mystery or other creative types of writing because they play an important role in organizing the writing.
- "W" is **where**. In almost every type of creative writing, the "where" comes into play.
- An important part of life is the **why** question. Why questions establish specific causes, solutions and/or problems that are an important part of a mystery or other type of creative writing.
- The last type of journalistic question is the **how**. *How did it happen? How was the theft planned?*

Questions according to the 5W protocol can be used when analyzing literary texts, but they can also be used when writing texts, for example, in the form of short stories on a given topic (crime mystery texts work well).

How to assess skills' development?

Measuring problem-solving and decision-making skills is fraught with many dilemmas. The most important problem is that students are characterized by different intellectual abilities and levels of knowledge. What may be a difficult problem for one person is a standard task for another. Whether something is a problem often depends on the person's state of knowledge. An evaluation should give the teacher confidence that he or she has conveyed to students the essence of the importance of problem-solving and equipped them with the basic tools to do so. Students, on the other hand, when receiving evaluations from teachers, should be able to identify existing deficiencies and know how to address them. Measures of assessment of problem-

solving and decision-making skills should include all relevant parameters of the process of solving and presenting solutions to real-world problems. Problem-solving and decision-making competencies are very difficult to measure in quantitative terms (except in science subjects). It seems that the best approach to the problem of measurement is to develop a scale that describes the various stages during problem-solving. Ideally, this scale could be used by the teacher, but could also be used independently by students for their own self-assessment or for peer assessment during group work. In some schools, formal assessment of problem-solving takes place only in math classes, but such practice ignores the importance of problem-solving in all content areas. Literary characters face problems, problems arise both in the science lab and in society at large, and people face problems every day of their lives. All of these types of problems are problems that students can solve using a sequential, multi-step process. The process described here can be used in many disciplines and at many levels of learning. It can be explicitly taught to students of all ages.

Scale for Problem solving & decision making skill

Assessment strategies

Example scale 1

<table>
<tr><th colspan="2">Problem solving and decision making</th></tr>
<tr><td colspan="2">SCORE (from 1 to 10)

STUDENT
1 - The student performs only tasks that are prepared by the teacher without showing his/her own initiative.
10 - Student demonstrates high problem-solving skills, takes initiative on his/her own, searches for new problem-solving strategies, is committed.

TEACHER
The teacher operates only standard examples, tasks placed in textbooks.
The teacher prepares unusual problems outside the textbook based on real problems, involves students in solving complex problems.</td></tr>
<tr><td>GRADE</td><td>_____</td></tr>
<tr><td>JUSTIFICATION</td><td></td></tr>
<tr><td>How can you raise your grade?
Share your ideas/insights.</td><td></td></tr>
</table>

Source: based on Wilson, M., Bejar, I., Scalise, K., Templin, J., Wiliam, D., & Irribarra, D. T. (2012). Perspectives on methodological issues. In *Assessment and teaching of 21st century skills* (pp. 67-141). Springer, Dordrecht.

Example scale 2

	Beginner (1)	Trainee (2)	Competent (3)	Expert (4)	GRADE
Identification of the problem	He has problems identifying the problem and isolating its parts.	Can explain what the problem is, but does not understand the parts of the problem.	Describes the problem with some of the details and supporting information.	Clearly describes, the problem, puts it in context with supporting information and details.	
Identification of multiple solutions	Proposes one solution but does not know if it is correct.	Describes one or two possible solutions.	Offers more than two solutions	Offers at least 3 solutions and can describe them in detail.	
Defense of the chosen solution	Is unable to justify the chosen solution.	Gives a simple justification for one solution that the student thinks makes sense.	Evaluates solutions and chooses the one that is feasible.	Evaluates all solutions, selects one that is most optimal.	

Source: based on Greenstein, L. M. (2012). Assessing 21st century skills: A guide to evaluating mastery and authentic learning. Corwin Press.

Example scale 3

Scores for teacher-designed tasks will be entered along with the results of the teacher's observations and perceptions. Depending on whether the entire problem-solving process is evaluated or only some selected skills, the evaluation can be done, for example, every semester, every month or at other intervals selected by the teacher. Rather, depending on the subject, the teacher should choose a small set of skills that fit well with the teaching content.

An example of a scale for the skill of CONCENTRATION OF ATTENTION

GRADE	REQUIREMENT
Grade 5.0	Student is able to apply ..... in unusual situations considering elements or using strategies that were not discussed in class. The student does not make significant errors or omit important information.
Grade 4.5	Compared to the rating of 4.0, partially meets the requirements for a rating of 5.0
Grade 4.0	Student is able to apply ..... in standard situations without making an error
Grade 3.5	Compared to a rating of 3.0, partially meets the requirements for a rating of 4.0
Grade 3.0	Student is able to apply ..... to a limited extent making numerous errors.
Grade 2.0	Even with the help of the teacher, cannot apply..... to a minimal extent.

Source: based on Scardamalia, M., Bransford, J., Kozma, B., & Quellmalz, E. (2012). New assessments and environments for knowledge building. In *Assessment and teaching of 21st century skills* (pp. 231-300). Springer, Dordrecht.

As mentioned earlier, teacher observation and perception are probably not the best tools for assessing 3.0-scored content, as it is difficult to observe or perceive a student's understanding of the information. Therefore, teacher observation and perception can be used in conjunction with traditional tests. More detailed criteria can also be developed by the teacher.

References – It matters to know more!
21st Century Skills

Problem – solving resources

Odyssey of the Mind (OM™) https://www.odysseyofthemind.com/

Odyssey of the Mind (OM™) teaches students how to develop and use their natural creativity to become problem-solvers. Imagine being faced with a problem that requires an original solution. Students solve interdisciplinary problems in an international program. This international program is designed to help students at all levels grow as individuals, develop as team members and reach their full potential. The basic types of problems students work with are:

1. mechanical devices or vehicles.
2. classical art, architecture, or literature.
3. performance - performances that include imposed elements.
4. structural - using wood and glue.
5. technical performance.

Destination ImagiNation https://www.destinationimagination.org/

At Destination Imagination (DI), students work together in teams to solve open-ended STEAM challenges designed to teach the creative process. The organization works nationally and internationally to encourage students to use creativity and teamwork to solve open-ended problems and compete in tournaments.

Creative Education Foundation www.creativeeducationfoundation.org

This organization focuses specifically on solving local problems and connecting to the community. The materials on the site use the Creative Problem Solving (CPS) approach, a proven method of approaching a problem, challenge or opportunity in an imaginative and innovative way. Students will not only learn how to create better solutions, but also have a chance to enjoy a positive experience.

World Class Arena https://www.worldclassarena.org/

World Class Arena works at the frontline of assessment and learning. Using the resources, the teacher can show students how:

- computers can make a unique contribution to assessment in the sense that they can present new sorts of tasks, whereby dynamic displays show changes in several variables over time.
- how IT tools support complex problem solving for different age groups.
- how computers can facilitate discovery hidden rules or relationships, such as virtual laboratories for doing experiments or games to explore problem-solving strategies.

Logic and Creativity Games

Important skills to develop for problem solving are logical and creative thinking. Some people are naturally good at logical and creative thinking but if you are not then don't worry. Everyone can improve both of these and it's not too difficult. Dobrym sposobem zwiększenia umiejętności logicznego myślenia i wnioskowania są gry logiczne np.

- Mastermind - Good for developing logical thinking.
- 2048 - can you plan far enough ahead?
- Sudoku
- Chess
- Rubiks Cube
- Online Escape Rooms
- Murder Mysteries
- Poem or story challenge

Online templates

- https://creately.com
  Many available templates including Ikishawa diagram, Venn diagram, concept maps and many others in various styles. Easy drag & drop diagram creation.
- https://www.mural.co/templates/problem-tree-analysis
  Problem tree analysis template. A way of exploring the causes and effects of a particular issue on Mural
- https://www.mindmup.com/
  Capture ideas at the speed of thought – using a mind map maker designed to help you focus on your ideas and remove all the distractions while mindmapping.
- https://www.mindgenius.com/spin-selling-mind-map/
  SPIN Selling stands for Situation, Problem, Implication, Pay-off. This method was designed to take away some of the ambiguity and difficulty when closing a sale. Use this template to map out the element of your product/service.
- https://seriousplay.community/australia/methodology/
  Community of lego® serious play® facilitators in australia trained and supported by the association of master trainers in the lsp method.

Courses and tutorials

- Seven thought experiments that will make you question everything https://bigthink.com/personal-growth/seven-thought-experiments-thatll-make-you-question-everything/
- Thought Experiments: An introduction to philosophy Student will learn how to use imagination to put definitions, analyses or conceptions of philosophically relevant notions to the test by means of imaginary examples and counterexamples, addressing questions that have been part and parcel of Western philosophy since its very inception https://www.coursera.org/learn/thought-experiments
- Problem Solving Using Computational Thinking The course includes an introduction to computational thinking and a broad definition of each concept, a series of real-world cases that illustrate how computational thinking can be used to solve complex problems, and a student project that asks you to apply what they are learning about Computational Thinking in a real-world situation. https://www.coursera.org/learn/compthinking
- Effective Problem-Solving and Decision-Making Problem-solving and effective decision-making are essential skills in today's fast-paced and ever-changing workplace. Both require a systematic yet creative approach to address today's business concerns. This course will teach an overarching process of how to identify problems to generate potential solutions and how to apply decision-making styles in order to implement and assess those solutions. https://www.coursera.org/learn/problem-solving

Scientific and popular science articles

1. James, A. R. (2013). Lego Serious Play: a three-dimensional approach to learning development. *Journal of Learning Development in Higher Education*, (6).
2. Stuart, M. T., Fehige, Y., & Brown, J. R. (2017). Thought Experiments: State of the art. *The Routledge companion to thought experiments*, 1-28.
3. Tümkaya, S., Aybek, B., & Aldaş, H. (2009). An Investigation of University Students' Critical Thinking Disposition and Perceived Problem Solving Skills. *Eurasian Journal of Educational Research (EJER)*, (36).
4. Wengel, Y. (2013, December). Creative thinking, problem solving & decision making using LEGO Serious Play Methodology. In *25th New Zealand Communication Association (NZCA) Annual Conference'Waiting for the Communication Revolution'*.
5. Vacek, J. E. (2009). Using a conceptual approach with concept mapping to promote critical thinking. *Journal of Nursing Education*, *48*(1), 45-48.

Sources:

1. Greenstein, L. M. (2012). *Assessing 21st century skills: A guide to evaluating mastery and authentic learning*. Corwin Press.
2. National Research Council. (2011). Assessing 21st century skills: Summary of a workshop.
3. Griffin, P., & Care, E. (Eds.). (2014). *Assessment and teaching of 21st century skills: Methods and approach*. Springer.
4. Tammy, Robert J., and Marzano Heflebower. "Teaching & Assessing 21 st Century Skills. The Classroom Strategies Series." (2012).

SKILL#8
SOCIAL RESPONSIBILITY

Authors: *Maria Isabel Borges, Luís Cardoso, Maria José Varadinov [IPP]*

Short Characteristic

Social responsibility is a new core of collective responsibility that complements moral and legal responsibilities and fosters political creativity (Valleys, 2011).

Social responsibility governs our impacts and citizen co-responsibility becomes necessary for people, to recognize that their way of life generates endemic, unsustainable problems, and also to institute the social changes necessary to solve these problems.

According to ISO 26000 (2010), an organization's social responsibility (in terms of co-responsibility for negative social and environmental impacts arising systemically from our collective lifestyle) is its responsibility for impacts in a local and global social environment.

Social responsibility involves the awareness, understanding, and appreciation of connections among people, including between people and the natural environment. Social awareness and responsibility focus on interacting with others and with the natural world in respectful and caring ways.

Abilities connected to social responsibility skill

Social responsibility is related to the following skills/abilities, also sought by employers in candidates for employment:

Empathy

Empathy, according to Barker (2003) is the ability to identify with and understand, another person's experience and point of view. Is "the act of perceiving, understanding, experiencing and responding to the emotional state and ideas of another person." Employees value this skill because it furthers collaboration and leads to strong workplace relationships.

Communication

This skill involves both verbal and non-verbal communication. Is the ability to communicate clearly in order to understand the other´s needs, regardless their cultural background, age, gender, literacy skill level or disability. The first is the ability to express yourself using clear language that others can understand. You'll need solid that skill whenever speaking to others in person or on the phone. It also comes into play whenever you write an email, text, letter, report, or presentation – here, appropriate grammar, spelling, and format are necessary. The second one is also an important skill, through body language, eye contact, and facial expressions, one can express that is an empathetic person who carefully listens to others. Walk around with a smile make people will more readily engage than if have a scowl on their face.

Active listening

Listening carefully, concentrating, asking the right questions, and utilizing techniques such as paraphrasing and summarizing, also helps to engage with the other's needs and emotions. You need to be able to listen carefully to what your colleagues say in a meeting, for instance, or what others ask of you. You must listen to their concerns, and express to them that you have understood them.

Cooperation

This skill is important to work in a team, where it´s required to partner with others to reach a common goal or a goal of an organization. Also, employers have a preference to work with people that can work well with others, and won´t obstruct progress.

Elements for Personal and Social Capability

Self - awareness

This element involves students developing an awareness of their own emotional states, needs, and perspectives. It comprehends the identification and description of the factors that influence their emotional responses. The students develop a realistic sense of their personal abilities, qualities, and strengths by knowing what they are feeling in the moment, and having a realistic assessment of their own abilities and having a well-grounded sense of self-knowledge and self-confidence.

Self- management

This element involves students developing the metacognitive skill of learning by knowing when and how to use particular strategies to manage themselves in a range of situations, developing organizational skills, identifying the resources needed to achieve goals, working independently, and showing initiative, to learn and to be conscientious, to delay gratification and persevere in the face of setbacks and frustrations.

Social- awareness and management

This element involves students recognizing others' feelings and knowing how and when to assist others. They learn to show respect for and understand others' perspectives, emotional states, and needs. They learn to participate in positive, safe, and respectful relationships, defining and accepting individual and group roles and responsibilities.

Examples of typical professional tasks supported by the skill

Empathy

1 – A employee empathizes with a customer whose heels broke after purchasing a pair of shoes from the store.

2 - Teams empathize by understanding customers' pain points and creating solutions to make their lives easier.

3- A company's leadership shows empathy by genuinely listening to feedback from employees and incorporating them into their business processes.

Communication

1- Team members: Open and constant lines of communication are vital to team success, particularly when completing quality- and deadline-critical projects.

2- Supervisors: The best supervisors employ active listening skills to understand employee needs and perspectives, engage in verbal negotiation to address and defuse issues, and capitalize upon opportunities to praise individual and team achievement.

3- Presenting scientific articles at a conference.

Active listening

1 - Supervisory position or interact frequently with colleagues.

2 – Responsible for security safety in a company.

3 – Engaging in active listening can help reduce errors and prevent unintentional harm.

Cooperation

1- Reaching a consensus about goals and methods for completing projects or tasks.

2- Customer care.

Methodologies/learning strategies

Learning strategies should develop Social Responsibility skills (***Self – awareness, Self – management, social awareness, and engagement***) in all domains and degrees and should include the more adequate ones to develop the skill: student-centered and connected to labor market requisites, such as Project-based Learning, Problem-based Learning, Discovery Learning, Inquiry Learning, Case-based Learning, Just-in-Time Teaching, Collaborative Learning, Cooperative Learning e Project-led Education. According to Mendes et alii (2018):

Project-based Learning presents itself as an active learning methodology with the proposal to involve the student with reading, writing, and questioning, in addition to proposing discussions, problem-solving, and project development (2018, p. 3).

1. According to his syllabus, the teacher divides the class into groups and determines, with the students: the duration of the project, the theme, objectives, resources and dissemination of results;
2. The teacher chooses the theme, according to his syllabus, shares resources and divides the class into groups; each group should choose a different strategy for solving the problem and different ways to communicate the results.
3. The teacher distributes to the students (gathered in working groups) texts related to the theme selected for each PBL, according to his syllabus, which refers to methodologies or techniques that allow the optimization of the use of resources and social welfare, and asks them to present verbally to the other classmates, in a later class, a summary of their reflection on the texts and how they can introduce an adaptation of the ideas captured in their project.
4. The teacher presents a problem, related to the syllabus. Responses reveal different feelings, needs, interests, and group experiences to create a solution.
5. Identify a range of emotions and describe situations about a problem that may evoke these emotions in an essay.

Problem-based Learning is a learning method based on problem-solving, that is, a problem of professional practice is presented to small groups of students or individually, who must actively participate in the search for ways to solve it (2018, p. 4).

1. The teacher divides the class into groups and asks the students to propose solutions to a problem, according to his syllabus, adopting more responsible behaviors;
2. The teacher poses a small problem, according to his syllabus, on a given subject and asks the students (divided into groups) to find the solution and to define among the members of the group (according to their different abilities and personal tastes) who puts the solution in written form, who translates the solution into a graphical form or drawing, who presents the solution in a sign language or mimic.
3. The teacher asks the class to identify strategies for a problem, regarding his syllabus. Students work in small groups, analyzing the problem, collecting information, directing their research activities in accordance with the knowledge that proves to be necessary for dealing with the problem posed and, finally, formulating solution hypotheses.
4. The teacher asks the students to identify situations or problems that feel safe or unsafe, selecting new approaches to enhance confidence.

5. Each student writes an essay or records a video and reflects on what each one has learned about themselves from a range of experiences at home and school when solving a problem.

Discovery Learning, or the discovery model, is considered an innovative method for differentiating itself from traditional teaching, based on discovery, encouraging the student to find solutions to the challenges presented to them (2018, p. 5).

1. The teacher divides the class into groups, and shares a problem, according to his syllabus, for debate and his solution; each group chooses a spokesperson to present arguments for and against the solution presented by the teacher
2. The teacher presents information (text, images, videos) according to his syllabus; divides the class into groups to research about the causes of the problem and present resolution proposals.
3. Students collect examples of a problem, according to the syllabus, gather in groups and present solutions to eliminate the problems.
4. The teacher organizes a debate, to develop brainstorming, based on the syllabus, to acknowledge that people hold many points of view, about a certain topic.
5. Debate each student's strengths and weaknesses, in small groups, as learners, and identify some learning strategies to assist them. Share views and solutions from different groups.

Inquiry Learning consists of teaching through questions, which can be prepared by teachers or students, who may have previously known answers or not, and seek not only to teach, but also to help students to discipline their studies, seek new knowledge, and to update their knowledge. (2018, p. 6).

1. The teacher presents a problem, according to his syllabus, and shares a list of questions to trigger the best research proposal on the problem.
2. Students prepare a set of questions about a problem regarding the syllabus. They take the questions to the classroom and discuss solutions that can be implemented.
3. Students ask teachers which classmates have more difficulties in each subject on the syllabus. According to the subjects, they organize study groups to support colleagues with difficulties.
4. The teacher shares information about a problem, according to the syllabus (text, image or video), to create experiences of cooperation in play and group activities, identifying options when making decisions to meet the needs of the people affected by the problem.

5. Students make a Self-oral presentation about each student´s abilities, talents and interests as learners to solve a problem, comparing solutions and choosing the best options.

Case Based Learning is an easily applied learning method, as long as there is a case to be analyzed and it is well structured. In this case, it is necessary that the case study can be related to previous knowledge. From a practical case, the theory already taught by the teacher is rescued, and thus applied in the proposed case (2018, p. 7).

1. The teacher chooses a positive case study, according to his syllabus, and asks the students to identify similar behaviors.
2. The teacher shares an example of a problem, according to his syllabus. The class, divided into groups, proposes similar procedures to solve this problem.
3. The teacher shares a good example of communication, according to the syllabus. Students create similar good examples.
4. The teacher invites students to identify people and situations with which they feel a sense of familiarity or belonging and asks each student to make a presentation about the theme.
5. Compare their emotional responses with those of their peers in an oral debate to find out the best solutions to solve a problem related to the syllabus.

Based on the flipped classroom concept, in the *Just-In-Time-Teaching* there is the creation of a culture of study by the student, requiring their engagement for learning to occur and the creation of a flexible and diverse environment by the teacher (2018, p. 8).

1. Students study good practices according to the syllabus, and send the teacher difficulties or problems they have detected; the teacher replies and, later, in class, divides the class into groups so that each one details the strategy for the previously identified problems.
2. Using computers and the internet, students prepare for the class, and choose a problem, according to the syllabus. The teacher shares an idea and asks the students for strategies to achieve this goal.
3. The teacher alerts the class to a problem according to the syllabus and describes a recent example. Students analyze the situation and present solutions.
4. The teacher defines a task to be carried out independently and identifies when and from whom help can be sought.
5. The teacher creates a flexible environment to include a range of emotions and describe situations that may evoke these emotions, compare emotional responses and present solutions.

Collaborative Learning is a teaching-learning method applied to a group of students with different performance levels, who work together to complete a task, respecting and collaborating with their peers (2018, p. 9).

1. The teacher divides the class into groups including students with different grades; releases information (text, images, or videos), according to the syllabus, and asks the groups for proposals.
2. The teacher divides the class into groups of 4-5, including students with more difficulty in a certain subject of the syllabus, and others with greater ease of understanding, so that one helps the other.
3. The teacher asks the class, divided into groups with students of different grades, to solve a problem, related to the syllabus. After analyzing the graph and according to the time of year, students present proposals to solve the problem.
4. According to the syllabus, the teachers set goals in learning and personal organization by completing tasks within a given time, while using group work.
5. Debate and identify personal interests, skills, and achievements and explain how these contribute to the curricular unit in a collaborative way.

Cooperative Learning consists of the use of small groups of students, oriented to work together in order to maximize their learning and also the learning of others (2018, p. 10).

1. The teacher divides the class into pairs and asks each small group to find an example of good practice related to the syllabus; later, he asks that the examples are shared and a joint proposal made by all groups to solve the problem.
2. The teacher divides the class into groups of students with different points of view in order for them to understand and extract from the dialog about a class topic, according to the syllabus, an integrative solution that respects the different views.
3. The teacher presents an exercise to the class, according to the syllabus. This exercise requires several stages of work. The class is divided into groups with students and each group has a stage to solve. The solution depends on everyone's work.
4. Regarding a problem connected to the syllabus, identify cooperative behaviors in a range of group activities, in situations when working in pairs and small groups.
5. According to the syllabus, the teacher divides the class into groups and give them different subjects and clues to upgrade the concepts related to the subject

by doing online search. After each group must present the results of the search in a class.

In *Project-led Education* there is the total involvement of students, who actively participate in the analysis, understanding, discussion, and reflection of activities. Cooperative learning has the student as the center of attention and prioritizes teamwork to develop their skills and abilities (2018, p. 12).

1. The teacher presents a negative example of a situation, according to the syllabus; divides the class into groups and each group has a task (research; creating solutions; predicting impact); the work of all groups must reveal itself as an integrative and collective response.
2. The teacher asks the class, divided into groups, to think about how different subjects can discuss the causes of a problem, according to the syllabus. In each subject, a different activity must be proposed, but with the same common objective of reducing the impact of the problem.
3. The teacher asks each student to think of a study strategy to help classmates with lower grades in this curricular unit. Proposals are shared and students with the lowest grades choose a strategy to be implemented with the colleague who proposed it.
4. Each student describes a colleague, highlighting his/her key emotions and how they can be helpful in creating class interaction activities to solve a problem.
5. The teacher divides the class into groups of students and give them the task to create a chronogram with the planning to complete a task related to the syllabus in a predetermined period of time; for instance, a task to be completed into one week or two weeks.

How to assess skills' development?

To assess Social Responsibility development, one of the most adequate methods is the formative evaluation, described by Pinto (2016). This process was greatly influenced by cognitive psychology and it is argued that students can have direct access to knowledge, without teacher mediation, as occurs in the traditional teaching process. Students are able to build their knowledge and this process is carried out directly, with the teacher having another mission which is to organize contexts and monitor learning, rather than being a simple transmitter of knowledge. Assessment instruments should be chosen to help the student to overcome his difficulties through his own effort, which determines a certain pedagogical regulation, as it is essentially a task of the student. This assessment process is student-centered, allowing you to analyze your path and your actions. Assessment tools, which may or may not be negotiated, strike a balance

between formative and summative assessment and may include the preparation of reports, essays, portfolios, and e-portfolios, which allow elements to be gathered throughout the process and its analysis by the student, identifying the actions created and the objectives achieved, as well as the objectives that were not achieved, which allows rethinking the undertaken actions, choosing others, correcting the trajectory of the intervention process and application of the skill.

SKILL#9
TEAMWORK & COLLABORATION

Authors: Soledad Domene, Juan A. Morales, María Puig, Margarita Rodriguez *[US]*

Short Characteristic

The set of knowledge, attitudes and skills required to work with others on tasks aimed at achieving common, shared goals (Hebles et al., 2022, p.510). Teamwork competence involves personal willingness and collaboration with others in carrying out activities to achieve common objectives, exchanging information, assuming responsibilities, resolving difficulties that arise and contributing to collective improvement and development (Torrelles et al., 2011, p. 340).

Abilities connected to teamwork & collaboration skill

- Group Goal Setting: Ability to establish common objectives. Requires interpretation and evaluation of the team's mission and identification of the principal tasks and the resources needed to complete that mission Planning and Coordination: Work sequentially in specific roles and effectively organise activities.
- Communication: Allows the exchange of information and the development of a shared vision.
- Conflict and problem solving: Detecting problems and finding joint solutions.
- Follow-up and feedback: Being aware of the work done and monitoring the performance of the other members to make sure that everything is working well and if not, making the necessary adjustments.
- Supportive Behaviour: Ability to help other members to do their job in the best possible way.

Examples of typical professional tasks supported by the skill

Teamwork and collaboration skills are essential in all areas of work. The following tasks are highly dependent on these skills:

- Solving conflicts and problems
- Negotiation
- Reporting
- Creative solutions
- Project development
- Interdisciplinary tasks
- Meetings

Methodologies/learning strategies

It is possible to learn to work in a team if we train the skills that are necessary for its development. If we offer our students the possibility to work side by side with their peers, set common goals, distribute roles and tasks and plan actions through collaboration, we will be helping them to develop their group work and collaboration skills. Below are some basic strategies that contribute to this competence:

- Create diverse teams. Encourage the creation of diverse working groups, where members display different skills, knowledge and styles. This enriches the exchange of views and encourages divergent thinking.
- Promote a collaborative environment. Create a pleasant working environment, where collaboration is valued over competition and where sharing ideas and building knowledge together is encouraged.
- Maintain open communication with the team. Good communication is essential for the proper functioning of groups, for organising meetings, sharing information, reaching agreements and carrying out actions. Moreover, improving communication is a way of building the group itself.
- Establish common goals. It is important that the members of the group set common objectives. The objectives of its members do not always coincide, so it is necessary to try to define together what the group wants to achieve and what the group considers important.
- Celebrate results. A key element for a group to function is to recognise achievements. Take the time to recognise the effort and merit of each of the members of the group, talk to them and congratulate them in public.
- Building trust. A group functions when there is trust among its members, so creating security and reassurance within the group is important.
- Fostering a sense of belonging. Make the members of the group feel identified with the group, generate identity. Only if we feel part of something do we really work to make it work.
- Distribution of roles. A role is the behaviour expected of an individual. All members of a group must play a role and be clear about their function within the group. The distribution of roles improves the effectiveness of the group and promotes its autonomy.
- Managing conflict. All groups encounter conflict situations throughout their development. Arnaiz and Isus (1995) are of the opinion that conflicts must be resolved by facing them decisively, bearing in mind that the solution will depend on the maturity of the group. It is recommended that the person involved in the conflict:

- express his/her feelings and communicate any incidents or difficulties to the group, avoiding ignoring the problem so as not to escalate the conflict;
- recognise their mistakes if the conflict has been caused by their actions;
- avoid the use of power, avoid humiliation and irony in comments and actions, avoid making comparisons between people in the group or between different groups, and instead use reasoned dialogue and teach the group how to use it.

- Have spaces for reflection. It is important to incorporate spaces to think, to evaluate the work done and to propose alternatives.

How to?

Domènech (2001) points out some techniques that group together several of the general strategies described above. We show some examples:

Group-Investigation (Group-Investigation)

In this technique we can highlight the following steps:

1. Choice and distribution of the sub-themes (students choose according to their aptitudes, interests, etc.).
2. Constitution of the group within the class (between 3 and 5 members).
3. Planning the study of the subtopic. Students and teacher plan the objectives and procedures to be used and the tasks to be performed (finding the information, systematising it, summarising it, outlining it, etc.).
4. Development of the plan (the teacher follows the progress of each group and offers help).
5. Analysis and synthesis (students summarise the information and present it to the class group).
6. Presentation of the work (questions are raised and possible questions, doubts or extensions that may arise are answered).
7. Evaluation (students and teacher jointly evaluate the work of the group and the presentation).

STAD (Student Team-Achievement Divisions)

In this technique there is intra-group cooperation and inter-group competition. Heterogeneous groups of 4 or 5 members are formed and the teacher presents the topic to the whole class with explanations and clarifications as he/she sees fit. The students

then work as a team for several working sessions in which doubts, questions, discussions, further information, clarification of concepts, memorisation, etc. are formulated. At the end, the teacher evaluates each student individually. The marks obtained are compared with their previous marks. If they equal or surpass them, they receive points, which added together generate the group mark.

Aronson's Puzzle Technique

It is also known as Jigsaw. With this technique, it is the students themselves who act as tutors of their classmates' learning in class, being at the same time tutored by them. The central idea consists of dividing the group into working teams (puzzle groups) and each component is assigned and made responsible for a different task. Subsequently, the puzzle groups are broken up and expert groups are formed. Each expert group consists of one member from each puzzle group. Once the work is finished, the expert groups will elaborate the results of their work. In the next phase, the original groups or puzzle groups are formed again, where each expert tells the rest of his or her colleagues the part of the information that corresponds to him or her. Finally, at the end of the work sessions, the students must each have the complete dossier on the content. In the evaluation phase, the teacher marks the dossier presented by each puzzle group and a brief individual test of knowledge on the subject is carried out, with the final mark being the average score. This technique has been developed with excellent results in several groups of teachers' diploma students at the University of Seville during the 2003-2004 academic year (Navarro et al., 2004).

De Vries' game-contest technique

It consists of responding to the contents previously explained by the teacher, and worked on by them. Subsequently, weekly "academic tournaments" are held, in which the students in each team, with similar levels of performance, play against the members of the rest of the teams. Once the game is over, the scores of each individual in the group are added up. The success of the group depends on the individual successes and the help they give each other. The evaluation is the sum total of each of the contestants in the group. García, Traver and Candela (2001) present the following example: if there are 25 students in the classroom, five quizzes will be held in which five subjects will participate (one from each group and with similar performance levels). For each quiz, the teacher has to prepare 15 questions, so that he/she can ask three questions to each contestant. In the case of five quizzes, the teacher must have 75 questions prepared for the subject.

TGT (Teams-Games Tournaments)

It is similar to STAD, except that instead of individual exams at the end of each topic there is a tournament in which students from different groups compete against each other. Teams of three students are formed, distributed equally: the three students who

scored the highest in the last tournament form team number one, the next three form team number two, etc.

Peer Tutoring

It is based on the collaboration that a pupil gives to a classmate who asks a question or asks for help. We find a dual learning structure: pairs of pupils in the same group. The strategy consists of a more advanced pupil teaching a less advanced pupil under the supervision of the teacher. It is also called "student-assisted learning, "peer-mediated teaching" and "partner-partner strategy" (Gallego and Salvador, 2002). Activities such as explaining a read text to a partner, listening to the other's interpretation, discussing ways of solving a task, are gradually being introduced in schools. A variant of this strategy is tutoring between pupils of different ages. In order to implement the strategy properly, the pupils who are to carry out the tutoring function must be trained beforehand. In this strategy, the role of the teacher is to direct, control the process of interaction between pupils and evaluate individual results.

How to assess skills' development?

To assess teamwork and collaboration skills we can use different tools: observation scales, rubrics, reports, etc. It is important that the selected instrument allows us to evaluate all the aspects that we have considered key in these skills and gives us the opportunity to know the degree of learning for each member of the group. For this reason, it is advisable to use various assessment tools and strategies. Below is a rubric that could be used to evaluate the work done by a group:

CATEGORY	4 EXCELLENT	3 SATISFACTORY	2 IMPROVABLE	1 INADEQUATE
WORK	They work constantly and with very good organisation.	They work, although some organisational shortcomings are detected.	They work, but without organisation.	They hardly work and show no interest.
PARTICIPATION	All team members participate actively and enthusiastically.	At least 75% of the students participate actively.	At least half of the students present their own ideas.	Only one or two people actively participate.
RESPONSIBILITY FOR THE PERFORMANCE OF TASKS	All team members share equal responsibility for the tasks.	Most team members share responsibility for tasks.	Responsibility is shared by half of the team members	Responsibility rests with one person.
WORK DYNAMIC	Listen to and accept the comments, suggestions and	They listen to the comments, suggestions and opinions of others	Some ability to interact. Some evidence of discussion or	Very little interaction, very brief conversation.

CATEGORY	4 EXCELLENT	3 SATISFACTORY	2 IMPROVABLE	1 INADEQUATE
	opinions of others and use them to improve their work, adopting agreements.	but do not use them to improve their work.	alternative approaches is listened to attentively.	Some are distracted or disinterested.
TEAM ATTITUDE	Respect and encourage each other to improve the working environment, making proposals to improve work and results.	They work with mutual respect and encourage each other to improve the working environment.	They work with mutual respect, but do not usually encourage each other to improve the working environment.	They do not work in a respectful way.
ROLES	Each learner has a defined role and performs it effectively.	Each student has an assigned role, but it is not clearly defined.	There are roles assigned to students, but they do not perform them.	No intention to assign roles to each team member is apparent.

Rubric adapted from: https://acortar.link/fxss0M

Another instrument that can be useful in assessing and monitoring group work is the learning contract. The learning contract is a document in which the agreements reached between teachers and learners to develop the learning process are set down in writing. It is a document that reflects the commitments of each party. The purpose of the contract is to promote students' autonomy and responsibility, to increase students' motivation and involvement in their own learning (decision-making), to promote the capacity for self-evaluation and critical thinking and to evaluate students' learning outcomes (Ruay et al., 2017).

A model cooperative learning contract is shown below:

COOPERATIVE WORK CONTRACT

Jointly written by students and teacher.

Level: Course:

COOPERATIVE WORK IN THE CLASSROOM AND IN THE LABORATORY

Why?

Some of the objectives of this course are:

- Learning to listen to the teacher and to fellow students

- Learning to defend, in a justified way, one's own ideas in front of a group.

- To learn to share and take advantage of the skills and knowledge that each member of the group can contribute.

- To perceive the satisfaction that comes from problem solving based on collaboration between peers

- Know how to ask for help or assist, when required, in carrying out a particular task.

- learn to organise time and work, when working in a group

- Learn to work in a similar way to scientists: analysing, questioning, experimenting, testing, checking, revising, etc.

How? How we do it?

In order to be able to work in a group, it is essential that we make a series of agreements, and that we comply with them.

These agreements are:

- To know how to respect the opinions of others

- To help any of the members of the group if they find it difficult to understand any aspect of the work.

- Not to get nervous or raise your voice if something goes wrong. It must be done again

- In order to get everyone in the group to participate, the work should be shared out.

- Do things in an orderly way

- Discussions with team members should be done in a calm manner, without getting upset.

- When the teacher has to talk to someone outside the class, keep her voice down a bit.

- Organise work and time well.

Signed

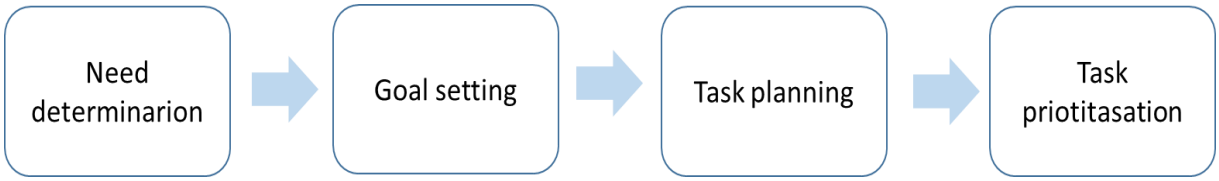
SKILL#10
TIME MANAGEMENT & PRODUCTIVITY & DEEP WORK

Authors: Georgia Micheli, Kyriakos Lingas [Militos]

Short Characteristic

Time management has been referred to as a technique, practice, or process that enables individuals to plan, allocate, even increase the available time with the aim of completing the required tasks.

The time management process is depicted in the following figure:



Time management is intrinsically linked to productivity and deep work. Its benefits can be observed at both (a) individual and (b) team level.

(a) Individual level
- Less stress
- Greater focus
- Less distraction
- Increased energy

(b) Team level
- Higher levels of productivity
- Less procrastination
- Increased satisfaction among team members
- Increased cooperation among team members

Abilities connected to time management & productivity & deep work skill

The skills related to time management are the following:

- Communication (Actively listening and clearly speaking allow individual to avoid wasting time on asking for clarifications and / or repeating ideas. Clear definitions of the discussion objectives will also save time and energy to both sides.)
- Goal setting (By setting goals and actively working towards them, the individual sets a definable target with a set deadline and a clear endpoint.)
- Planning (Planning beforehand is an extremely beneficial exercise that saves time and effort.)

Examples of typical professional tasks supported by the skill

In fast-pace, demanding working environments, time management activity supports:

- Accurately estimated time duration;
- Plans readjustment for progress-rate improvement;
- Focused and deep work with high-quality outcomes;
- Time-saving meetings;
- Providing short but thorough feedback.

Methodologies/learning strategies

The efficient management of time is a tangible "know-how" that can be gained through activities tailored-made to promote this set of skills. These skills will, consequently, allow to successfully assume the transition from the educational / university system to the professional world.

Conceptually, time management is a set of habits and / or learnable behaviors that may be acquired through increased knowledge, training, or deliberate practice. Therefore, the acquisition of skills is the result of a temporary process that starts at school and is enriched by experience.

This section presents some practices that can assist in enhancing time management skills, ensuring deep work and increased productivity.

1. Taking control of your time

To enhance time management skills, students should first and foremost acquire control over their available time. For learners, taking control requires:

- Realizing how they allocate time to the various daily activities and tasks;
- Distinguishing between activities that are time-consuming and those that are time-saving;
- Identifying which of the working hours are more productive.

To put it simple, it is essential for students to thoroughly consider how they spend time throughout the day and, then, draw conclusions about their time management habits (or the lack of them).

To familiarize students with this strategy, teachers can implement several exercise, the most common of which are described in the "How to" section.

2. Task prioritisation

The definition of prioritization is "to organize (things) so that the most important thing is done or dealt with first." Sometimes this involves organizing a group of tasks, or things that need to be completed, and ranking them according to different factors (e.g. criticalness, whether or not it is time sensitive, and how long it takes to complete each one). This technique will help students determine where to be focused to achieve maximum productivity. The process of selecting activities and allocating the required time is described in detail in the "How to?" section.

3. Planning and Progress monitoring

To manage their time, students shall realise how they allocate their time on daily activities and distinguish between time-slots that are more and less productive.

Additionally, when setting goals, it is useful to break them up into actionable steps and monitor their progress towards them. To this end, students shall also learn to plan their objectives and set a time-plan to achieve them.

How to?

1. Taking control of your time

As mentioned earlier, teachers can support learners in acquiring control over their time. Two exercises are recommended:

a) "The 60 seconds game",
b) "The $86,400".

"The 60 seconds game"

This exercise can be implemented any time throughout class since it is quick and easy and no equipment is required.

Step 1 –Preparation

The teacher covers all clocks in the class and asks students to do the same with their digital (smart) devices. Then, (s)he explains the instructions of the game in a clear and comprehensive manner.

Step 2 –Implementation

The game is individual. Teacher asks students to sit on their chairs and close their eyes simultaneously. Students are expected to open their eyes and stand up only when they think that from the time they closed their eyes 60 seconds have passed.

Throughput this phase, the teacher takes notes on the time each student stand up (e.g. if it closes to 60 second).

Step 3 – Discussion

When all student have stood up, the teacher shall draw their attention to two things; (a) the fact that people have different sense of how time passes and (b) inform students how close to 60 seconds they were.

This exercise enhances time management skills by highlighting the subjective experience of time passing and the importance of using management tools.

Tip: Teacher can enrich the discussion by presenting to learners both the implication of poor time management and the benefits of an effective time management strategy.

The following table might be a useful tool.

Implications of Poor Time Management	Benefits of effective Time Management
1. Poor workflow 2. Wasted time 3. Loss of control 4. Poor quality of work 5. Poor reputation (applicable for professional environments)	1. Less stress 2. Greater focus 3. Increased available time 4. Higher levels of productivity 5. Less procrastination

"The $86,400"

This exercise is excellent for changing students' perception on time. It is quick and easy, so it can be implemented throughout class – even as a break from the core lesson.

Step 1 – The question

Teacher asks students the following question and / or write it on the whiteboard:

"If you had $86,400 only for a day, how would you spend it?"

Then, teacher asks students to write down what they would do during 24 hours with this money and how they would spend it. It is essential that students develop their spending plan per day hour.

Tip: Teacher shall clarify that the money cannot be banked. Anything that students haven't assigned to be spent over twenty-four hours is gone.

Step 2 – The implementation

Teacher provides time (~10 min.) to the students to design their 24-hour spending plan.

Step 3 – The discussion

Teacher explains to students that this activity is a visual representation of time, as there are 86,400 seconds in a day.

It shows the importance of time by making students more aware of the limited time they have. This helps them understand how to prioritize and complete important tasks first.

2. Task prioritisation

For familiarising students with the concept of task prioritisation, teachers can implement "**The time jar**" practice.

Step 1 – Preparation

For this exercise, teacher brings two empty jars, large rocks, smaller rocks, gravel, sand and water.

Step 2 – Implementation

Teacher begins by setting out the empty jar. Then, (s)he pours sand until half of the jar is full. (S)he also adds small and larger rocks into the jar without randomly.

Teacher also sets out the second jar, where (s)he initially places larger rocks, followed by smaller rocks, gravel, sand and water.

Step 3 – Discussion

Teacher shall help students notice that incorporating the larger items first makes room for the smaller and / or more flexible materials.

Then teacher encourages discussion on how this can be a metaphor for time management by prioritizing important matters and fitting smaller issues around them.

Tip: At this stage, teacher can present to students the following matrix and explain to them how they can use it when prioritising their tasks.

(The following figure is an indicative example of the simplest form of this tool)

The Action Priority Matrix

Source: Time Management Skills | SkillsYouNeed

This tool can be found online as template and application as well as in other forms, more appropriate for professional environments.

3. Planning and Progress monitoring

"The Circadian Rhythm"

The goal of the Circadian Rhythm activity is to help students synchronise their body clock (circadian clock) with their work. This way, they'll be able to identify specific times that's best for them to do a specific activity.

Step 1 - Preparation

Teacher asks students to write their daily routine on a piece of paper, beginning from when they wake up to when they go to bed, and then label the hourly blocks with the headings like *on fire, vibrant, cruise control, at 70%, distracted, slowing down, tired*, and *hungry* to indicate how they feel during certain times of the day.

Step 2 – Implementation

Students write down their daily routine and consider how their physical state changes throughout the day.

Step 3 – Discussion

Once students have finished their plans, teacher initiates a discussion by asking the following questions:

- ➢ When do you get the most work done?
- ➢ At which time are you most distracted?
- ➢ At which time of the day is it better to tackle a specific task?
- ➢ When is it the best time to take a break?

Answering these questions, students determine when they are at their ideal energy level. This way, they can work on the most important things within the adequate time slots.

"Colored blocks"

Teacher brings to class a set of colored blocks. The amount of blocks a class needs depends on the amount of participants; total amount of blocks = 4 x number of participants.

Step 1 – Preparation

Teacher asks students to form groups. Each group sits on a circle around a desk.

Teacher places the colored blocks on and explains to students that they must pick as many blocks as they can in one minute and gather them on their own desk. (S)he also explains to them that they can only use their non-dominant hand, and they may only pick up one block at a time.

Teacher sets the time clock to 1 minute.

Step 2 – Implementation

Students implement teachers' guidelines.

Once time is up, teacher gives each students a point for every block they have and write down the results.

Step 3 – Second round

Teacher spreads the blocks on the table again, assigning a point value to each color.

Students repeat the exercise. When time is up students mark their points on a separate sheet.

Step 4 – Discussion

Teacher initiates a discussion on the planning skills required for this exercise. (S)he asks students how many of them strategically collect blocks by considering the number

of blocks they can collect and the number of points associated with each block. The answers guide teachers to introduce the importance of daily planning.

Tip: In this exercise, teacher can introduce the following two techniques that might help students when planning their daily activities.

a. The 80/20 rule

The main rule in strategic planning is the 80/20 rule, namely the rule developed by the Italian economist Vilfredo Pareto, according to which 20% of activities are accountable for 80% of results. The purpose of Pareto analysis is to assist in prioritizing tasks that are most successful at issue resolution.

Based on Pareto's rule, teacher – together with students – lists some of the difficulties that students experience with the daily tasks, determine the fundamental source of each issue, assign a score to each problem (greater score ~ greater difficulty) and group them by cause. Then, teacher adds the scores per group. Upon these conclusions, students realise which activities are more challenging (thus, more time shall be allocated to them).

b. The Pomodoro technique

Pomodoro technique is another practice that teacher shall discuss with students when designing their daily plan. The Pomodoro Technique is an effective way for promoting the habit of combining periods of intense focus (focused thinking) with relaxing mental breaks (diffused thinking). Francesco Serilo developed this time-management methodology in the 1980s.

Based on this practice, students shall:

- Focus on a task for 25 minutes and then take a five-minute break.

- Take a longer break after four 25-minute sessions.

This way, they will achieve high levels of productivity and deep work and high-quality work.

Tip 2: To ensure that students achieve their goals when implementing their daily plan, teacher shall introduce them the concept of progress monitoring. More specifically, (s)he explains to them the SMART criteria for setting objectives that can lead to the desired outcome.

SMART is an acronym for Specific, Measurable, Achievable, Realistic, and Timely. Each SMART objective should meet all the aforementioned criteria to ensure goal attainment. In detail, SMART goals should be:

- Specific - Simple, well-defined, and unambiguous (i.e. what exactly is needed to be accomplished).

- Measurable – With specific criteria to measure own progress. Indicative questions to be addressed starts with "how much", "how many" to know when the objective is accomplished.
- Achievable – The objective should stretch own abilities but remain attainable.
- Realistic – Reasonable, practical, and relevant. Learners should ensure that the objectives support pertinent other goals.
- Timely – With a clearly defined timeline, including the start date and target date.

Notes for specific disciplines

The aforementioned strategies are content-agnostic so as to ensure that teachers across disciplines can incorporate them into their classes.

How to assess skills' development?

According to Brigitte et al. (2004), past studies have mainly used self-report questionnaires. In total, ten different types of self-report questionnaires were used to measure time management behaviours, three types of which were used more often.

These questionnaires are:

- The time management behaviour scale (TMBS, Macan et al., 1990),

- The time structure questionnaire (TSQ, Bond and Feather, 1988),

- The time management questionnaire (TMQ, Britton and Tesser, 1991).

Teachers are encouraged to use these questionnaires as templates for designing their own tools that are tailored-made to learners needs.

REFERENCES

Ajello, A. M., & Torti, D. (2019). Imparare a imparare come competenza chiave di cittadinanza e come soft skill. Scuola democratica, 10(1), 63-82.

Al-Ababneh, Mukhles M. (2020) THE CONCEPT OF CREATIVITY: DEFINITIONS AND THEORIES, International Journal of Tourism & Hotel Business Management (IJTHBM) (ISSN: 2641-6948), Vol. 2 (1), 245-249, SciTech Central Inc., USA

Alvarez Sainz, M., Ferrero, A.M. Ugidos, A. (2019) "Time management: skills to learn and put into practice", Education + Training, https://doi.org/10.1108/ET-01-2018-0027.

Andrade, Heidi & Valtcheva, Anna. (2009). *Promoting Learning and Achievement Through Self-Assessment. Theory Into Practice*. 48. 12-19. 10.1080/00405840802577544

Anesi, C., Mich, L., & Franch, M. Creatività in azienda: metodi e tecniche per sviluppare la creatività.

Arnaiz, P. & Isus, S. (1995). *La Tutoría, organización y tareas*. Grao.

Bacigalupo, M. (2022). Competence frameworks as orienteering tools. *RiiTE Revista Interuniversitaria de Investigación en Tecnología Educativa, 12,* 20-33.

Bailin, S. (1998). Critical thinking and drama education. Research in drama education, 3(2), 145-153.

Barker, R. L. (2003). The Social Work Dictionary. 5th ed. Washington, DC: NASW Press.

Bellanca J., Brandt R. (Eds.) (2010) *21st Century Skills: Rethinking How Students Learn.* Solution Tree.

Bezanilla, M. J., Fernández-Nogueira, D., Poblete, M., & Galindo-Domínguez, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher's view. Thinking skills and creativity, 33, 100584.

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). *Defining twenty-first century skills*. In Assessment and teaching of 21st century skills (pp. 17-66). Springer, Dordrecht.

Boscolo, P., & Mason, L. (2001). Writing to learn, writing to transfer. In Writing as a learning tool (pp. 83-104). Springer, Dordrecht.

Boswell, C. (2006). The art of questioning: Improving critical thinking. Annual review of nursing education, 4, 291.

Boye, Allison "How Do I Create Meaningful and Effective Assignments?" https://www.depts.ttu.edu/tlpdc/Resources/Teaching_resources/TLPDC_teaching_resources/CreatingEffectiveAssignments.php

Brigitte J.C. Claessens Wendelien van Eerde Christel G. Rutte Robert A. Roe, (2007),"A review of the time management literature", Personnel Review, Vol. 36 Iss 2 pp. 255 – 276.

Buzan T. (2013), *Mind Map Handbook: The ultimate thinking tool.* Thorsons.

Buzan T. (2018), *Mind Map Mastery: The Complete Guide to Learning and Using the Most Powerful Thinking Tool in the Universe*. Watkins Publishing.

Caroli P., Caetano Coimbra T. (2020) *FunRetrospectives: activities and ideas for making agile retrospectives more engaging.* Editora Caroli.

Carretero, S., Vuorikari, R. & Punie, Y. (2017*). DigComp 2.1. The Digital Competence Framework for Citizens. With eight proficiency levels and examples of use*. Publications Office of the European Union.

Carroll K., Bob Elliott B. (2009) *Make Your Point!: Speak Clearly And Concisely Anyplace, Anytime.* Second Avenue Press.

Chen, X., Zhai, X., Zhu, Y., & Li, Y. (2022). Exploring debaters and audiences' depth of critical thinking and its relationship with their participation in debate activities. Thinking Skills and Creativity, 44, 101035.

Chu, Samuel & Reynolds, Rebecca & Tavares, Nicole & Notari, Michele & Lee, Celina. (2017). Assessment Instruments for Twenty-First Century Skills. 10.1007/978-981-10-2481-8_8.

Cornford, I. R. (2002). Learning-to-learn strategies as a basis for effective lifelong learning. International journal of lifelong education, 21(4), 357-368.

Coughter P. (2012) *The Art of the Pitch: Persuasion and Presentation Skills that Win Business*. Palgrave Macmillan.

COM Commission of The European Communities (2006), Implementing The Community Lisbon Programme: Fostering entrepreneurial mindsets through education and learning; 33 Final Communication From The Commission To The Council, The European Parliament, The European Economic And Social Committee And The Committee Of The Regions, Brussels.

Domene, S. y Morales, J.A. (2020). Identificación, desarrollo y acreditación de capacidades significativas para el trabajo. En Lindín, C., Esteban, M. B., Bergmann, J. C. F., Castells, N., & Rivera-Vargas, P. (Ed.). *Llibre d'actes de la I Conferència Internacional de Recerca en Educació. Educació 2019: reptes, tendències i compromisos (4 i 5 de novembre de 2019, Universitat de Barcelona).* Albacete: LiberLibro. http://www.ub.edu/ired19/

Domènech, J. (2001). Algunas técnicas para el aprendizaje cooperativo. In AA.VV. *Estrategias organizativas de aula. Propuestas para atender la diversidad* (pp. 181-186). Graó

Duarte N. (2008) *slide:ology: The Art and Science of Creating Great Presentations*. O'Reilly Media.

Duarte N. (2012) *HBR Guide to Persuasive Presentations (HBR Guide Series)*. Harvard Business Review Press.

Duarte N. (2019) *DataStory: Explain Data and Inspire Action Through Story*. Ideapress Publishing.

Duff, A. (2004). The role of cognitive learning styles in accounting education: developing learning competencies. Journal of Accounting Educational, 22(1), 29–52.

Duron, R., Limbach, B., & Waugh, W. (2006). Critical thinking framework for any discipline. International Journal of Teaching and Learning in Higher Education, 17(2), 160-166.

Dynes, R., Norton, S., & Green, B. (2019). *Essay essentials with readings (7th Ed.)*. Nelson.

Eisenhower matrix * Saaty AHP = Strong actions prioritization? Theoretical literature and lessons drawn from empirical evidences Article · May 2019.

European Commission (2007) European competences for lifelong learning. Luxembourg: Publication Office of the European Union.

European Commission (2019). *Key competences for lifelong learning*. Luxemburg: Publications Office of the European Union.

Farrell, L. (2018), The Entrepreneurial Attitude: Lessons From Junior Achievement's 100 Years Of Developing Young Entrepreneurs, McGraw Hill Professional, ISBN 126002671X, 9781260026719.

Ferrari, A. (2013*). DIGCOMP: A framework for developing and understanding digital competence in Europe.* (Y. Punie & B. N. Brečko Eds.). Publication office of the European Union.

Floyd E. (2021) *How to Speak Effectively Anywhere: Real & Proven Ways to Develop Effective Communication Skills and Win Your Audience*. Independently published.

Gallego, J. L. & Salvador, F. (2002). Metodología de la acción didáctica. In A. M. Medina & F. Salvador (Coord.) Didáctica general (pp. 155-182). Prentice Hall.

Gallo C. (2015) *Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds*. St. Martin's Griffin.

García, R., Traver, J. A. & Candela, I. (2001). *Aprendizaje cooperativo: fundamentos, características y técnicas*. CCS.

Garzón, N., Lozano M. (2022) Organizational Sustainability: An Index From Macroeconomic Variables, IGI Global – Publisher of Timey Knowledge, DOI: 10.4018/978-1-7998-9301-1.ch006

Gielen, S., Peeters, E., Dochy, F., Onghena, P., & Struyven, K. (2010). Improving the effectiveness of peer feedback for learning. Learning and instruction, 20(4), 304-315.

Global Partnership for Education (GPE) (2020) 21st-Century Skills: What potential role for the Global Partnership for Education? *A Landscape Review,* https://www.globalpartnership.org/content/21st-century-skills-what-potential-role-global-partnership-education

Global Partnership for Education (GPE) (2022) https://en.wikipedia.org/wiki/Global_Partnership_for_Education

Grant, Mitchell (2022) What Is Customer Service, and What Makes It Excellent?, https://www.investopedia.com/terms/c/customer-service.asp (accessed 21.01.2023).

Gray D., Brown S., Macanufo J. (2010) *Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers*. O'Reilly Media.

Hamilton, J. G., & Klebba, J. M. (2011). Experiential learning: A course design process for critical thinking. American Journal of Business Education, 4(12), 1-12.

Hayes, K. D., & Devitt, A. A. (2008). Classroom discussions with student-led feedback: a useful activity to enhance development of critical thinking skills. Journal of Food Science Education, 7(4), 65-68.

Hargie O. (2006) *The Handbook of Communication Skills*. Routledge.

Hebles, M., Yániz, C. & Dos Santos, M. A. (2022). Teamwork competency scale (TCS) from the individual perspective in university students. *Journal of Technology and Science Education*, 12(2), 510-528. DOI:10.3926/jotse.1478

Hoskins, B., & Fredriksson, U. (2008). Learning to learn: What is it and can it be measured?. European Commission JRC.

https://slack.com/blog/collaboration/mastering-time-management-at-work

https://www.skillsyouneed.com/ps/time-management.html

https://time-management.org/what-are-the-benefits-of-time-management-for-students/

https://www.timedoctor.com/blog/time-management-activities/

https://www.theexceptionalskills.com/time-management-activities/#6-circadian-rhythms

International Encyclopedia of the Social & Behavioral Sciences (2001).

ISO - ISO 26000:2010 - Guidance on social responsibility (accessed at 2022/10/26) Home | The Australian Curriculum (Version 8.4)(accessed at 2022/11/01).

Kagan J. (2022) Networking Definition, https://www.investopedia.com/terms/n/networking.asp (accessed 21.01.2023).

Karabulut, Ü. S. (2012). How to Teach Critical-Thinking in Social Studies Education: An Examination of Three NCSS Journals. Eurasian Journal of Educational Research, 49, 197-214.

Klaff O. (2011) *Pitch Anything: An Innovative Method for Presenting, Persuading, and Winning the Deal*. McGraw-Hill.

Klein, P. D., Haug, K. N., & Bildfell, A. (2018). Writing to learn. Best practices in writing instruction, 162.

Kotler P. (2012) Marketing Management, Pearson, ISBN-10: 0132102927

Ledalla M. (2020) *Retrospectives for everyone: Powerful metaphors for effective retrospectives*. Notion Press.

Lyons, T., Lyons, J. & Samson, J. (2021) Entrepreneurship Skill Building: Focusing Entrepreneurship Education on Skills Assessment and Development, Palgrave Macmillan, ISBN 9783030779191.

Malone, Y., & Michael, T. (2018). Collaborative learning and critical thinking skills: Effects of a debate-based pedagogy. International Journal of Learning and Teaching, 10(1), 61-69.

Mariani, L. (2010). Saper apprendere: atteggiamenti, motivazioni, stili e strategie per insegnare a imparare. libreriauniversitaria. it ed..

Matthews J. (2020) *How to Write an Awesome Paragraph Step-by-Step: Step-by-Step Study Skills*. Independently published.

McKay M., Davis M., Fanning P. (2018) *Messages: The Communication Skills Book*. New Harbinger Publications.

Mendes et al. (2018). Uma revisão sobre as principais metodologias de ensino e suas diferenças. Universidade Federal do Paraná. https://hdl.handle.net/1884/58075.

Metiri Group (MG) (2022) https://metirigroup.com/our-company/

Modell, H. I. (1996). Preparing students to participate in an active learning environment. Advances in physiology education, 270(6), S69.

Morales, J.A. (2009). Formación a lo largo de la vida: Realidades y retos. En J. Tejada (Coord) *Estrategias de innovación en la formación para el trabajo*. Madrid: Tornapunta, 355-374.

National Research Council. (2011). *Assessing 21st century skills: Summary of a workshop*.

Navarro, R., Rodríguez Gallego, M., Barcia, M. y Corujo, M.C. (2004). El aprendizaje cooperativo como innovación para la mejora del rendimiento de los alumnos universitarios. In J.M., De Mesa, R. Castañeda, y L. M. Villar (Coord.) *La Universidad de Sevilla y la innovación docente*. Curso 2002-03. Área de Ciencias Sociales y Jurídicas. ICE/Vicerrectorado de Calidad y Nuevas Tecnologías.

Northern Illinois University Center for Innovative Teaching and Learning. (2012). Classroom debates. In Instructional guide for university faculty and teaching assistants. Retrieved from https://www.niu.edu/citl/resources/guides/instructional-guide

Nussbaumer Knaflic, C. (2015). *Storytelling with data* (C. N. Knaflic, Ed.). John Wiley & Sons.

OECD (2005) The Definition and Selection of Key Competencies - Executive Summary, https://www.oecd.org/pisa/definition-selection-key-competencies-summary.pdf

OECD (2019) OECD Future of Education and Skills 2030 - Conceptual learning framework - LEARNING COMPASS 2030 https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/OECD_Learning_Compass_2030_concept_note.pdf

OECD/EU (2019), Supporting Entrepreneurship and Innovation in Higher Education in Austria, OECD Skills Studies, OECD Publishing, Paris, https://doi.org/10.1787/1c45127b-en.

Ohio Department of Education (ODE) (2016) 21st century skills standards book 2, https://www.marietta.edu/sites/default/files/documents/21st_century_skills_standards_book_2.pdf

Oros, A. L. (2007). Let's debate: Active learning encourages student participation and critical thinking. Journal of Political Science Education, 3(3), 293-311.

Partnership for 21st Century Skills (P21) (2022) https://en.wikipedia.org/wiki/21st_century_skills

Peris-Ortiz, M., Alonso Gómez, J., Vélez-Torres, F., & Rueda-Armengot, C. (2015), Education Tools for Entrepreneurship: Creating an Action-Learning Environment through Educational Learning Tools, Springer International Publishing, ISBN 3319246550, 9783319246550.

Pinto, J. (2016). A avaliação em educação: da linearidade dos usos à complexidade das práticas. In L. Amante & I. Oliveira (Coords.). Avaliação das aprendizagens: perspetivas, contextos e práticas (pp. 3-40). Lisboa: Universidade Aberta-LE@D.

Popil, I. (2011). Promotion of critical thinking by using case studies as teaching method. Nurse education today, 31(2), 204-207.

Price, Jon & Light, Daniel & Pierson, Elizabeth. (2011). Using Classroom Assessment to Promote 21st Century Learning in Emerging Market Countries.

Rawson, M. (2000). Learning to learn: more than a skill set. Studies in Higher Education, 25(2), 225-238.

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

Reynolds G. (2019) *Presentation Zen: Simple Ideas on Presentation Design and Delivery (Voices That Matter)*. New Riders.

Ruay, R. et al. (2017). El contrato didáctico o de aprendizaje: una estrategia de evaluación auténtica en la educación superior. Boletín Redipe, 6(7), 62-82. Available in: https://dialnet.unirioja.es/servlet/articulo?codigo=6189574

Runco, M., Pritzker, S. (1999) Encyclopedia of Creativity, Volume 2, Elsevier, ISBN 0122270754, 9780122270758

Rustler, F. (2012) *Mind Mapping For Dummies*. For Dummies.

San Nicolás, M. B.; Fariña, E. y Area, M. (2012). Competencias digitales del profesorado y alumnado en el desarrollo de la docencia virtual. Revista Historia de la Educación Latinoamericana, 19 (14), 227-245.

Schank, R. C. (1995). What we learn when we learn by doing (Vol. 60). Technical report.

Schmidt, S. J. (1999). Using writing to develop critical thinking skills. NACTA journal, 31-38.

Sinek S. (2011) *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Portfolio.

Sinek S., Mead D., Docker P. (2017) *Find Your Why: A Practical Guide for Discovering Purpose for You and Your Team*. Portfolio.

SMART Goals: Powerful Way to Get Where You Want to Be | Simplilearn

Snyder, L. G., & Snyder, M. J. (2008). Teaching critical thinking and problem solving skills. The Journal of Research in Business Education, 50(2), 90.

Successful Student Publications (2022) *How To Write A 5-Paragraph Essay: A No-Nonsense Step-By-Step Guide To Mastering Effective Essay Writing, Practical Study Skills, Easy Exercises & Simple Lessons for the Successful Student*. Successful Student Publications.

TIME Magazine (2006), *How to Build a Student for the 21st Century*, December 18

Tom Albrighton T., Kessler D. (2021) *How to Write Clearly: Write with purpose, reach your reader and make your meaning crystal clear.* ABC Business Communications Ltd.

Torrelles, C., Coiduras, J., Isus, S., Carrera, F.X., París, G. & Cela, J. M. (2011). Competencia de trabajo en equipo: definición y categorización. Profesorado. *Revista de currículum y formación del profesorado*, 15(3), 329-344.

Uzunöz, F. S., & Demirhan, G. (2017). The effect of creative drama on critical thinking in preservice physical education teachers. Thinking Skills and Creativity, 24, 164-174.

Valenzuela, M., Martínez-Martínez, S. Soto, J. (2021) Financial Literacy and Innovation Performance in SMEs: The Mediating Effect of Risk-Taking, IGI Global – Publisher of Timey Knowledge, DOI: 10.4018/978-1-7998-7634-2.ch004

Vallaeys, F. (2011). Les Fondements Éthiques de la Responsabilité Sociale. PhD thesis, Université Paris Est. Retrieved July 4, 2013 from http://blog.pucp.edu.pe/ item/149507/these-de-doctorat-les-fondements-ethiquesde-la-responsabilite-sociale.

Vuorikari, R., Punie, Y., Carretero, S., & Van den Brande, G. (2016*). DigComp 2.0: The digital competence framework for citizens. Update phase 1: the conceptual reference model*. Publication Office of the European Union.

Vuorikari, R., Kluzer, S. & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens-With new examples of knowledge, skills and attitudes (Vol. UR 31006 EN).* Publications Office of the European Union.

Wilke C., O. (2019) *Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures*. O'Reilly Media.

Williams J., W. (2020) *Communication Skills Training: How to Talk to Anyone, Connect Effortlessly, Develop Charisma, and Become a People Person*. Independently published.

Wirth, K. R., & Perkins, D. (2008). Learning to learn.

Woods, D. R., Hrymak, A. N., Marshall, R. R., Wood, P. E., Crowe, C. M., Hoffman, T. W., ... & Bouchard, C. K. (1997). Developing problem solving skills: The McMaster problem solving program. Journal of Engineering Education, 86(2), 75-91.

Živković, S. (2014). The importance of oral presentations for university students. Mediterranean Journal of Social Sciences, 5(19), 468.