Module 3
The concept of CREATIVITY

FLI
CREATE

Erasmus+ Programme School sector – Development of Innovation
2019-1-IT02-KA201-063149

Content

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Description of the module

Rationale

The knowledge constructed by students is not only dependent on the learning content, but on their previous knowledge, interest and learning styles as well. For this reason, it is of key importance for teachers to adequately choose a strategy to create the ideal learning environment for students. Modern classroom management approaches provide complex opportunities for active learning, developing competences that are essential on the 21st century labour market.

The aim of the module is to

- present innovative classroom management methods, alternative teaching practices;
- emphasize the essential role of student-centred, active learning.

Topics

Creativity Concept

Units

1. A clear knowledge of the concept of creativity, its role with respect to cognitive and teaching styles;
2. Awareness of the importance of cultivating a creative spirit and why;
3. Be aware of what the brakes and blocks of creativity are
4. Understand the mindset (frame) of divergent or lateral thinking
5. Analyse the elements that characterize creativity (activation, method and energy) into the teaching process;

Creativity Method in the School

Units

1. Creativity Method (Introduction)
2. The Perception phase (techniques and exercises and case studies)
3. The Analysis phase (techniques and exercises and case studies)
4. The Ideas Production phase (techniques and exercises and case studies)
5. The Selection phase (techniques and exercises and case studies)
6. The Implementation phase (techniques and exercises and case studies)

Implementation of Creativity Method

Units

1. Pilot project on some classes – Pre-testing the method
2. Analysis of the results of pre-testing the method

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Learning objectives

Competences

The module contributes to the development of the following Creativity competences:

Area 1 - The perception and analysis of the teacher

(C1) to find and set problems related to students' learning
(C2) to formulate new problems about the learning process/activities
(C3) to fully understand the student (learning styles, character, personality traits, etc.)
(C4) to evaluate and analyse the emerging information from the classroom.

Area 2 - The production of ideas phase

(C5) to produce a wide range of solutions (learning units, learning objects, digital learning resources, teaching method used, etc) for each problem analysed (in a short time)
(C6) to find amazing learning resources to raise the attention.
(C7) To engage the students in learning processes aligning the learning activities with the learning styles/attitudes of the students
(C8) to cogenerate the learning or teaching unit/event developing the infinite solutions with involvement of the students and colleagues
(C9) to develop infinite, different new learning unit/event.

Area 3 - The selection phase

(C10) To find (to select) always the best (right) solution to develop new teaching formats (in terms of training resources, teaching materials, tools, environments etc.).

Area 4 - The application phase

(C11) The ability to effectively implement emerged and selected solutions.

Knowledge Outcomes

At the end of the Module the participants will:

- be familiar with challenges educators face in the 21st century;
- have an insight into the main characteristics of innovative teaching methods;
- see the difference between traditional and student-centred classroom management;
- have an overview about the possible practical application of the Flipped Classroom model.

Skills Outcomes

At the end of the Module the participants will be able to:

1. perceive, define, set, analyse the characteristics of the students, problems related to learning in the context of design and implementation of teaching activities in the flipped classroom
2. quickly generate a variety of alternative and suitable solutions (learning units, learning objects, digital learning resources etc) for solving specific problems/needs related to learning, individually and in groups, in the flipped classroom teaching paths

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

3. select and choose the best teaching solutions and resources (digital and traditional) based on criteria related to specific learning outcomes
4. design, test and implement a learning units/learning events/activities/experiences in a flipped classroom environment
5. face an unexpected problem during the teaching (inside or outside the classroom) and to find the right pedagogical solution.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Module content – Introduction of creativity concept

The Context

Below you can find some information from newspaper articles and other sources that demonstrate the importance of learning creativity.

The World Economic Forum presented the skills which, from now until 2020, will become indispensable. In the first three places we find:

- **complex problem solving;**
- **critical thinking**
- **creativity.**

These are elements connected, in one way or another, to technological evolution. (...) And it is in this context that man will be called to make a difference through his ability to deal with complex problems, in increasingly interconnected areas and with transversal subjects. (...) "[1]

"It is important to equip current and future generations – regardless of social and cultural background – **with the characteristics of successful innovators** – including curiosity (or inquisitiveness), use of *imagination*, *critical thinkin*g, *problem-solving*, and *perseverance* (resilience or persistence) which includes positive risk-taking.

These characteristics are associated with **'creativity'**, *which is a process typically of imagining possibilities*, *creating something n*ew, and reflecting upon and modifying what is being created. In a broader sense it is a way of interpreting and acting upon the world.

'Innovation' means to create something new within a particular context or strive towards a goal in a new way.

'Creativity and innovation' appear in the competences of: *literacy; mathematical, science and technology; digital; entrepreneurship; and cultural awareness and expression."*[2]

-

THE "4 CS " OF LEARNING - Transversal skills

- **CRITICAL THINKING**
- **CREATIVITY**
- **COMMUNICATION**
- **COOPERATION**

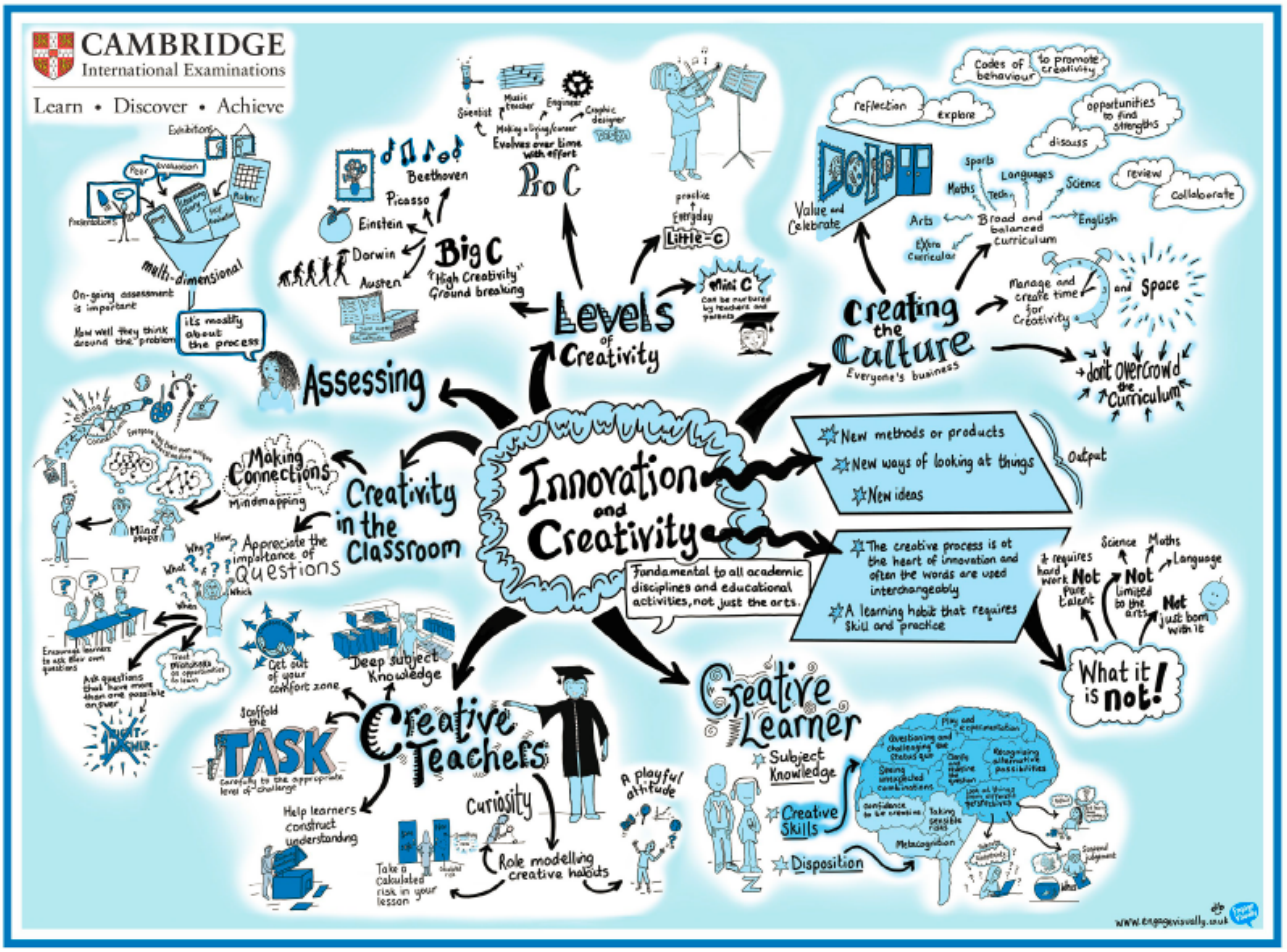
Nowadays it is increasingly necessary to move to an approach that stimulates and enhances the ***participation*** of the whole class through *decision-making*, *sharing* and *problem-solving processes*.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Using methods that put “issues" in the centre, help the problems to be solved. Situations in which students can easily descend by making important assessments.[3]

Innovation and Creativity in the Classroom



[1] FONTE: Il Sole24Ore – “*Creatività, una competenza di cui non potremo più fare a meno”* – di Francesca Cantardi 01.12.17

[2] FONTE: " Commission Staff Working Document "at the basis of the Recommendation of the board on key competences for lifelong learning COM (2018) n.24 of 17.01.2018

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

[3] Prof. Irene Baldriga "*Le competenze del XXI secolo: idee e strategie per la scuola della complessità.*»– Mondadori Education 18.01.18

Creativity - the Concept

Is this creativity?

Creativity (artistic) as a process based on purely aesthetic criteria.

Or this?

Creativity is the process that gives life to something **new** that satisfies a **real need**. An **original** and **valuable** process.

The second one (Barbie) is the creativity concept we will work with.

Creativity (in school) is an **original** process that gives "**new**" **value** to teaching.

It allows you to rethink *programming*, the *structure* of teaching activities, the management of class *dynamics* and the *spaces* in which you teach.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

1. Creativity (in school) Serves, Among Other Things[1]:

- Amaze, intrigue and excite pupils
- Involve the class by capturing their attention
- Maintaining interest in the topics covered
- Communicate better what you think is useful
- Make that topic useful at that time
- Clarify why it is important to study that particular topic.
- Incentivize emotions
- Making the diversity of pupils productive
- Share the didactic activity with the pupils
- Questioning yourself
- Always ask yourself many questions
- Develop critical thinking
- Develop the spirit of initiative
- Seeing things in a new way (spaces included)
- Remove ground from conformity
- It favours interdisciplinarity

2. Creativity's Impacts

Impact on multiple intelligences[2]:

- linguistics
- logical-mathematical
- space
- body-kinesthetic
- musical
- interpersonal
- intrapersonal
- naturalistic
- existential.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Let's try to deepen the concept reading this article: The Role of Multiple Intelligences and Creativity in Students' learning style.

On the one hand, creativity encourages "**personalization**" by allowing each student to work and develop their talents in an inclusive logic. On the other, it urges "**individualization**", ensuring that students achieve the fundamental skills[3].

It stimulates all the different learning styles[3]:

- Visual-Verbal
- Non-verbal
- Auditory
- Kinesthetic

Let's try to deepen the concept reading this article: The Relationship between learning styles and creativity

Impact on different cognitive styles[3]*:*

- **GLOBAL** (overview)
- **ANALYTICAL** (individual details)
- **SYSTEMATIC** (one variable at a time)
- **INTUITIVE** (hypothesis)
- **MINUTES** (summary, verbal associations)
- **VISUAL** (diagrams and graphic representations)
- **IMPULSIVE** (fast processing)
- **REFLECTIVE** (slow and reflective processing)
- **FIELD EMPLOYEE** (context dependent)
- **FIELD INDEPENDENT** (autonomous)
- **CONVERGENT** (proceeds according to logic)
- **DIVERGENT** (proceeds creatively)"

Let's try to deepen the concept reading this article: The Role of cognitive style in creative thinking among college students.

Impact on different teaching styles[3]:

- **SPOKEN** (use words and refer to written text)

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- **VISUAL** (uses images, maps, diagrams, blackboard and refers to the iconic aspects of the text)
- **GLOBAL** (focuses on a general idea of the topic and defines macro-relationships)
- **ANALYTICAL** (starts from the details and declines one aspect at a time)
- **SYSTEMATIC** (follows the detailed list of topics)
- **INTUITIVE** (follows the outline of the topics in general, modifying it on the basis of the pupils' references)"

Let's try to deepen the concept reading these 2 articles:

- Teachers' creativity different approaches and similar results
- A_Study_on_the_Relationship_between_Creativity_and_Innovation_in_Teaching_and_Learning_Methods_towards_Students_Academic_Performance_at_Private_Higher_Education_Institution_Malaysia

3. Creativity (in educational activities):

"It allows an **accurate analysis** of the **starting situation** and the **choice of the topics and objectives** that are considered important;

It helps **identify the reasons why I have to teach those topics**.

It **allows you to find solutions**, **operational strategies** that allow you to teach what you think is the most appropriate."

"Creativity is more than producing something different or unique. It has also to produce something that is meaningful, that is, of value to others. "[4]

"The CREATIVE IDEA[5] should "***work***". It is the idea that proves to be:

- ***Correct***
- ***Useful;***
- ***Valuable;***
- ***Meaningful."***

4. Myths to dispel:

- We are born creative (the prerogative of exceptional minds)
- Children are more creative (more spontaneous and free)
- Creativity is transgression and provocation
- Creativity is a spontaneous act, which comes by itself and which does not involve effort

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Creativity is a solitary process
- Once the creative flow has started, there is no need for rational control over the process itself
- Creativity is like fantasy (far from concrete)
- Artists are creative, scientists are rational

CREATIVITY is a **TRANSFORMATIVE** (voluntary) ACT that satisfies a need.

First Picture: Jump without considering the new context and its possibilities

Second Picture: Jump considering the new context and its possibilities

«Creativity is the ability to observe things well»
PABLO PICASSO

---

[1] FONTE: ISABELLA MILANI – "*L'arte di insegnare"*– VALLARDI 2013

[2] FONTE: HOWARD GARDNER – "Multiple Intelligences: New Horizons in Theory and Practice" – BASIC BOOKS 2008

[3] FONTE: F.CARTA: "*Stili di apprendimento, stili cognitivi e stili di insegnamento. Per una scuola inclusiva*" Liceo G.M. Dettori Cagliari

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

[4] RALPH L. KLIEM „Creative, Efficient, and Effective Project Management" – CRC PRESS Taylor &Francis Group 2014

[5] DANIEL GOLEMAN, MICHAEL RAY, PAUL KAUFMAN «*Lo Spirito Creativo, imparare a liberare le idee*» – BEST BUR 2001

Unit 1 - The Concept of Creativity and its Role in Implementing Cognitive Teaching Styles

1. Introduction to Creativity[1]

"To many of us, "creativity"' is a mysterious quality that some lucky people are born with. But the truth is that everyone is, and can be, creative. Even if you think your mind works in an entirely logical way, there are techniques and approaches you can use to help you think more creatively. You could define creativity as the ability to meet needs or solve problems in new and inventive ways. When you look at it like this, many of us are actually being creative without even thinking about it."

What are the benefits of creativity?

There are various ways that you and your organisation can benefit from improved levels of creativity. These include: **finding new solutions**.

Creativity helps you generate lots of new ideas which can help you and your organisation to deal with change, build strong teams, develop new products and services, improve customer service, and retain talented staff. The more ideas you generate, the more likely you are to find new ways to meet challenges and overcome problems. The possibilities are as endless as your imagination.

Minimising frustration. Improving your creativity means you can drastically reduce the frustration caused by failing to meet challenges or to solve problems at work.

Increasing productivity. The right creativity tools and techniques can help you and your organisation to generate ideas and solve problems faster, making you more effective, productive and fulfilled.

2. When can I Use Creativity?

Creativity can be particularly useful for generating ideas and for problem-solving at work. When your usual response, or organisational guidelines, suggest a particular course of action, pause for just a moment and consider whether there might be an alternative way.

Generating ideas There are all sorts of techniques available, e.g. brainstorming and mind mapping, to help you think more creatively and innovatively.

By this we mean:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- setting aside assumptions about how particular challenges or problems should be approached, e.g. just because that's the way you're always done something, does that make it the best way?
- taking new perspectives and being open to new ways of doing things in your day-to-day work. Think back to the last time you did something, did anyone suggest another way, or did you receive any feedback?
- looking for new ways to create value for your organisation. Think about any competitors or rivals your organisation has. What do they do differently, what is it about them that you admire? Could you adapt this to your organisation?
- listening to, respecting, and incorporating other people's suggestions and ideas into your thinking.

Problem-solving: The secret of using creativity to solve problems is to avoid the temptation of looking at how you tackled similar challenges in the past. Instead, try to re-formulate your thoughts.

You can do this by:

Re-defining your problem. Before you start, make sure it's the problem and not the symptoms you're trying to solve. Ask yourself why the problem exists, and spend time getting to the bottom of it. It's also important to be clear about what you're trying to achieve, and any constraints that exist. If the problem is a particularly large one, break it down into smaller parts, and deal with each one at a time. When you have thought the problem through thoroughly, try summarising the problem in a couple of words if possible, to really focus your mind.

Open your mind. Once you're really clear about the problem, start generating possible solutions. Remember to try to think about ways of doing something out with the normal approach. You will find a variety of creativity techniques throughout this unit to help you do this. Avoid the temptation to immediately go with your first idea. It may or may not be your best idea, but by considering a number of alternative options first you may come up with something better. If you do go back to your original idea you can be sure that you've considered all the other options. Try not to pass judgment on any of your ideas until you have come up with as many as you can, and then revisit them all with an open mind.

Identify the best solution. Once you have a number of possible solutions, choose the best one by weighing up the pros and cons of each. There might be an obvious choice, but if not, you may wish to ask others for their input to help you decide.

Implement your solution. The final stage of creative problem-solving is to transform your solution into action. Without this final stage, your creative efforts will have been wasted. It is useful, therefore, to draw up an action plan to help you implement your chosen solution.

Where should I start?

Being creative doesn't have to mean having big original ideas. It can be something as simple as contributing to a suggestion scheme with your ideas on trying something new or doing something better in your department. What's more, brand new ideas are few and far between. Most of the time

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

new ideas are created by putting together existing ones in new and original ways. Think about email. It's really just a combination of the letter, the word processor and a modem. But what has resulted is something that has changed the way that people around the world communicate with each other. Look around you for inspiration. What are other teams, departments, or industries doing that you could 'steal' creatively? The interesting and original concept a rival has come up with could well be adapted and moulded for your purposes.

3. What is Creativity?[2]

"E. Paul Torrance (Millar, 1997) has been a pioneer in creativity research and education for more than 50 years. Torrance sees creativity as a process and has developed a battery of tests of creative thinking abilities. He believes that all individuals are creative and that creativity can be enhanced or blocked in many ways. He considers creativity developmentally, opposite to those who believe that a person's creativity was established at an early age (two or three years old), however his research has shown that creativity does not develop linearly and that it is possible to use activities, teaching methods, motivation and procedures to produce growth, even in ageing. **Torrance asserts that creativity is an infinite phenomenon**; you can be creative in an endless manner.

You find creativity in many apparently different areas: humour (haha), science (aha) and art (ah). Koestler (1976) presents the theory that all creative activities - the conscious and unconscious processes underlying artistic originality, scientific discovery, and comic inspiration have a basic pattern in common.

He calls it "**bisociative thinking**" - a concept he coined to distinguish the various routines of associative thinking from the creative jump which connects previously unconnected frames of references and makes us experience reality on several planes at once. Koestler introduced the concept of a "matrix" to refer to any skill or ability, to any pattern of activity governed by a set of rules - its "code".

All ordered behaviour, from embryonic development to verbal thinking is controlled by the rules of the game, which lend it coherence and stability, but leave it sufficient degrees of freedom for flexible "strategies" adapted to environmental conditions. The term code is deliberately ambiguous, and reflects a characteristic property of the nervous system: to control all bodily activities by means of coded signals. The concept of matrices with fixed codes and adaptable strategies, is proposed as a unifying formula, and it appears to be equally applicable to perceptual, cognitive, and motor skills and to the psychological structures variously denominated frames of reference, associative contexts, universal discourse, mental sets, schemata, etc. These silent codes can be considered as condensation of learning into habit or associative thought. Bisociative thought is the challenge of habit by creativity."

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

[1] An Introduction to Creativity - https://www.southampton.ac.uk/~assets/doc/hr/An%20introduction%20to%20creativity.pdf

[2] Creativity for Operational Researchers – Paragraph 2 – What is Creativity? - https://orbit.dtu.dk/files/2770938/imm3343.pdf

Unit 2 - The Importance of Improving the Creative Spirit

“For creativity to manifest itself, we need to take something that we have inside and give it life by expressing it outside of us.

The creative spirit is something that "animates a whole way of being" within us, whatever we do. The difficult. Of course, it's about releasing him.”[1]

1. The Stages of the Creative Spirit

“The stages of the CREATIVE SPIRIT

- **PREPARATION** (immersion in the problem)
- **INCUBATION** (let the problem ferment)
- **THE FANTASTIC** (open to the intuition of the unconscious)
- **LIGHTING** (the emergence of the solution)

The translation of **ILLUMINATION** into REALITY"[1]

The first stage is **PREPARATION**[1].

We dive into the maze of the problem in search of any useful information.

We do it in an open and welcoming way of the new, listening without prejudice.

*Preparation barriers**[1]***

“**Functional fixity**”. See the most obvious way to deal with a problem. Bind inextricably to the routine.

"**Self-censorship**". We no longer go beyond our "acceptable".

All this generates **despair** and **frustration**.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

At this stage it is essential to have **perseverance**, without giving up prematurely.

The second stage is **INCUBATION**[1].

It is the phase in which we let **the problem ferment** allowing the mind to search for the solution by itself. We use the unconscious.

Here is the kind of knowledge that we usually call **INTUITION**.

The third stage is **FANTASIZING**[1].

Find space in times **when we don't think about the problem**. We are open to intuition.

When we are lost in the everyday life of things. E.g. while cleaning the house, cooking, playing sports, relaxing.

The fourth stage is **LIGHTING**[1].

It is the moment when, fantasizing, **the solution emerges from nothing**.

The solution must then be translated into reality.

Let's try to deepen the concept reading these 2 articles:

- The Unconscious Mind according to Henri Poincaré
- The Flow of Creativity

2. The “Ingredients” of the Creative Person

- Sense of challenge (accept the conflict)
- Playful
- Cultivation of courage
- Sense of humour
- Be naive

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Having a childish freshness
- Systematic doubt
- Be prepared to take risks
- Positive dissatisfaction
- Be amazed
- Knowing how to see things in a new way
- The art of knowing how to listen
- Joy of discovery
- Willingness to be born every day
- Different perception of things
- Tolerance to ambiguities
- Make correlations
- Systematic perplexity
- Ask yourself questions
- Knowing how to learn from your mistakes
- Curiosity
- Open minded
- Critical thinking
- Desire to learn and act
- Propensity to experiment
- Passion

2.1. The Creative Person[8]

We can characterise at least three types of creative persons. First, the problem solver where the person (subject) is trying to solve a problem (object) in a creative way, this is the case of OR workers, engineers, scientists, advisers, etc.

Secondly, the artistic person (subject) who creates a new piece of art (object) usually it will be a close interaction between the subject and object, the “soul of the artist” will be in the object, this object can be a product (painting, music, film) or a process (dance, theatre, performance).

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

And thirdly, the persons that adopt creativity as a life-style being creative at work, at home and everywhere, both in an extrovert and introvert way (inventors, artists, mode designers, etc). Amabile (1983) has documented that creativity in each individual has three components: expertise, creative-thinking skills and motivation. Expertise is in a few words, knowledge in its many forms: technical, procedural and intellectual. Knowledge can be acquired both theoretically and practically. Learning to learn is an important tool for becoming an expert in modern Society. Creative-thinking skills determine how flexibly and imaginatively people approach problems and tasks. It demands courage to be creative because you will be changing the status quo. Individuals can learn to be more creative and can learn to use creative tools in problem solving. Motivation is the last component. An inner passion and desire to solve the problem at hand will lead to solutions far more creative than external rewards, such as money. This component, usually called intrinsic motivation, is the one that can most immediately be influenced by the work environment.

Amabile's research has identified six general categories that support creativity: challenge, freedom, resources, work-group features, supervisory encouragement, and organisational support. Teresa Amabile (1998) after many years of research focusing on creativity within organisations has also concluded that individual creativity gets killed much more often that it gets supported. Mostly, it is not because management has a vendetta against creativity, it is undermined unintentionally because of the optimisation of short business imperatives: co-ordination, productivity, efficiency and control. Her research has shown that it is possible to develop organisations where both profit and creativity flourish, but you need a conscious strategy. Torrance´s research has also shown that children's creativity gets killed in the primary schools and it is possible to design schools and education systems where both rational and creative work flourish (Goff, 1998). Amabile (1998) has also drawn attention to the crucial importance of intrinsic motivation in creative endeavour.

Business has traditionally rewarded people extrinsically with pay and promotion but creative actions often arise out of a long-standing commitment to and interest in a particular area. She appreciates this is only one part of the equation, and that expertise in the domain concerned, and sufficient mental flexibility to question assumptions and play ideas, are also important. In addition, she points out the critical importance of challenge, for instance, matching people to tasks they are interested in and have expertise in, permitting people freedom as to how they achieve innovation, setting a sufficiently diverse team the task of innovation, along with sufficient resources, encouragement and support.

It is difficult to give a simple and general definition of creativity. It is easier if we focus to study creativity in relation to problem solving tasks. Herrmann (1996) gives a short definition that encapsulates many other definitions presented in the literature: “What is creativity? Among other things, it is the ability to challenge assumptions, recognize patterns, see in new ways, make connections, take risks, and seize upon chance.” Let us elaborate a little more on this definition: challenge assumptions means questioning the basis of the problem formulation; recognise patterns because usually chaos and complexity are caused by simple patterns which, when recognised, lead us to the solution to the problem; see in new ways means looking for patterns from different perspectives: a rational or logical, an organisational or procedural, an interpersonal or emotional, and an experimental or holistic; make connections, or “bisociate”, because many creative ideas are the result of synergy occurring between two thoughts or perceptions; take risks because there always exists the probability that your ideas will lead to failure due to many factors out of your control; and seize upon a chance means to take a calculated risk in order to take advantage of an

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

opening that allows to move forward toward a creative solution. In addition, a response is creative if it is heuristic rather than algorithmic. A heuristic is an incomplete guideline or rule of thumb that can lead to learning or discovery. An algorithm is a complete mechanical rule for solving a problem or dealing with a situation. Thus, if a task is algorithmic it imposes its own tried-and-true solution. If a task is heuristic it offers no such clear path, you must create one.

2.2. The Personality[9]

Focusing on the characteristics of the individual who creates. Factors such as temperament, personal attitudes, and habits influence creativity. Creative thinking is largely a function of divergent thinking - the discovery and identification of many alternatives. Psychologists have performed considerable research on the characteristics of creative individuals that promote divergent thinking. These included: knowledge, imagination, evaluative skills, awareness and problem sensitivity, capability to redefine problems, memory, ideational fluency, flexibility, originality, penetration, self-discipline and persistence, adaptability, intellectual playfulness, humour, nonconformity, tolerance for ambiguity, risk taking, self-confidence, and scepticism. Recent research has shown that creativity is more than just divergent thinking.

The two complementary patterns of convergent and divergent thinking must run alongside one another. Gardner (1983) has identified seven kinds of intelligences or pathways to learning: linguistic (writers and speakers), logical-mathematical (scientists), musical (composers), spatial (visual artists), bodily kinaesthetic (dancers, athlete), interpersonal (educators), and intrapersonal (therapists). It could be possible to think of creativity in the same way. However, creativity scholars and practitioners have not made any move in this direction, but they have recognised that there are many ways of being creative. The intelligence testing (IQ) movement originated in attempts to predict academic competence. Using familiar situations with prior knowledge and reasoning (intelligence) may be sufficient to solve some problems or dilemmas. However, there are instances in everyday life in which new and different problems and dilemmas emerge, which require some cognitive bridging or creativity.

Results have been published showing that there is not a meaningful correlation between intelligence (essentially IQ) and creative problem solving (Goff, 1998) Maslow (1987) distinguishes between "special talent creativeness" and "self-actualising creativeness" and he found that creativity is a universal characteristic of self-actualising people. Self-actualisation may be described as the full use and exploitation of talents, capacities, potentialities and the like. Such people seem to be fulfilling themselves and doing the best that they are capable of doing. He identified the following characteristics of self-actualising creativeness: perception or fresh appreciation and wonder of the basic good of life; expression or ability to express ideas and impulses spontaneously and without fear of ridicule from others; childlike or innocence of perception and expressiveness, natural, spontaneous, simple, true, pure and uncritical; affinity for the unknown; resolution of dichotomies or the ability to synthesise, unify, integrate; and peak experiences or fearless, wonderful, ecstatic experiences which change the person and his/her perception of life. Their codes of ethics tend to be relatively autonomous and individual rather than conventional. They regard upon the world with wide, uncritical, undemanding, innocent eyes, simply noting and observing what is the case, without either arguing the matter or demanding that it be otherwise. Self-actualising creativeness is

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

"emitted", like radioactivity, and it hits all of life, regardless of the problems. Maslow (1987) mischievously wrote: "Science could be defined as a technique whereby non-creative people can create".

---

[1] DANIEL GOLEMAN, MICHAEL RAY, PAUL KAUFMAN «*Lo Spirito Creativo, imparare a liberare le idee*» – BEST BUR 2001

[8] Creativity for Operational Researchers – Paragraph 2 – The creative person - https://orbit.dtu.dk/files/2770938/imm3343.pdf

[9] Creativity for Operational Researchers – Paragraph 4 – The Personality - https://orbit.dtu.dk/files/2770938/imm3343.pdf

Unit 3 - The Pros and Cons of Creativity

Do schools kill creativity? | Sir Ken Robinson

https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity

1. The Main Barriers to Innovation through Creativity

- Mental models
- Lack of knowledge

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Resistance to change
- Poor analysis of the problem
- Lack of method

1.1. Mental Models

"Our" mental models "determine not only how we make sense of the world, but also how we act." - *Peter Senge*

"Although people do not (always) behave consistently with the theories they marry (i.e. with what they say), they behave consistently with the theories they use (i.e., their mental models)" - *Chris Argyris*.

Let's focus on mental model concept: Mental_models_A_robust_definition

2. What hinders creativity?

- PERCEPTUAL (e.g. Limited points of view; Difficulty in distinguishing facts from emotions; Not having an overview; Inability to divide problems into "sub-problems")
- EMOTIONAL (e.g. Fear of going against the current; Stopping at the first solution; inability to relax; low esteem and self-confidence)
- CULTURAL (e.g. Excessive faith in logic, in statistics; excessive recourse to past experiences; refusal of doubt; believing that daydreaming is childish)

2.1. Barriers to Creativity[1]

To be creative you have to be open to all alternatives. This open mindedness is not always possible to meet because all humans build up **blocks** or **mental locks** in the maturation and socialisation process. Some of those locks can have external causes, such as family environment, the educational system, and organisational bureaucracy. Other blocks are internally generated by our reactions to external factors or by physical factors. A key to improve your creativity is to become aware of your locks and do something about them. While everyone has blocks to creativity, blocks vary in quantity and intensity from person to person. Most of us are not aware of our conceptual blocks. Awareness not only permits us to know our strengths and weakness better but also gives the needed motivation and knowledge to break down these blocks.

Adams (1986) identifies the mental locks as perceptual, emotional, cultural, environmental, and intellectual. Perceptual locks are obstacles that restraint us from clearly perceiving either the problem itself or the information needed to register the problem. It is well known that our eyes can deceive us in observing some figures. Our perceptions are not always accurate. Emotional locks restrict our freedom to investigate and manipulate ideas. They prevent the communication of our ideas to others. These locks are also called psychological barriers and are the most significant and prevalent blocks that impede innovation. Fear of something new is a common characteristic of many individuals in the developed world. Cultural locks are adapted by exposure to a given set of

Co-funded by the Erasmus+ Programme of the European Union
The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

cultural patterns. The culture of the industrialised countries trains mental playfulness, fantasy and reflectiveness out of people by placing stress on the value of efficiency, effectivity and moneymaking. Taboos and myths are predominant blocks to creative behaviour. Therefore, it needs courage to be creative in a culture that does not support creative changes. Our near social and physical environment imposes environmental locks. Creative persons have usually had a childhood where they were free to develop their own potentialities. We have seen that Amabile (1998) has documented that organisational climate can be a barrier or a stimulus to creative activities. Intellectual locks are caused by conservatism and lack of willingness to use new approaches. The same approaches, the same tools and the same persons are tackling the same problems for years. Persons with intellectual locks are usually very negative to changes and are fast to criticise new proposals.

---

[1] Creativity for Operational Researchers – Paragraph 2 – Barriers to creativity - https://orbit.dtu.dk/files/2770938/imm3343.pdf

Unit 4 - Understand the Mindset of Divergent or Lateral Thinking

Several authors call creativity an "alternative thought":

- Ellis P. Torrance *"right thinking";*
- Max Wertheimer *"productive thinking";*
- Joy P. Guilford calls it *"divergent thinking";*
- Edward De Bono a *"lateral thought".*

We will deepen the “lateral thinking” by Edward De Bono.

1. Lateral Thinking[1]

- "Lateral thinking is an *intentional* process."
- "It is a way of using the mind as determined as logical thinking, but extremely different."
- "It differs completely from vertical thinking."
- "Both are necessary and complementary."
- "Lateral thinking is productive."
- "Vertical thinking is selective."

"The two fundamental aspects of the lateral thinking process:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The intentional generation of alternative ways of looking at things; (principle: any particular way of looking at things is only one among many other possible ways)

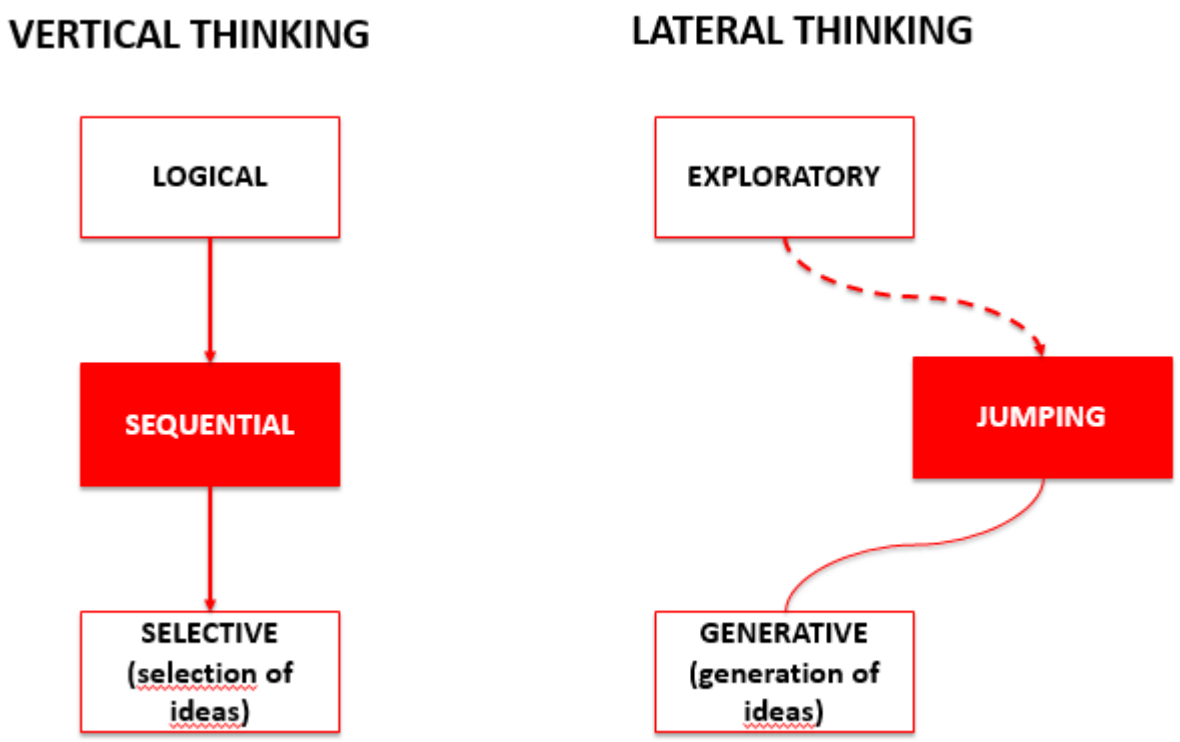
Questioning the assumptions."

1.1. “Vertical Thinking (VT) vs Lateral Thinking (LT) [1]

- VT is selective, LT is productive.
- The VT starts only if there is a direction in which to move, the LT starts moving in order to generate a direction.
- VT is analytical, LT is stimulator.
- The VT is sequential, the LT can jump.
- With the VT you have to be correct at every step, with the LT you cannot be correct.
- With the VT the negotiation is used in order to block some paths, with the LT there is no negotiation;
- With the VT we concentrate and exclude what is irrelevant, with the LT we welcome the intrusions of the case;
- With the categories of the VT classifications and definitions are fixed, with the LT no;
- The VT follows the most probable paths, the LT the least probable ones;
- VT is a finite process, LT is probabilistic.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



1.2. The Nature of Lateral Thinking[1]

"Lateral thinking deals with changing models."

"*Instead of taking a model and then developing it as it does in vertical thinking, lateral thinking tries to restructure the model by putting the elements together in a different way*."

1.3. Lateral Thinking Phases[2]

- Select a FOCUS (or centre of attention);
- Carry out a LATERAL DISPLACEMENT to generate a STIMULUS (the starting point of creativity);
- Establish an ASSOCIATION.

Let's focus on convergent and divergent thinking reading this article from page 1-25: Toward a definition of creativity: construct validation of the cognitive components of creativity

and this article: Creative and Lateral Thinking Edward de Bono

Let's focus on vision of the Split Brain reading this article: Visions of the Split Brain

Here are two explanatory videos on the mechanism of lateral thinking in a creative process:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Lateral Thinking I Edward de Bono

https://youtu.be/Nb9Oe83ruUw

Creative Thinking – How to get out of the box and generate ideas I Giovanni Corazza

https://youtu.be/bEusrD8g-dM

To better understand the mechanism of lateral thinking, which is the basis of a creative approach, we recommend reading the book by Edward de bono "Lateral Thinking".

2. The Creative Problem Solving[3]

Process Experience has shown that it is a good idea in a creative problem solving process to start with divergent thinking to produce as many ideas or solutions as possible and thereafter to switch to convergent thinking to select the few most promising ideas. This is usually illustrated in the form of a diamond.

Some of the rules for **divergent thinking** are:

- Image, reframe and see issues from different perspectives
- Defer judgement (criticism or negativity kills the divergent process), be open to new experiences
- Quantity breeds quality, to have good ideas you need lots of ideas
- Hitchhiking is permitted, in this way a synergetic effect can be achieved
- Combine and modify ideas, in this way you can create many ideas
- Think in pictures, to create future scenarios you can even simulate potential solutions
- Stretch the ideas, imagine ideas beyond normal limits, and
- Do not be afraid to break paradigms, avoid destructive criticism, and to add value to the challenged concept.

Some of the rules of **convergent thinking** are:

- Be systematic, find structure and patterns in the set of produced ideas
- Develop ways to evaluate ideas, assess qualitative and quantitative measures of ideas
- Do not be afraid of using intuition, this is the way most important decisions are taken
- Avoid quickly ruling out an area of consideration, take your time or better sleep on it
- Avoid idea-killer views, try the impossible
- Satisfy, do not expend too much time in looking for the optimal solution of an ill-structured multi-criteria problem

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Use heuristics, use common sense and experience-based rules, and
- Do not avoid but assess risk, this does not mean being blind to risks, for serious consequences be sure to have a contingency plan.

As we will see below, creative problem solving processes always contain phases of divergent and convergent thinking. Divergent thinking produces as many solutions as possible within the available time. The participants will vary in the way they prefer to produce ideas; some will do it by association, others by unrelated stimulus. Convergent thinking on the other hand requires the participants to use skills in reality testing, judgement and evaluation to choose the one or two best options from a number of possibilities. It is not unusual that in a group some members will very easily diverge, that is build a list of alternatives, while others will converge very fast by trying to select the best solution from the list and the rest will be passive not knowing what is required of them. Hence the need of a facilitator, he or she designs a clear and visible process to align the group.

---

[1] EDWARD DE BONO – "*Creatività e Pensiero Laterale, Manuale di pratica della fantasia"* – BUR R.C.S LIBRI 1998

[2] PHILIP KOTLER, FERNANDO TRIAS DE BES *"Marketing Laterale, tecniche nuove per trovare idee rivoluzionarie"* IL SOLE 24 Ore 2004

[3] Creativity for Operational Researchers – Paragraph 6 – The Creative Problem Solving - https://orbit.dtu.dk/files/2770938/imm3343.pdf

Unit 5 - Elements that Characterize Creativity

The **Three Ingredients of Creativity [1]** are:

1. **Talent -** Attitude to create. To invent.
2. **Method**
3. **Energy -** Positive and constructive attitude.

What prevents us from creating[1]?

*"The anti-creative monster is called **PIP**:*

- ***Fear of failure**. To be wrong.*
- ***Do not know the method.** Ignorance.*
- ***Stop at your own conventions.** Laziness."*

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

1. TALENT

We have seen a variety of abilities that characterises creative individuals or groups. Four of the key abilities will be discussed in this section as well as tools to enhance them in concrete problem solving situations.

The creative attitude - or talent - **can be measured through 4 factors** [1]:

- **Fluidity/Fluency** - quantity;
- **Flexibility** - change direction;
- **Originality** - uniqueness;
- **Elaboration** - choose and process.

In this section we will only present some few tools, those being the most popular and especially suitable for group work. Higgins (1994) presents many other tools and at the end of the list of references addresses of the best-known creativity home pages are presented.

Fluency[2]

Fluency is the **production of multiple problems, ideas, alternatives or solutions**. It has been shown that the more ideas we produce, the more likely we are to find a useful idea or solution. Fluency is a very important ability especially in the creative problem solving process. To have too few alternatives is not a good thing in problem solving, especially if you have to be innovative. There are many tools for producing ideas, alternatives and solutions.

Several researchers have shown that training and practice with these tools cause a better fluency. One creative tool, which has been widely used with big success for generating many ideas, is **Brainstorming**. Osborn (1953) invented it for the sole purpose of producing checklists of ideas that can be used in developing a solution to a problem. The tool is directed to generating unconventional ideas by suppressing the common tendency to criticise or reject them summarily. He tried to separate idea-evaluation from idea generation because he believed that if evaluation comes early, it reduces the quantity and quality of the ideas produced. Therefore in a brainstorming session no criticism is permitted, and freewheeling generation of a large number of ideas and their combination and development are encouraged.

Brainstorming is founded on the associative premise that the greater the number of associations, the less stereotyped and more creative the ideas of how to solve a problem will be. However, nothing in brainstorming is directed at changing the assumptions or paradigms that restrict the generation of new ideas. This is an excellent technique for strengthening fluency, fantasy, and communication skills. It is a good idea to have a facilitator to prepare and warm-up the brainstorming session, to lead and support the session, and to evaluate the whole process. This tool gives the possibility for the group to use more than one brain achieving a synergetic effect. Generate a multitude of ideas and some of them will be truly useful, innovative and workable. Asking individuals for inputs gives

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

them an increased sense of importance and produces an atmosphere for truly creative and imaginative ideas to surface and be acknowledged.

Brainstorming combined with other methods has been used for a wide diversity of problems, including not only marketing and product issues but also strategy development, planning, policy, organisation, leadership, staffing, motivation, control, and communication. However, this tool is not appropriated for broad and complex problems demanding high-qualified expertise and know-how. Some of the ideas produced may be of low quality or obvious generalities. Brainstorming is not a good idea for situations that require trail and error as opposed to judgement.

Flexibility[2]

Flexibility is the ability to **process ideas or objects in many different ways** given the same stimulus. It is the ability to delete old ways of thinking and begin in different directions. It is adaptive when aimed at a solution to a specific problem, challenge or dilemma. Flexibility is especially important when logical methods fail to give satisfactory results. Looking at modern paintings requires flexibility, they demand looking from different perspectives in order to see different objects, images and symbols. Seeing persons or objects in the clouds requires the flexibility of seeing concrete shapes in cloud formations. Flexible thinking provides for changes in ideas, detours in thinking to include contradictions, differing viewpoints, alternative plans, differing approaches and various perspectives of a situation.

A family of creative tools, known as **verbal checklists**, has been created to enhance flexibility in the creative process. Usually this is a checklist of questions about an existing product, service, process, or other item to yield new points of view and thereby lead to innovation. Osborn (1953) has developed a very extensive verbal checklist while he was a partner of a major US advertising firm. The idea behind the verbal checklist is that an existing product or service can be improved if one applies a series of questions to it and pursues the answers to see where they may lead. The main questions take the form of verbs such as Modify? or Combine? These verbs indicate possible ways to improve an existing product or service by making changes to it. Then you add definitional words to the verb, for instance combine ideas, combine appeals, combine purposes, combine units, etc. Elberle (1971) developed a short verbal checklist known as the **SCAMPER technique** to assist people in improving their flexible thinking.

When using such a checklist, you will usually follow the following steps:

- Identify the product or service to be modified
- Apply each of the verbs on the checklist to suggest changes in the product or service
- Make sure you use many definitional words for the listed verbs, and
- Review your changes to determine which one meets your solution criteria.

Another important tool for encouraging flexibility is the use of **provocative questions**. These questions will open up a situation to a broader and deeper direction of thinking which otherwise might not be produced or considered. They encourage people to think about ideas or concepts they have not thought about previously. Some provocative questions can be: What would happen if:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

water tasted like whisky? Cats could bark? Women could fly? How is: A PC like a ship? A flower like a cat? A sunset like a lake? A car like a fork? What might happen if: It never was Sunday? It was against the law to be perfectionist? People were not creative? Image what might happen if: By law it was forbidden to have children? Cars could fly? Men could have children?

Originality[2]

Originality means getting away from the obvious and commonplace or **breaking away from routine bound thinking**. Original ideas are statistically infrequent. Originality is a creative strength, which is a mental jump from the obvious. Original ideas are usually described as unique, surprising, wild, unusual, unconventional, novel, weird, remarkable or revolutionary. You need courage to be creative, because as soon as you propose a new idea, you are a minority of one. Belonging to a minority is unpleasant. In addition to it the original thinker must be able to withstand the ridicule and scepticism, which will be directed toward his/her ideas and himself/herself. To enhance creativity, we have to be respectful of unusual or crazy ideas or alternatives.

Picture Stimulation is a very popular technique used to provide ideas beyond those that might be obtained using brainstorming. The members of the group will look at a set of selected pictures and relate the information gained from the picture to the problem, otherwise the rules of brainstorming should be followed.

Photo Excursion uses the same principles of picture stimulation but instead of using prepared pictures for stimulation, participants are required to leave the building walk around the area with a (polaroid or digital) camera, and take pictures of possible solutions or visual ideas for the problem; when the group reconvenes, ideas are shared.

Another related technique is the **Object Stimulation** tool where instead of pictures a variety of different objects (e.g. a hammer, a pencil, a board game, etc.) will be used.

Sometimes you can use words instead of pictures or objects, and associate them to your problem. Originality can also be enhanced by analogies and metaphors. An **analogy** is a comparison of two things that are essentially dissimilar but are shown through the analogy to have some similarity. A **metaphor** is a figure of speech in which two different universes of thought are linked by some point of similarity. In the broadest sense of the term, all metaphors are simple analogies, but not all analogies are metaphors. Nature is a good source to provide analogies. Poetry is a good source of metaphors. Similes are specific types of metaphors that use the words "like" and "as" - for instance, the wind cut like a knife; his hand was as quick as a frog's tongue, he sees like a condor and digs as fast as a mole. **Similes** can be used to suggest comparisons that offer solutions.

Elaboration[2]

Mind Mapping is a visual and verbal tool usually used to structure complex situations in a radial and expanding way during the creative problem solving process. A mind map is by definition a creative pattern of related ideas, thoughts, processes, objects, etc. It is difficult to identify the origin and the creator of this technique. It is probable that this tool has been inspired by research on the interplay between the left and the right hemisphere of the brain. It can also be dated back to experiments with the brain and accelerated learning.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

It has been, among others, Buzan (1983) who has made **Mind Mapping** a well-known technique with many applications. The principles to construct mind maps are few and easy to understand. The best way to learn it is by practice. After short time you will do it automatically. If it is difficult for adults it is because they think linearly and take notes in a linear way (using the left hemisphere of the brain). To make mind maps you have to draw ideas from the centre of the paper and move in a radial and parallel way, to do that you have to use both your creative and your logical brain. With some experience you develop your own style, your own pallet of colours, your own symbols, your own icons, etc.

A Mind Map contains usually the following elements:

- The subject or the problem that has to be studied or analysed will be placed in the centre of the paper
- Keywords (names or verbs) are used to represent ideas, as far as possible only one word is used in a line
- The keywords are connected to the centrum through a main branch and sub-branches
- Colours and symbols are used to emphasise ideas or to stimulate the brain to identify new relations
- Ideas and thoughts are permitted to arise free; too much evaluation is avoided during the period of elaboration of the map.

When constructing a mind map, it is a good idea to start from left to right building main branches in a circular way. Then, to continue drawing sub-branches moving in a circular way until the whole sheet of paper is fill up with ideas. That is, you have been moving following an expanding spiral pattern. Then, move in the reverse way following a contracting spiral pattern supplementing the map with new ideas and connections. These spiral movements provoke the interplay between the creative and the logical parts of the brain, combining holistic thinking with particular details of the subject or the problem in question.

2. METHOD - Problem Solving

Ability to find solutions in every area, allows you to shift the focus, to change the point of view.

- **Problem Finding** - be aware of the problem;
- **Problem Setting** - define the problem in detail;
- **Problem Analysis** - break the problem down into secondary problems;
- **Problem Solving** - eliminate the causes and answer the questions posed by the problem
- **Decision Making** - choose how to act based on the answers obtained;
- **Decision Taking** - take action.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

2.1. The Process[2]

Focusing in the way that creative solutions and products were developed, Wallas' four-stage model has given inspiration to the development of approaches to be used by individuals or groups in the creative solving process. In the next two sections we will see some of these methods. Some definitions of creativity are closely related to the process of sensing problems, forming ideas or hypotheses, testing and modifying these assumptions and communicating the results.

In this respect creativity is the ability to see a situation in many ways (divergent thinking) and continue to question until satisfaction is reached (convergent thinking). The creative process can involve tiny creative leaps or giant breakthroughs. Both require that an individual or a group go beyond where they have gone before, embracing the unknown, the mysterious, the change, and the puzzling without fear.

The creative process may be considered as a new way of seeing, a different point of view, an original idea or a new relationship between ideas. It is the way or manner in which a problem is solved. It is the process of bringing something new into being. It is the process of combining previously unrelated ideas or perceiving a new relationship from previously unrelated ideas. Whether solving problems alone or in a group, you really **must have a guided process** i.e. a plan or a map of the steps to be followed. This is especially so in a group due to the need to align the capabilities of the members in a positive way. This map is usually called the creative problem solving process and under this denotation there exists a huge number of methods, tools and techniques to support the creative process. It is also a good idea to facilitate the group creative process. The facilitator will support the process, will elaborate a plan of the steps to be followed and will manage the whole process to secure that an action plan will be elaborated and implemented.

2.2. The CPS (Creative Problem Solving) Approach[2]

Osborn (1953) described several basic steps to support groups and individuals to be more successful in creative problem solving. Later, based on these proposals, several researchers have formalised and extended these ideas into a systematic approach to creative problem solving known as the CPS approach or process. 4-step, 5-step and 6- step models have been proposed. Here we present the most general version. It is called the 6-diamond model (Courger, 1995), where the upper part of each diamond represents the divergent sub-processes and the lower part corresponds to the convergent subprocesses.

The **6 steps** are:

- **Mess finding:** Identify areas of concern. Generate ideas about possible problematic situations from a holistic viewpoint. Identify the three most critical and general problems. Select one for further work.
- **Fact finding:** Observe carefully, like a video camera, while collecting information and data about the problem situation. Both objective facts and subjective experiences should be collected, explored and identified.
- **Problem finding:** Fly over the challenge or the problem by considering different ways of regarding it. Think about those possibilities.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- **Idea Finding:** Search for a variety of ideas, options, alternatives, paths, approaches, manners, methods and tools. Select potential solutions or ideas.
- **Solution finding:** Dig about the ideas in new and different ways, from other viewpoints and criteria. Assess the consequences, implications, and reactions to the selected ideas. Select ideas and solutions to develop an action plan.
- **Acceptance finding:** Develop ideas about how to implement the action plan. Search for ways of making the ideas or solutions more attractive, acceptable, stronger, more effective, and/or more beneficial. Develop a working plan for implementation.

Considerable research into the CPS process shows that a willingness to consider alternatives, to take some risks, to venture into insecure land, and to tolerate some uncertainty and ambiguity are important; see Parnes for further (1997).

Let us now focus on the different types of creative sub-processes that are needed at each step of the 6-diamond model:

Steps:	Sub-processes:
Mess finding	fluency, flexibility, originality, deferred judgement, and evaluation
Fact finding	analysis and evaluation
Problem finding	synthesis
Idea finding	fluency, flexibility, analysis, originality, and deferred judgement
Solution finding	synthesis, elaboration and evaluation
Acceptance finding	synthesis, evaluation, originality, and flexibility

As we can see at all these stages creativity tools can be used, but depending on the problem or the situation under study, both "hard" and "soft" methods can also be applied especially in the convergent phase of each step in the CPS process. Depending on the size and complexity of the problem the whole CPS process might take a long time. During this process the work group at some stages will need a facilitator, an expert, or a supervisor to support the different types of decisions to be taken. These are some of the roles that the advisor or mentor of a group of students at the university working on theses or projects can take. On the other hand, a very important aspect in this respect is learning. Every person that has a “proactive” stance to life can easily learn the use of creativity tools and the CPS process. Because of their simplicity many of these tools can be used in everyday life.

Children at school and elderly people can creatively empower their life by being proactive instead of reactive. Moreover, being creative in a group is usually fun; creative teams at work usually laugh a lot, see further Goff (1998). Depending on the actual problematic situation some more specialised

Co-funded by the Erasmus+ Programme of the European Union
The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

approaches could be used combined with creative tools, for instance: Synectics (Gordon, 1961), Future Workshops (Jungk and Müller, 1987), TKJ (Kobayashi, 1971), SWOT (Sørensen and Vidal, 1999), The Search Conference (Emery and Purser, 1996), Idealized Design (Ackoff, 1978) and TRIZ (Kaplan, 1992)

2.3. The "PAPSA" Method[1]

- **P**ERCEPTION. "Collect all possible data and information trying to explore the" problem "from every point of view;"
- **A**NALYSIS. "Destructuring the problem and determining the directions of research;"
- IDEAS **P**RODUCTION. "Find as many original ideas;"
- **S**ELECTION. "Choose the best ideas based on criteria;"
- **A**PPLICATION. "Proceed with the practical realization of the chosen ideas."

3. ENERGY

How to mobilize creative energy[1]?

"Energy spontaneously tends to flow in a positive sense. We want to create, to communicate, to be happy. "

It can encounter two types of obstacles:

"Objective processing. Laws, standards, physical, moral or economic constraints.

Imaginary. These are negative beliefs. But there are also positive beliefs and ambivalent beliefs. "

It develops in an **INDIVIDUAL**, **GROUP** (collective) and at **COMPANY** level (values).

"*The **Three Pillars of Creative Energy**[1]*

- *The multiplicity of options*
- *Constructive listening*
- *The ability to turn problems into opportunities.* "

The Environmental Variables of Creativity

- **Attention** (empathic and generative)
- **Collegiality** (collaboration)

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- **Dialogue**
- **Sincerity**
- **Analysis and summary, priorities**
- **Curiosity and wonder**
- **Optimism and sense of humor**
- **Trust**

"A common context in which knowledge is SHARED, CREATED and USED through Interaction."

The Environment[2]

Focusing on the organisational culture or climate that encourages or kills creativity there will be things that happen either formally or informally and either of these may in turn help or hinder; there may also be things that the organisation does not do that affect the quality of problem solving.

Environmental factors conducive to creative thinking include: the freedom to do things differently, an environment that encourages risk taking and self-initiated projects, and provides help and time for developing ideas and individual efforts; an optimal amount of work pressure, a no punitive environment, a low level of supervision, resources and realistic work goals; shared responsibilities, timely feedback, confidence in and respect for co-workers, and shared decision-making (participation); interaction with others outside the work group; and open expression of ideas, particularly of-the-wall ideas.

All these factors will increase individual motivation and the happiness of enjoying your work, being essential elements for creative and innovative work. Many organisations do not foster these conditions. Cultural change, education, and training are necessary within a global strategy to develop an action plan to make an organisation more creative. Managers at all levels, especially engineers and scientists, educators, and graduate students have much to gain from understanding how to foster a creative climate.

Barriers to creativity include habits and routines, judgmental thinking, oppression and hierarchy, and various perceptual, emotional and cultural blocks seen in the last section, see further Amabile (1983, 1998).

For an exhaustive and comprehensive understanding of the creative approach, also in relation to its connection with design thinking, **we recommend other readings**, some of which are specifically related to the didactic context.

- Nature of creativity
- Design thinking educators
- Innovation Creativity design

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- The Creative Process as Creators Practive It

Finally, please, watch a last interesting video:

The Open Mind: The Art and Science of Changing Minds

https://youtu.be/EOm_YTkHK8M

---

[1] HUBERT JAOUI, ISABELLA DELL'AQUILA *"66 tecniche creative per formatori e animatori"* – Franco Angeli 2013

[2] Creativity for Operational Researchers https://orbit.dtu.dk/files/2770938/imm3343.pdf

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assignment 3

Description of the task

After reading the content of this module, answer the 10 questions in the attached Word template, related to the module content.

Submission

Use the attached Word template (answer the questions). Size: 1-2 A4 pages

Name the file (YourName_Module_3) and upload it.

Evaluation

Insufficient - Less than 5 correct answers

Sufficient - between 5-6 correct answers

Good - between 7-8 correct answers

Excellent - 9 correct answers

Excellent - 10 correct answers

Max. points achievable: **10 points**

Assignment 3 - template

Your name:

1. **Describe the creativity concept.**

2. **What should a creative idea be like?**
   - □ Correct; Useful; Valuable; Meaningful
   - □ Correct; Fluid; Valuable; Meaningful
   - □ Correct; Useful; Original; Meaningful
   - □ Fluid; Original; Flexible; Valuable
3. **What is meant by functional fixity?**

4. **What types of creativity blocks do you know *(answer through bulleted list)*?**

5. **What are the phases of lateral thinking (*answer through bulleted list)*?**

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

6. **Which of the following statements are correct (Vertical Thinking VT vs Lateral Thinking LT)? (multiple choice)**

   - □ VT is productive, LT is selective.
   - □ VT is analytical, LT is stimulator.
   - □ The LT is sequential, the VT can jump.
   - □ VT is a finite process, LT is probabilistic.
   - □ The LT follows the most probable paths, the VT the least probable ones.

7. **What are the ingredients of creativity? (multiple choice)**

   - □ Method
   - □ Talent
   - □ Perseverance
   - □ Energy
   - □ Attention

8. **What are the steps of the creative method - PAPSA - *(answer through bulleted list)*?**

9. **What is meant by the ingredient - energy?**

10. **Write at least three characteristics of a creative environment *(answer through bulleted list)*.**

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.