

EDUCATIONAL HANBOOK

“Creative Problem- Solving Methodology”

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CONTENTS

CHAPTER 1: CPS METHODOLOGY FOR VET	3
1.1 Introduction in CPS Methodology	3
1.2 Approaches and Techniques	10
CHAPTER 2: DIVERGENT AND CONVERGENT THINKING	21
2.1 Divergent thinking	22
2.2. Convergent Thinking.....	25
2.3. Divergent VS Convergent Thinking.....	27
CHAPTER 3: CPS IMPLEMENTATION	30
3.1 The Six Thinking Hats.....	30
3.2 More techniques.....	33
CHAPTER 4: RESEARCH ALL OVER EUROPE.....	39
4.1 Greece	39
4.2 Finland.....	41
4.3 Italy	48
4.4 United Kingdom.....	53
4.5 Poland	56

CHAPTER 1: CPS METHODOLOGY FOR VET

” Instead of thinking outside of the box, get rid of the box”

Deepek Chopra

1.1 Introduction in CPS Methodology

Why we use Creative Problem-Solving?



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Over the last at least 50 years there has been a variety of creative processes used in many areas of human life, let alone the business arena. Many people refer to these processes as Creativity on demand outlining the increased conscious competence in creative thinking (CT) and creative problem solving (CPS). According to the article of Bob Eckert, “The Universal Creative Process: 7 Steps to Something

Better”, CT and CPS are of vital importance and new methodologies keep coming to the fore, trying to offer a solution to three core challenges:

- Desire of a universal innovation process/language that provides the overarching framework for a variety of creative thinking tools, processes, techniques, etc.
- Comprehensive processes and frameworks that work together (much like a carpenter's toolbox) to help us uncover opportunity and design solutions (create new value) while anticipating and overcoming challenges along the way.
- Hope to understand and strengthen an individual's capacity for creative cognition, collaboration, utilization of diversity and the organization's ability to support people with a well-managed innovation ecosystem.

Dealing with these challenges and obstacles has become a regular part of working life and life in general and overcoming them is not always easy to do. For the improvement of products, services, communication and interpersonal skills in VET sector we need to encourage Creative Thinking and find innovative solutions that work and have direct effectiveness.

CPS asks you to separate your "divergent" and "convergent" thinking as a way to do this. Divergent thinking is the process of generating lots of potential solutions and possibilities, otherwise known as brainstorming. And convergent thinking involves evaluating those options and choosing the most promising one. Often, we use a combination of the two to develop new ideas or solutions. However, using them simultaneously can result in unbalanced or biased decisions, and can stifle idea generation.

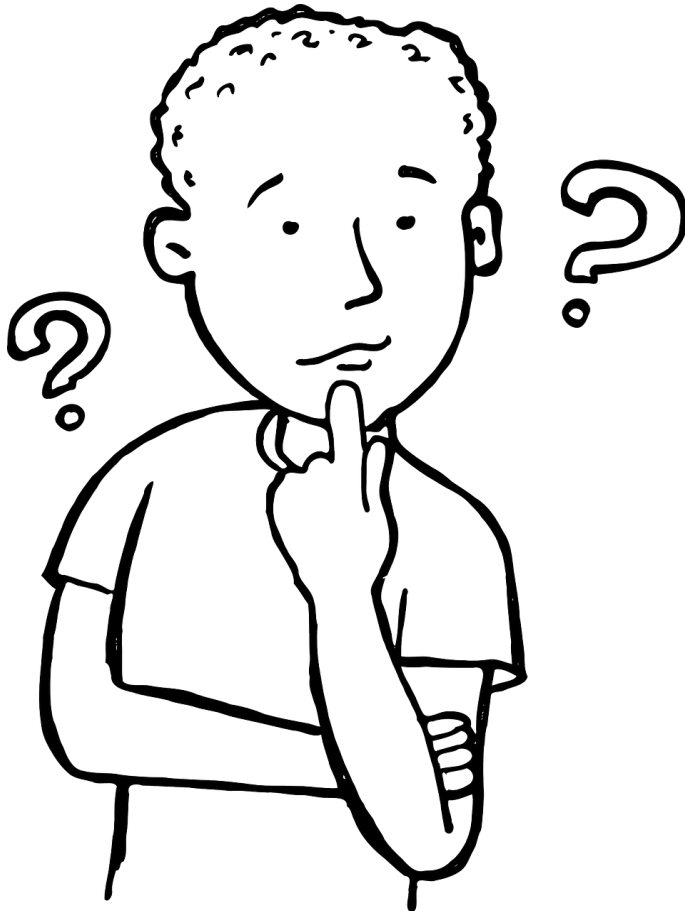


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A definition

In effect, the Creative Problem Solving is a lot **more than 3 words put together** and in reality, it could be defined as follows: *It is a methodology based on a multidisciplinary approach dealing with the role of creativity, innovation and problem solving in various situations of daily life.* (Franco et al,2017)¹

According to Jeffrey Baumgartner on his article “The Basics of Creative Problem Solving – CPS”, Creative problem solving isn’t just brainstorming, although that’s what many people may associate it with. It’s actually

a well-defined process that can help you from problem definition to implementing solutions, according to Jeffrey Baumgartner. Creative ideas do not suddenly appear in people’s minds for no apparent reason. Rather, they are the result of trying to solve a specific problem or to achieve a particular goal.

Albert Einstein’s theories for example, were not sudden inspirations. Rather they were the result of a huge amount of mental problem solving trying to close a discrepancy between the laws of physics and the laws of electromagnetism as they were understood at the time. Among other creative minds that were characterized “geniuses” we can place Leonardo da Vinci and Thomas Edison that had always worked in the same way. They do not wait for creative ideas to strike them. Rather they focus on trying to solve a clearly stated, at least in their minds, problem. This is just like important TED talks to ideate for business innovation specifically discussed to get a better solution for existing problems. In simple words, Creative Problem Solving may be defined as a problem-solving technique that addresses a challenge or problem in a creative manner or an imaginative way. The solution is

¹ Franco, Peppino & Kearns, Liviana & Valtonen., David & Kommers, Piet. (2017). *Creative Problem Solving Methodology Guide*. 10.13140/RG.2.2.35949.64484.

creative because it is not obvious. To meet the criteria for solving a problem in a creative manner, the solution should resolve the declared problem in an original manner with the solution being reached independently. This idea generation strategy usually incorporates a team approach. This is owing to the fact that people inside the workplace are allowed to engage in the process of change in their search for creative solutions.

The difference between this process and other CPS strategies is that there is utilization of both convergent and divergent thinking in the course of each process step, and not only when coming up with ideas to fix the problem. Each step starts with divergent thinking, an extensive search for multiple alternatives. After this comes convergent thinking that involves evaluating and selecting. This strategy is taught at the Creative Problem-Solving Institute, the International Center for Studies in Creativity, and the CREA conference. It is particularly recognized as an important influence on the Productive Thinking Model.

Formalized approach of CPS- Osborn-Parnes model

This approach has been formalized as Creative Problem Solving (CPS). CPS is a simple process that involves breaking down a problem to understand it, generating ideas to solve the problem and evaluating those



ideas to find the most effective solutions. Highly creative people tend to follow this process in their heads, without thinking about it. Less naturally creative people simply have to learn to use this very simple process. Although creative problem solving has been around as long as humans have been thinking creatively and solving problems, it was first formalized as a process by Alex Osborn, who invented traditional brainstorming, and Sidney Parnes. Their Creative Problem-Solving Process (CPSP) has been taught at the International Center for Studies in Creativity at Buffalo College in Buffalo, New York since the 1950s and is based on the following process:

Creative Problem Solving refers to the trademark Osborn-Parnes (CPS) process of creatively solving problems. The process was crafted by Dr. Sidney J. Parnes and Alex Osborn in the 1950s. CPS begins with two assumptions:

- Everyone is creative in some way.
- Creative skills can be learned and enhanced.

There are six stages in the Osborn-Parnes process of Creative-Problem Solving. Here, the six stages are described with two examples of questions for some of the stages, to stimulate your thinking.

1. Objective Finding- Pinpointing the challenge or goal and delineating your preferred output is the basis of the CPS strategy. At times, people pay no heed to certain essential aspects about the problem or take something for granted to solve it rapidly. This causes an obscuring of the thought process, and the person fails to take note of the big picture. Delineating the goal or objective provides a lucid idea pertaining to the problem that facilitates the investigation of various possible solutions to it. Questions: What bottlenecks or barriers exist? What is it that you wish to be better organized?

2. Fact Finding- Collecting information pertaining to the problem and associated data is essential for comprehending the problem. At this stage, make a list of key details such as what and who is involved, assumptions and perceptions, viewpoints of interested parties, feelings and facts, and so on so that you may begin the process of crafting ideas. Questions: Who should be or is already involved? Why doesn't/does it happen?

3. Problem Finding- Using the problem objective and gathered data as a basis, determine possible challenges that may come about and the possible opportunities that are present inside of it. This would assist you with concentrating on the problem. It is so simple to move your attention away from the aim and to come up with answers to the incorrect problems. Questions: What is the actual problem? What is the key objective?

4. Idea Finding- Reusing a solution when we come across a problem that we possibly encountered before, is a very easy process. Our mind detects 'conceptual blocks' that comprise hurdles such as commitment, complacency, compression, and constancy. These hinder us from thinking creatively and developing fresh concepts or ideas. Thus, it is essential to investigate, brainstorm and determine as many probable solutions as you can.

5. Solution Finding- After you've done with coming up with new ideas and noting down probable solutions in list fashion, assess them to determine whether they meet your specification for success and can be executed. Improve, reinforce and select the best idea. Make sure that the solutions are not only creative, but also useful. At times, will power is the sole solution. Questions: Will it work? Are the technology and materials available?

6. Acceptance Finding- You have selected the best probable solution that is both actionable and satisfies the requirements for success. The next thing to do is to plan your steps for action by lucidly describing responsibilities and determining the best method to utilize the available resources. The calls for action that you put out should be comprehended by all associated with the Problem-Solving process so that it becomes an accepted solution.

The models

When describing the Osborne-Parnes process of Creative Problem Solving, one can think of no less than *three models*. Here, three are discussed.



1. Linear: In the linear model, each of the six stages of the Creative Problem-Solving process is represented by a diamond shape. This shape signifies first, generating or diverging options, followed by a selection of a refreshed focus and then, moving on. Thinking was in straight lines, moving just one step at a time for the sake of maintaining order, channeling

freedom. This model came out in the 1970s.

2. Bubble: In the 1990s, the diamond shapes changed into connected bubbles representing attitude shifts towards directed and meaningful connectedness. Channeled freedom gets wider birth. There are three unique stages in the bubble model. Visually, this indicates authorization to enter not solely at the first stage (as was the case in the 1970s model), but at any stage of the process. The linear model has diamond shapes with smoother edges, and there are arrows to give directions. The three bubbles in the bubble model let you know exactly what you should do.

3. Systemic: The Thinking Skills Model is a system with many entry points determined by the task at hand (center hub) or situation. The construction in this model is in agreement with our current web-like interrelated view of the world. It depicts the distinctive core of each stage by renaming. While the bubble and accordion (diamond) CPS models offer rational, logical approaches to CPS, providing an overt course of action, this model tells you what happens. It outlines the three key phases and charts the thinking processes utilized for each. You can see the diamonds remain the three key focus points join in fluid colors with the beginning point varying with the situational requirement.

Coming after Dr. Sidney J. Parnes and Alex Osborn, Noller in 1979 tried to give a definition to Creative Problem solving starting from the **three words** it is composed by:



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CREATIVE

CREATIVE is about having an element of newness that is relevant to anyone that wants to create a solution. It implies to bring into a situation something that was not there before, that has elements of newness.

About **CREATIVITY**: it refers to the introduction of something in a context that has value. It is important not to confuse creativity and ART, even though ART is usually new and has value. In this specific project, creativity is about new ideas and not about the creativity of art that involves aesthetic, excellence and skills/attitudes that cannot be learned.

PROBLEM

Noller defined a **PROBLEM** as any situation that presents a challenge, offers an opportunity, or is a concern to the solver. In effect, the Cambridge Dictionary defines **PROBLEM** as a situation that causes difficulties. About **PROBLEM**: Peter Honey, a psychologist, defines a problem as the difference between what you've got and what you want.

SOLVING

SOLVING is immediately connected with **PROBLEM**. It is devising ways to answer, to meet, or to satisfy a situation by changing self or situation. About **SOLVING**: in stressful situations, it's natural to just go with the first good solution emerging from an analogical reasoning. It is in fact natural to look for an answer/action to stop or remove the problem.

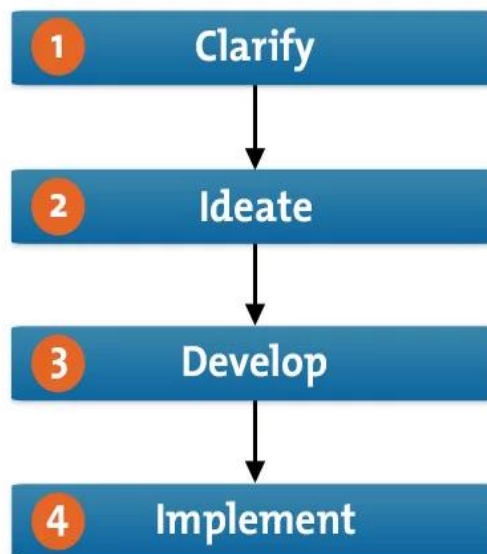
1.2 Approaches and Techniques

Osborn-Parnes model² inspired a number of other tools and techniques that were developed and enriches until nowadays. One of these is the 2011 CPS Learner's Model, also from the Creative Education Foundation, developed by Dr Gerard J. Puccio, Marie Mance, and co-workers. According to them there is a four-step model to explore how you can use CPS to generate innovative, effective solutions:

1. Clarify

Explore the Vision

Identify your goal, desire or challenge. This is a crucial first step because it's easy to assume, incorrectly, that you know what the problem is. However, you may have missed something or have failed to understand the issue fully, and defining your objective can provide clarity. Read our article, 5 Whys, for more on getting to the root of a problem quickly.



Gather Data

Once you've identified and understood the problem, you can collect information about it and develop a clear understanding of it. Make a note of details such as who and what is involved, all the relevant facts, and everyone's feelings and opinions.

Formulate Questions

When you've increased your awareness of the challenge or problem you've identified, ask questions that will generate solutions. Think about the obstacles you might face and the opportunities they could present.

² <https://www.mindtools.com/pages/article/creative-problem-solving.htm>

2. Ideate

-Explore Ideas

Generate ideas that answer the challenge questions you identified in step 1. It can be tempting to consider solutions that you've tried before, as our minds tend to return to habitual thinking patterns that stop us from producing new ideas. However, this is a chance to use your creativity.

Brainstorming and Mind Maps are great ways to explore ideas during this divergent stage of CPS. And our articles, Encouraging Team Creativity, /community/Bite-SizedTraining/ProblemSolving.phpProblem Solving, Rolestorming, Hurson's Productive Thinking Model, and The Four-Step Innovation Process, can also help boost your creativity.

3. Develop

-Formulate Solutions

This is the convergent stage of CPS, where you begin to focus on evaluating all of your possible options and come up with solutions. Analyze whether potential solutions meet your needs and criteria, and decide whether you can implement them successfully. Next, consider how you can strengthen them and determine which ones are the best "fit." Our articles, Critical Thinking and ORAPAPA, are useful here.

4. Implement

-Formulate a Plan

Once you've chosen the best solution, it's time to develop a plan of action. Start by identifying resources and actions that will allow you to implement your chosen solution. Next, communicate your plan and make sure that everyone involved understands and accepts it.

The more focused on innovation CPS model (that is the implementation of the most promising ideas), it involves seven straightforward steps.



1. Clarify and identify the problem

Arguably the single most important step of CPS is identifying your real problem or goal. This may seem easy, but very often, what we believe to be the problem is not the real problem or goal. For instance, you may feel you need a new job. However, if you break down your problem and analyze what you are really looking for, it may transpire that the actual issue is that your income does not cover your costs of living. In this case, the solution may be a new job, but it might also be to re-arrange your expenses or to seek a pay rise from your existing employer.

A powerful Problem-Definition technique

A 7 Steps model

The best way to clarify the problem and understand the underlying issues is to ask yourself – or better still, ask a friend or family member to ask you – a series of questions about your problem in order to clarify the true issues behind the problem. The first



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question to ask is simply: “why is this a problem?” or “why do I wish to achieve this goal?” Once you have answered that, ask yourself “why else?” four more times. For instance, you might feel you want to overcome your shyness. So, you ask yourself why and you answer: “because I am lonely”. Then ask yourself “Why else?” four times. You answer: “Because I do not know many people in this new city where I live”, “Because I find it hard to meet people”, “Because I am doing many activities alone” and “Because I would like to do activities with other people who share my interests”. This last “why else” is clearly more of the issue than reducing shyness. Indeed, if you had focused your creative energy on solving your shyness issue, you would not have actually solved the real problem. On the other hand, if you focused your creative energy on finding people with whom to share activities, you would be happier without ever having to address the shyness issue.

**More questions
you can ask to
help clearly**

In addition, you can further clarify your problem by asking questions like: “What do I really wish to accomplish?”, “What is preventing me from solving this problem/achieving the goal?”, “How do I envision myself in six months/one year/five years [choose most relevant time span] as a result of solving this problem?” and “Are my friends dealing with similar problems? If so, how are they coping?” By the time you have answered all these questions, you should have a very clear idea of what your problem or real goal is.

**Set criteria for
judging potential
solutions**

The final step is to decide what criteria you will eventually use to evaluate or judge the ideas. Are there budget limitations, timeframe or other restrictions that will affect whether or not you can go ahead with an idea? What will you want to have accomplished with the ideas? What do you wish to avoid when you implement these ideas? Think about it and make a list of three to five evaluation criteria. Then put the list aside. You will not need it for a while.

2. Research the problem

The next step in CPS is to research the problem in order to get a better understanding of it. Depending on the nature of the problem, you may need to do a great deal of research or very little. The best place to start these days is with your favourite search engine. But do not neglect good old-fashioned sources of information and opinion. Libraries are fantastic for in-depth information that is easier to read than computer screens. Friends, colleagues and family can also provide thoughts on many issues. Fora on sites like LinkedIn and elsewhere are ideal for asking questions. There’s nothing an expert enjoys more than imparting her knowledge. Take advantage of that. But always try to get feedback from several people to ensure you get well-rounded information.

3. Formulate one or more creative challenges

By now, you should be clear on the real issues behind your problems or goals. The next step is to turn these issues into creative challenges. A creative challenge is basically a simple question framed to encourage suggestions or ideas. In English, a challenge typically starts with “In what ways might I [or we] ...?” or “How might I...?” or “How could I...?”

Creative challenges should be simple, concise and focus on a single issue. For example: “How might I improve my Chinese language skills and find

a job in Shanghai?” is two completely separate challenges. Trying to generate ideas that solve both challenges will be difficult and, as a result, will stifle idea generation. So, separate these into two challenges: “How might I improve my Chinese language skills?” and “How might I find a job in Shanghai?” Then attack each challenge individually. Once you have ideas for both, you may find a logical approach to solving both problems in a coordinated way. Or you might find that there is not a coordinated way and each problem must be tackled separately.

Creative challenges should not include evaluation criteria. For example: “How might I find a more challenging job that is better paying and situated close to my home?” If you put criteria in the challenge, you will limit your creative thinking. So simply ask: “How might a I find a more challenging job?” and after generating ideas, you can use the criteria to identify the ideas with the greatest potential.

4. Generate ideas

Finally, we come to the part most people associate with brainstorming and creative problem solving: idea generation. And you probably know how this works. Take only one creative challenge. Give yourself some quiet time and try to generate at least 50 ideas that may or may not solve the challenge. You can do this alone or you can invite some friends or family members to help you.

Irrespective of your idea generation approach, write your ideas on a document. You can simply write them down in linear fashion, write them down on a mind map, enter them onto a computer document (such as Microsoft Word or OpenOffice) or use a specialized software for idea generation. The method you use is not so important. What is important is that you follow these rules:

Write down every idea that comes to mind. Even if the idea is ludicrous, stupid or fails to solve the challenge, write it down. Most people are their own worst critics and by squelching their own ideas, make themselves less creative. So, write everything down. **NO EXCEPTIONS!**

If other people are also involved, ensure that no one criticizes anyone else’s ideas in any way. This is called squelching, because even the tiniest amount of criticism can discourage everyone in the group for sharing their more creative ideas. Even a sigh or the rolling of eyes can be critical. Squelching must be avoided!

If you are working alone, don’t stop until you’ve reached your target of 50 (or more) ideas. If you are working with other people, set a time limit like 15 or 20 minutes. Once you have reached this time limit, compare ideas and make a grand list that includes them all. Then ask everyone if they have some new ideas. Most likely people will be inspired by others’ ideas and add more to the list.

If you find you are not generating sufficient ideas, give yourself some inspiration. A classic trick is to open a book or dictionary and pick out a random word. Then generate ideas that somehow incorporate this word. You might also ask yourself what other people whom you know; such as your grandmother, your partner, a friend or a character on your favorite TV show, might suggest.

Brainstorming does not need to occur at your desk. Take a trip somewhere for new inspiration. Find a nice place in a beautiful park. Sit down in a coffee shop on a crowded street corner. You can even walk and generate ideas. In addition, if you browse the web for brainstorming and idea generation, you will find lots of creative ideas on how to generate creative ideas!

One last note: If you are not in a hurry, wait until the next day and then try to generate another 25 ideas; ideally do this in the morning. Research has shown that our minds work on creative challenges while we sleep. Your initial idea generation session has been good exercise and has certainly generated some great ideas. But it will probably also inspire your unconscious mind to generate some ideas while you sleep. Don't lose them!

5. Combine and evaluate ideas

After you have written down all of your ideas, take a break. It might just be an hour. It might be a day or more. Then go through the ideas. Related ideas can be combined together to form big ideas (or idea clusters). Then, using the criteria you devised earlier, choose all of the ideas that broadly meet those criteria. This is important. If you focus only on the “best” ideas or your favorite ideas, the chances are you will choose the less creative ones! Nevertheless, feel free to include your favorite ideas in the initial list of ideas.

Now get out that list of criteria you made earlier and go through each idea more carefully. Consider how well it meets each criterion and give it a rating of 0 to 5 points, with five indicating a perfect match. If an idea falls short of a criterion, think about why this is so. Is there a way that it can be improved in order to increase its score? If so, make a note. Once you are finished, all of the ideas will have an evaluation score. Those ideas with the highest score best meet your criteria. They may not be your best ideas or your favorite ideas, but they are most likely to best solve your problem or enable you to achieve your goal.

Depending on the nature of the challenge and the winning ideas, you may be ready to jump right in and implement your ideas. In other cases, ideas may need to be developed further. With complex ideas, a simple evaluation may not be enough. You may need to do a SWOT (strengths, weaknesses, opportunities and threats) analysis or discuss the idea with others who will be affected by it. If the idea is business related, you may need to do a business case, market research, build a prototype or a combination of all of these.

Also, keep in mind that you do not need to limit yourself to one winning idea. Often you can implement several ideas in order to solve your challenge.

6. Draw up an action plan

At this point, you have some great ideas. However, a lot of people have trouble motivating themselves to take the next step. Creative ideas may mean big changes or taking risks. Some of us love change and risk. Others are scared by it. Draw up an action plan with the simple steps you need to take in order to implement your ideas. Ideas that involve a lot of work to implement can be particularly intimidating. Breaking their implementation down into a series of readily accomplished tasks makes these ideas easier to cope with and implement.

7. Implement it!

This is the simplest step of all. Take your action plan and implement your idea. And if the situation veers away from your action plan steps, don't worry. Rewrite your action plan!

CPS IN SCHOOL



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Nowadays, many core elements of the traditional classroom experience such as textbooks, whiteboards, pencils, and paper are disconnected from the preferences and mindsets of today's students. More and more educators and trainers are recognizing the importance of walking away from traditional and old-fashioned teaching methodologies and processes and they are starting integrating practical strategies and tactical approaches to effectively and efficiently engage students and prepare them for their entrance into the "real world". That's the reason why the importance of teaching creative problem thinking in the classroom is pointed out. Though it's not just the educators that need to embrace this change in learning. People of all ages will need to commit to a lifelong learning education based in the provision of real technical and practical skills and qualifications versus the earning of a paper and then stepping away from the learning front. Higher education has a crucial role to play to provide students with skills and techniques that will be proved useful and necessary, on numerous occasions even more than a diploma stating an internship or specialization. Teaching entrepreneurship, open educational resources, gamification, creative problem solving based on critical thinking should be encouraged and promoted through the teaching processes. These skills respond to the real-time changes in technology and it is meaningful to invest in ongoing training and education including these skills.

The students from the primary level of their educational system should be nurtured to practice investigating, inventing, brainstorming, thinking and developing solutions. The educator no longer holds the answer to the challenge. It's shifting its role from being the dispenser of knowledge and the master of a classroom, on the contrary, educator's role is now focused on helping students be creators and problem-solvers as well as to distinguish between true and false information. Those are the critical thinking that will help them survive in a world where they will have to be continually learning, doing things they couldn't imagine and deal with the inequality in all the possible human levels.

Other CPS Techniques³

Problem solving is both an art and a science that includes formal techniques, social collaboration and creative processes. The art of problem solving is a process of rational thought and interaction designed to spark creative solutions. The science includes techniques such as logic, research and peer review designs to systemize problem solving. The following are a few techniques that are commonly used to solve business problems.

³ <https://simplicable.com/new/creative-problem-solving>

Problem Statement

Problem statements are generally concise with great attention paid to wording. Slight differences in your problem statement can lead to completely different solutions. A well-designed problem statement can improve the Problem-Solving processes and produce more desirable outcomes.

If a problem solving stalls or produces poor solutions it is common to revisit the problem statement. In theory, a new problem statement can spark completely new insights.

An open-ended problem statement sets no constraints or conditions. This allows for creativity in problem solving as the solution space is large. For example, the problem statement “develop a new product that addresses a significant customer need:

A closed-ended problem statement imposes constraints and conditions. This is used to limit the solution to those that fulfill your goals. For example, “develop a bicycle helmet will generate sales of 100€.

Brainstorming

Brainstorming is a group creativity technique that encourages participants to spontaneously list our ideas without overthinking them. The term is used as a catch-all phrase for any activity that quickly lists out ideas. The strategy behind brainstorming is that ideas should be allowed to flow out in an undertrained way without fear of criticism. This allows for seemingly farfetched ideas to surface.

Counterfactual thinking

Counterfactual thinking is a common type of thought pattern that goes back in time to evaluate choices and actions that weren’t made. It is typified by questions like “what if I had”.

As a time-horizon passes, choices that were once available may become impossible. Counterfactual thinking is the practice of examining the impossible to extract insights that can be applied elsewhere. In other words, evaluation past possibilities can have value in improving decision making or solving a problem.

Creativity of constraints

Creativity of constraints is a theory that suggests that well designed constraints improve creativity. While creativity is commonly seen as a product of imagination, widely appreciated results of creativity such as great arts, music, designs and innovations typically result from a constraint such as culture, influences, schools of

thought, schools of art, traditions, methods, techniques and styles. If creativity is free to bend constraints; it rarely works without them altogether.

Thought Experiment

A thought experiment is a hypothesis, story or procedure that is invented in order to examine its consequences. It is a technique that can tackle wicked problems that has played a role in a great number of scientific discoveries.

Thought experiments are designed to examine ideas in a lightweight fashion that doesn't require a physical experiment. They can be solvable with logic or can be far reaching ideas that require speculation as there is no way to solve them definitely. In many cases, they are used to establish principles, assumptions or solutions that can aid problem solving or decision making.

Preserving ambiguity

Preserving ambiguity is a design technique that seeks to avoid making assumptions or imposing constraints too early in a design process. Design starts with the idea that anything is possible in the hopes that a seemingly improbable idea will emerge that has significant value to the design.

The idea of preserving ambiguity isn't necessarily well accepted. A contrary technique, the creativity of constraints suggests that designers generate more valuable ideas when they are presented with constraints such as a clear problem statement.

Beyond designing, preserving ambiguity is used in processes of creative problem solving such as brainstorming. Making assumptions too early in a creative process can result in failure of imagination.

Creative Intuition

Creative intuition is the ability to quickly identify valuable or useful creative ideas without conscious thought. As with all intuition, it is described as instantaneous without any conscious understanding of how the mind created the idea. The phenomenon is associated with creative professions or people who are known for creativity in regular professions. This suggests that thinking creatively can eventually become so fast that it hardly resembles thinking at all.

Serendipity

Serendipity is a word that means “pleasant surprise that’ s often used to describe the role of chance in scientific discoveries.

There are dozens of examples in the history of science in which an important theory was discovered seemingly by chance after years of working on a problem. Examples include Alexander Fleming’s accidental discovery of penicillin and Isaac Newton’s laws of universal gravitation that he described as a sudden inspiration after watching an apple falling from a tree.

Improvisation

Improvisation is the act of creating something spontaneous without preparation. The term is associated with creativity and the ability to add value in a fast-moving situation.

Real life scenarios for example such as problem solving and decision making are unscripted and involve working with what you have in the moment. As such, training in an improvisational art form is thought to stimulate creative problem solving. It is common to use exercises that resemble improvisational theatre to stimulate group strategy, problem solving, decision making and design sessions.

Conceptual Framework

A conceptual framework is a method for organizing ideas to solve problems in a particular domain that may include a vocabulary, model and a set of conventions.

The use of conceptual framework is extremely common to solve everyday problems. For example, a football playbook can be considered a conceptual framework for the sport of American football.

The value of a conceptual framework is that organizes information into a standard format that is specifically designed to achieve a goal such as winning a football game.

Inductive Reasoning

Inductive reasoning is as form of logic that formulates theories based on a set of known facts. It allows for false conclusions, meaning that it can be wrong.

The classic example of inductive reasoning is that because most life forms on earth depend on liquid water for survival, water must be important to alien life forms, if they exist.

More than a way to do it

Theirs is more than a way to do it is the principle that designs is diverse and that every problem has a large set of potential solutions. It has several common interpretations.

This method suggests that design rules and principles are meant to be broken. Taking principles too seriously can result in uninspired designs and missed opportunities. Balance is usually considered a strict rule of visual design but some designers break it to catch the eye or create a particular aesthetic. Minimalism taken too far can be boring. Passive design is eloquent but can miss out on technology.

There is more than a way to do it can be interpreted to suggest that it is a bad idea to settle for the first solution you find to a problem. Techniques such as preserving ambiguity encourage designers to consider a wide range of approaches.

Peer review

Peer review is a formal evaluation of a work by professionals with a similar level of competence as the work's authors.

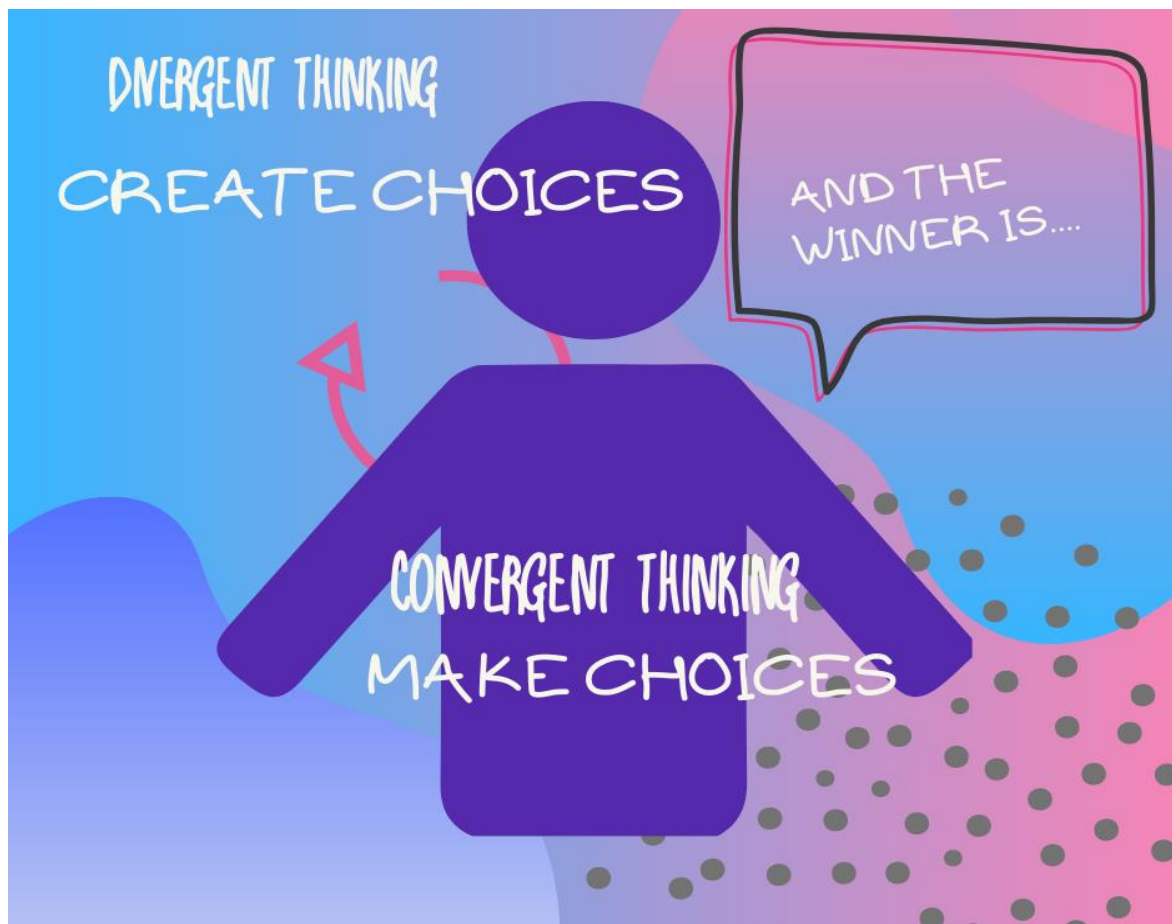
It is considered a form of validation and due diligence that typically adds credibility to a work, even if some reviews are negative. Peer review is a good way to improve quality as reviewers will typically find mistakes or oversights. In some cases, they will go so far as to suggest an improvement to a solution.

Peer review can also act as a form of motivation. In some cases, experts and leaders rarely have their work reviewed by anyone who is likely to apply much criticism. Peers at the same level may be quite vocal. For example, a security expert who presents work to programmers may receive little feedback. However, a security expert who has work reviewed by other security experts is more likely to be challenged.

CHAPTER 2: DIVERGENT AND CONVERGENT THINKING

“Your problem is to bridge the gap which exists between where you are now and the goal you intend to reach.”

Earl Nightingale



When it comes to problem solving and idea generation, two ways are commonly cited, namely divergent and convergent thinking strategies. The convergent style of thinking was rapidly equated with typical intelligence. On the other hand, divergent thinking was equated with creativity and both were not uncommonly presented as competing or conflicting processes. While divergent thinking was considered to be good, its counterpart was seen as either bad or a necessarily evil considerably exaggerated in business and schools. Having said that, an important development in recent years is the increasing acceptance of the fact that real creative production needs both divergent thinking and convergent thinking, and not just the former.

2.1 Divergent thinking

The secret to creating new ideas is to separate your divergent thinking from your convergent thinking. This means generating lots and lots of options before you evaluate them. Such brainstorming techniques are used during divergent thinking. Both Osborn and Parnes note the importance of removing the barriers to divergent thinking in their book (*Visionizing*). They suggest that adverse criticism is taboo, free-wheeling is desirable, quantity breeds quality, and combinations and improvement are sought. (*Creative education Foundation*)

The term “divergent thinking” refers to that strategy of solving problems characterized by the proposal of a multiplicity of possible solutions in an attempt to determine the one that works. It usually happens in a free-flowing,

spontaneous manner, where multiple creative ideas are engendered and evaluated. A manifold number of potential solutions are studied in a brief span of time, and unconventional connections may be drawn. Once the stage of divergent thinking is complete, information and ideas are structured and organized using convergent thinking. Brainstorming and free writing are two processes that involve divergent thinking.

Divergence is typically signified by the capacity to produce many, or a greater number of complicated or complex ideas from a single idea or simple triggers or ideas. It calls for making unexpected combinations, changing information into unanticipated forms, identifying connections among remote associates, and the like. In divergent thinking, a single question returns multiple answers, and though the answers vary considerably depending on the person, all answers are of equal value. Perhaps they did not exist ever before and so are novel, surprising or unusual. At times, this is true purely for the specific setting or in the experience of the person responsible for the variability in question. However, it may also be the case in an absolute sense.

Described below are eight elements of divergent thinking⁴:

Complexity – The capacity to conceptualize difficult, multifaceted, many layered or intricate products or ideas;

Curiosity – The personality characteristic of displaying probing behaviors, searching, asking questions, learning to get more knowledge/information about something, and of being able to go deeper into ideas;

Elaboration – The skill of adding to, building off of or embellishing a product or an idea;

Flexibility – The capability of creating varied perceptions or categories wherefrom come a range of different ideas pertaining to the same thing or problem;

Fluency – The skill of engendering many ideas so as to have an increase in the number of potential solutions or associated products;

⁴ Treffinger, Donald & Isaksen, Scott & Dorval, K. (1982). *Creative Problem Solving .A Contemporary Framework for Managing Change.*

Imagination – The capability of dreaming up, inventing, or to think, to see, to conceptualize novel products or ideas, to be original;

Originality – The skill of coming up with fresh, unusual, unique, extremely different or completely new products or ideas;

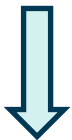
Risk-taking – The readiness to be courageous, daring, adventuresome – take risks or experiment with new things so as to stand apart.

Divergent thinking has been detected in people with personality characteristics such as these – curiosity, nonconformity, persistence and readiness to take risks.

Bubble mapping, creating artwork, maintaining a journal, subject mapping, devoting some time to meditation and thinking, and building lists of questions are all examples of activities that trigger divergent thinking. (*Idea Generation: Divergent vs. Convergent Thinking*)

Guidelines for Divergent thinking

Defer Judgment – Deferring judgment isn't the same as having no judgment. It just says "hold off for a while". Avoid judging ideas as either bad or good in the divergent-thinking phase.



Combine and Build – Use one idea as a springboard for another. Build, combine, and improve ideas.



Seek Wild Ideas – Stretch to create wild ideas. While these may not work directly, getting way outside the box allows the space to discover extraordinary ideas.



Go for Quantity – Take the time necessary and use the tools in this guide to generate a long list of potential options.

To make it easier to generate a long list, set a concrete goal such as at least 50 ideas in seven minutes for groups or 30 ideas in 7 minutes if solo

before going to the next step. This sharpens focus and prompts the changes the brain needs to get moving. It also supports “deferring judgment.” (*Creative education Foundation*)

2.2. Convergent Thinking

Convergent thinking is a problem-solving technique involving the bringing together different ideas from different participants or fields to determine a single best solution to a lucidly defined problem. In other words, this is a kind of thinking that concentrates on finding out the single best or frequently, correct solution to a problem or answer to a question. The credit for coining the term “convergent thinking” goes to Joy Paul Guilford. He came up with the term as an opposite term to “divergent thinking.” The focus for this thinking strategy is speed, logic and accuracy and on identifying the known, reapplying techniques, and amassing stored information. This strategy is best suited for situations characterized by a readily available answer that just has to be worked out or recalled by way of decision-making strategies. A vital facet of convergent thinking is that it culminates in one best answer, meaning there is no chance for ambiguity. You either have a right answer or a wrong one. This type of thinking is also associated with knowledge (one of the key facets of creativity) as it entails using existing knowledge by way of standard procedures.

Standard IQ tests measure convergent thinking. Logic thought flow, pattern recognition, the capacity to solve problems and testing knowledge can all be evaluated and graded in these tests. Standardized multiple choice questions are also an example of testing convergent thinking. (*Idea Generation: Divergent vs. Convergent Thinking*)

At certain points in the creative process, thinking and focus needs to shift. To select the best of our divergent options, determine their potential value. In the **Convergent Thinking** process, choice is deliberate and conscious. Criteria are purposefully applied as we screen, select, evaluate, and refine the options, all the while knowing that raw ideas still need development. (*Creative education Foundation*)

Scott Isaksen, PhD and Don Treffinger, PhD proposed convergent thinking guidelines in *Creative Problem Solving, the Basic Course* (1982).

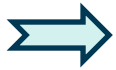
Use the guidelines that follow when it’s time to make decisions about the ideas generated by divergent thinking.

Guidelines for Convergent Thinking

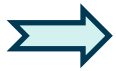
Be Deliberate – Allow decision-making the time and respect it requires. Avoid snap decisions or harsh judgments. Give every option a fair chance.



Check Your Objectives – Verify choices against your objectives in each step. This is a reality check – are the choices on track?



Improve Your Ideas – Not all ideas are workable solutions. Even promising ideas must be honed and strengthened. Take the time to improve your ideas.



Be Affirmative – Even in convergence, it's important to first consider what's good about an idea and judge for the purpose of improving, rather than eliminating, ideas.



Consider Novelty – Do not dismiss novel or original ideas. Consider ways to tailor, rework, or tame. (*Creative education Foundation*)

2.3. Divergent VS Convergent Thinking

According to Anne Manning (2017)⁵, constructor of Creative Thinking: Innovative Solutions to Complex Challenges, everybody is capable of both convergent and divergent thinking, depending on the situation. However, it's natural to lean more toward one or the other when approaching problems and projects. Manning (2007)⁶ distinguishes between two categories of people. Those who have a preference for divergent thinking and love to come up with new ideas and those who are most useful when solving daunting, complex challenges because they are more likely to articulate ideas that are new and useful.

The real issue that she is pointing out lies in becoming too reliant on one method of thinking. According to Manning too much divergent thinking can lead to endless

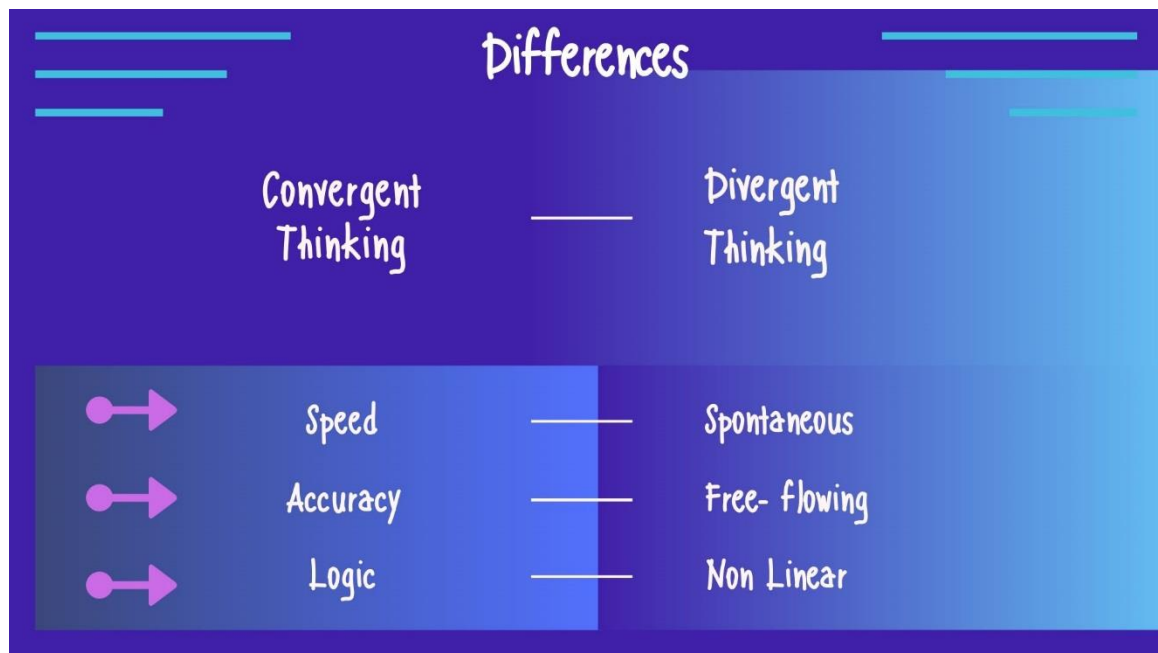


⁵ Praveen Shrestha.(2017). "Convergent Vs Divergent Thinking," in Psychestudy, November 17, 2017, <https://www.psychestudy.com/cognitive/thinking/convergent-vs-divergent>.

⁶ Manning, Anne. (2007). "The Impact of Creative Process on the Development of a New Assessment Tool for Innovation: A Case Study." . Creative Studies Graduate Student Master's Projects. Paper 100

ideation and no solutions while too much convergent thinking can lead to no new ideas and ‘analysis paralysis’”

Convergent and Divergent thinking are like two sides of a coin. They are completely in contrast with each other yet extremely important in our daily lives. It is not a must for one to always be in conjunction with another but they tend to function best when used in conjunction.



As we already mentioned above the process of figuring out a concrete solution to any problem is called convergent thinking and it’s a straight forward process that focuses on figuring out the most effective answer to a problem. In contrast, divergent is the process of thinking that explores multiple possible solutions in order to generate creative ideas that refers to opening the mind in various directions and trying out multiple solution for a problem, mostly thinking outside of the box.

Methods involved in convergent thinking also involve recognizing the previously tried out techniques and reapplying them along with the readily stored information while divergent thinking relates to figuring out new procedures to solve a problem despite existing and “traditional” solutions.

In Mathematics, convergent refers to approaching a definite limit in a series. Divergent thinking generates its name from the idea that there are limitless number of solutions for any given problem, however unrelated they might be, which are then spread on the table to pick out the best one. Convergent thinking helps to find out the best possible answer to any problem, which are accurate most of the time, and no room for ambiguity is left while Divergent thinking keeps the options open, a completely accurate answer isn't identified. The answer procured by convergent thinking is either completely right or 100% wrong, which might not always be the best possible way to go about. Convergent thinking only considers the world as Black and/or White, with no other possibilities. At the same time a divergent thinker keeps the options open, the world isn't always Black and/or White. Divergent thinker isn't always able to pin-point the right answer. For instance, in a standardized aptitude test, a convergent thinker might be able to decide the right answer, but the contemplating mind of a divergent thinker might work against him in the situation. On contrast, a convergent thinker is exactly what the circumstances demand in various situations, such as standardized tests.



In theory, convergent and divergent thinking are two completely different aspects of thinking. However, they hold more in common than one might realize. Although they are completely different in terms of the basic meaning of the terms and how they work, the major purpose is the same. Both these thinking processes are implemented in order to explore creativity and find solutions to different problems.

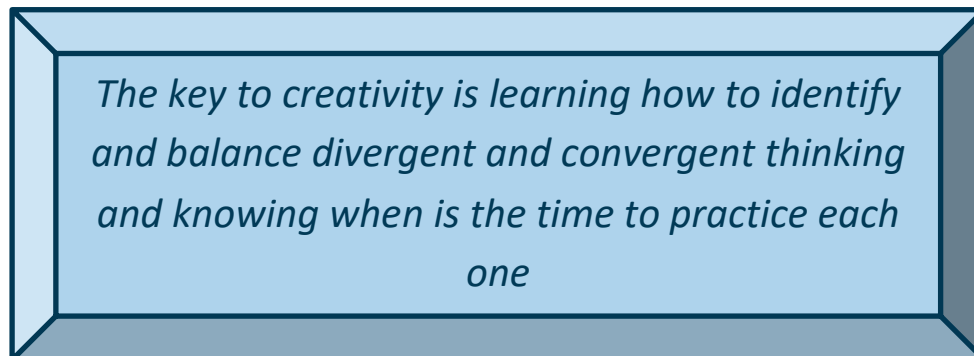
These processes tend to work best when applied **in conjunction**. Divergent



thinking takes place in a free-flowing, spontaneous manner and creates varieties of possible resolutions to another problem. If convergent thinking is applied then after, the very best answer can be picked out from the multiple solutions resulted due to divergent thinking. In this manner, they are

correlated. (Praveen Shrestha, 2017)⁵.

To sum up:



CHAPTER 3: CPS IMPLEMENTATION

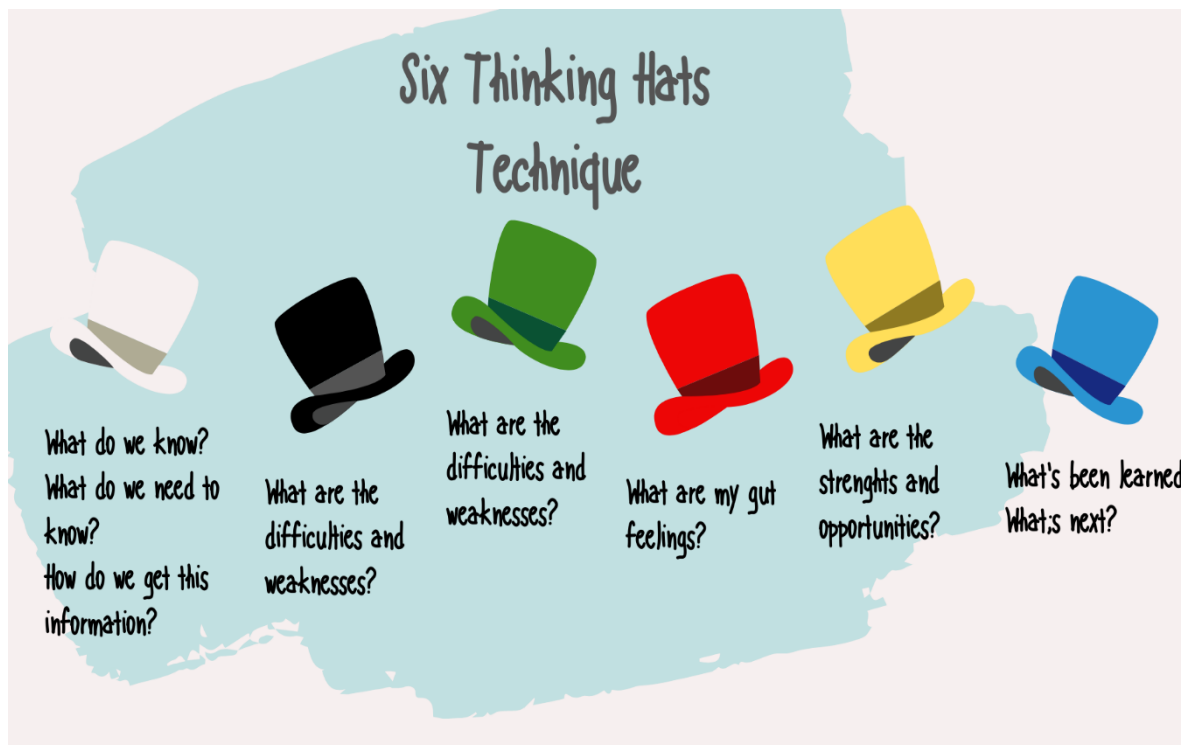
“Every problem has in it the seeds of its own solution. If you don’t have any problems, you don’t get any seeds.”

Norman Vincent Peale

Practical Solutions and tips

3.1 The Six Thinking Hats

The Six Thinking Hats is a widely used and known tool to solve many different Creative Challenges and to promote creativity and teamwork.



The technique was initiated by Dr Edward Bono (1992)⁷ who was widely known as the father of modern creative thinking and has pioneered numerous practical thinking tools, used in schools and businesses internationally. It helps individuals and groups adopt a variety of perspectives, broadening their thinking and potentially encouraging fresh solutions.

This technique is a really powerful one for looking at decision making from different points of view. It allows emotion and skepticism to be brought into what might normally be a purely rational process and it opens up the opportunity for creativity within decision making. Decisions made using the Six Thinking Hats technique can be sounder and more resilient than would otherwise be the case. It can also help you to avoid possible pitfalls before you have committed to a decision.

Description:

Each hat is assigned a different color and refers to a different thinking approach. An individual or a group “wears” each hat in turn, fully exploring the mode of thinking it represents. Then they switch to the next.

⁷De Bono, E. (1992). Six Thinking Hats for Schools: Book 3. Cheltenham, Victoria: Hawker Brownlow Education.

In a group, each person wears the same hat at the same time, to encourage collaboration and minimize conflict.

You can use Six Thinking Hats in meetings or on your own. In meetings, it has the benefit of preventing any confrontation that may happen when people with different thinking styles discuss a problem, because every perspective is valid.

Watch the description video [here](#).



Source: MindToolsVideos (2019) Retrieved from https://www.youtube.com/watch?v=QUVT66n-Vc4&feature=emb_logo

White Hat: with this thinking hat, you focus on the available data. Look at the information that you have, analyze past trends, and see what you can learn from it. Look for gaps in your knowledge, and try to either fill them or take account of them.

Red Hat: "wearing" the Red Hat, you look at problems using your intuition, gut reaction, and emotion. Also, think how others could react emotionally. Try to understand the responses of people who do not fully know your reasoning.

Black Hat: using Black Hat thinking, look at a decision's potentially negative outcomes. Look at it cautiously and defensively. Try to see why it might not work. This is important because it highlights the weak points in a plan. It allows you to eliminate them, alter them, or prepare contingency plans to counter them Black Hat thinking helps to make your plans "tougher" and more resilient. It can also help you to spot fatal flaws and risks before you embark on a course of action. It's one of the real benefits of this model, as many successful people get so used to thinking positively that they often cannot see problems in advance. This leaves them under-prepared for difficulties.

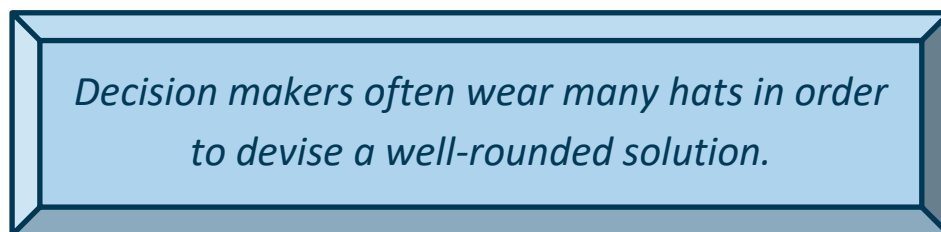
Yellow Hat: this hat helps you to think positively. It is the optimistic viewpoint that helps you to see all the benefits of the decision and the value in it. Yellow Hat thinking helps you to keep going when everything looks gloomy and difficult.

Green Hat: The Green Hat represents creativity. This is where you develop creative solutions to a problem. It is a freewheeling way of thinking, in which there is little criticism of ideas. (You can explore a range of creativity tools to help you)

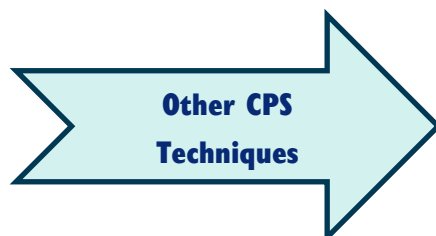
Blue Hat: this hat represents process control. It's the hat worn by people chairing meetings, for example. When facing difficulties because ideas are running dry, they may direct activity into Green Hat thinking. When contingency plans are needed, they will ask for Black Hat thinking.

The six hats divide neatly into pairs. The white hat is about information, while the red hat is about emotions. The black hat is negative, while the yellow hat is positive. The green hat encourages creativity, while the blue hat focuses on process. It's worth noting that the black hat and the yellow hat are broadly equivalent to the red team and the green team in the Red Team, Green Team exercise. (Zach Obront, Use the Six Thinking Hats to Solve Your Next Creative Challenge)

REMEMBER:



3.2 More techniques



1. Synectics

Synectics is usually classified as a Creative Problem-Solving (CPS) Technique along with Brainstorming and Lateral Thinking. This Problem-Solving methodology inspires thought processes that the subject might not be aware of. The credit for developing the technique that had its beginnings in the 1950s in the Arthur D. Little Invention Design Unit goes to George M. Prince and William J.J. Gordon.

The process was gathered from tape recorded (starting with audio with video coming later) meetings, assessment of the outcomes, and experiments with other methods of coping with the barriers to achievements, in the meeting.

The term “Synectics” has its origins from the Greek language and means the combining of different and supposedly irrelevant elements. Though Synectics is a trademarked name, it has turned into a standard word for delineating Creative Problem Solving that takes place in groups. This idea generation technique approaches problem solving and creativity in a rational manner.

In Gordon’s opinion, Synectics research has to do with three key assumptions:

- ✓ It is possible to describe and teach the creative process
- ✓ Invention processes in science and arts are analogous and propelled by the same “psychic” processes
- ✓ Creativity at the level of individual and group is analogous.

In short, if people comprehend the working of creativity, they can improve their ability to be creative.

2. TRIZ methodology

TRIZ (or TIPS – Theory of Inventive Problem Solving) was created by Genrich Altshuller and his coworkers. It is a Russian method of problem solving. This strategy is meant to cultivate the creation of patentable inventions. However, the technique is also helpful for developing non-product solutions.

In the beginning, following the invention of bulletproof glass, a trade off happened. Though the glass would prevent the bullet from entering, the former would crack to such an extent that the vision of the pilot or driver behind the glass would be obscured. TRIZ has a considerable list of principles for settling tradeoffs. In this particular case, the pertinent principle was segmentation for which the solution was to create a huge pane of glass from smaller panes. This was to ensure that the cracks were limited to the one small pane. If you are capable of articulating your trade off, the chances are high that TRIZ has methods to triumph over it that have proved successful with respect to other problems.

3. Brainstorming

Brainstorming is an individual or group activity by which attempts are made to determine a conclusion for a particular problem by collecting a list of ideas that its members spontaneously contributed. Alex Faickney Osborn popularized the term in Applied Imagination, a 1953 book. Take a look at the video below⁸:

⁸ MindTools Videos https://www.youtube.com/watch?v=V-uDOier1RQ&feature=emb_logo



Retrieved from MindTools Videos https://www.youtube.com/watch?v=V-uDOier1RQ&feature=emb_logo

*To get the most out of your individual **brainstorming** session, choose a comfortable place to sit and think. Minimize distractions so that you can focus on the problem at hand!*

Tip 1

Tip 2

***Brainstorming** needs to be done correctly for it to be successful! Start your problem solving in a structured, analytical way, so you know you've considered the essentials. Only then move on to brainstorming.*

4. Mind mapping

This creativity technique both reframes the situation and cultivates creativity. A mind map is a representation of concepts and ideas in a graphical manner. This visual thinking tool assists with structuring information, assisting with better analysis, synthesis, comprehension, recall and engendering of new ideas. The power of the mind map is traceable to its simplicity.

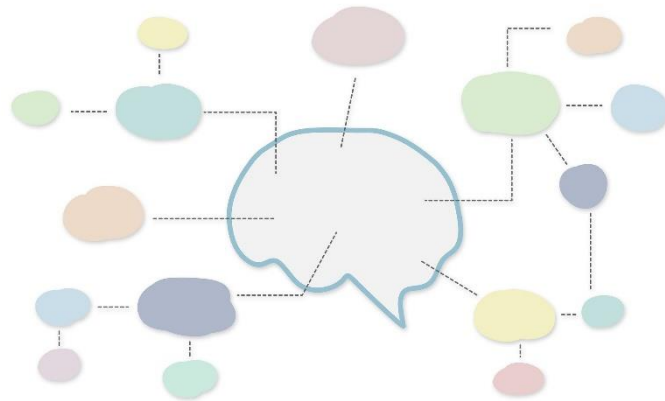


image: pixabay.com - <https://pixabay.com/en>



Step 1: Think of your general main theme and write that down in the center of the page. i.e. Food

Step 2: Figure out sub-themes of your main concept and draw branches to them from the center, beginning to look like a spider web i.e. Meats, Dairy, Breads

Step 3: Make sure to use very short phrases or even single words

Step 4: Add images to invoke thought or get the message across better

Step 5: Try to think of at least two main points for each sub-theme you created and create branches out to those

5. Reversal of problem

This approach is about coming up with ideas to solve problems by way of a different/opposite perspective (turning it around: upside-down, inside-out or back to front).

6. Look beyond something's common function

Split an object into all its individual parts. If you have a description suggesting a function (just like the function of a prong is transporting electricity), describe it in a more generic manner by way of shape, size and the make-up of the material (such as rectangular, flat, small piece of metal). If you call an item an electric plug's prong, the description may conceal the fact that the item could also turn into a screwdriver if required.

Here's an example of looking beyond a thing's common function: Imagine that the passengers of the luxury liner Titanic had considered the iceberg to

be a huge floating surface instead of an object that hits ships. If they had thought so, perhaps many lives could have been saved by using the ship as a lifeboat because the iceberg would not sink.

7. Lateral thinking

Lateral thinking is a manner of thinking that looks for a solution to an obstinate issue through unorthodox elements or methods that would usually be disregarded by logical thinking. To be more precise, “lateral thinking” may be defined as a way to solve problems by a creative or indirect approach, utilizing reasoning that may not be obvious straight away or incorporating ideas that cannot be gathered by utilizing only conventional step-by-step logic. The term was coined by Edward de Bono, a foremost creativity practitioner, in 1967. De Bono created two different models pertaining to creativity thinking namely “parallel thinking” and lateral thinking. The creativity practitioner created the two models over many years with “Mechanism of the Mind” – his book, coming out in print in 1969.

Parallel thinking has to do with pondering over an issue in a single state of mind at a time as against confusing ourselves by attempting to process several issues differently in a single go. Coming back to lateral thinking, the concept makes you realize that coming up with breakthrough ideas doesn’t necessarily have to spring from a shotgun effort or luck. The method provides a systematic and most importantly, deliberate process for which the outcome is innovative thinking.

Creative thinking is no talent but rather, a learnable skill. It empowers those who adopt it by strengthening their natural abilities, which enhances innovation and creativity, which in turn leads to a boost in efficiency and profit.

Challenge, alternatives, and provocation and movement are three examples of lateral thinking techniques.

8. SCAMPER

SCAMPER⁹ refers to a series of thought sparkers or provocations which help you to innovate on an existing product, service or situation by looking through different lenses. There are seven provocation lenses in the SCAMPER method:

S = Substitute

C = Combine

A = Adapt

⁹ <https://www.interaction-design.org/literature/article/learn-how-to-use-the-best-ideation-methods-scamper>

M = Magnify

P = Put to Other Uses

E = Eliminate (alternative is Minify)

R = Rearrange (alternative is Reverse)

How to use?

To utilize the SCAMPER technique, start by stating the problem you wish to solve or the thought you wish to develop. This thought/idea can be anything: a product, process or service you wish to improve, a challenge in business, or other problem. Once you have identified the challenge, you need to come up with questions. Utilize the SCAMPER checklist for guidance.

Here's a sample:

S: What to substitute in my process of selling?

C: How do I blend selling with other activities?

A: What to copy or adapt the selling process of another person or company?

M: What do I put more weight on or magnify when selling?

P: What other uses can I put my selling to?

E: What do I eliminate or make easier in my process of selling?

R: How do I change, reverse or reorder my manner of selling?

With the help of these questions, you are pushed to a different viewpoint with respect to your problem and ultimately come up with original solutions.

Whether at business or in your personal life, Creative Problem Solving can help you see aspects and solutions that you may never have realized when you only permitted your mind to move the conventional path. So, embrace it!

TOOL: <https://www.cleverism.com/what-is-creative-problem-solving/>¹⁰

¹⁰ <https://www.cleverism.com/what-is-creative-problem-solving/>

CHAPTER 4: RESEARCH ALL OVER EUROPE

“Problems are not stop signs; they are guidelines.”

Robert H. Shuller

CONTEXT - CASE STUDIES – BEST PRACTICES

4.1 Greece

Research in Europe - Context

Research and National context in the partner organization countries regarding the current situation about the Creative Problem-Solving methodologies and policies in education and in particular in the Vocational Education and Training field.



in a wider framework and adapted by many educational actors.

OECD, the Organization for Economic Co-operation and Development, aiming at the promotion of policies that will improve

radically the socio-economic well-being of the people around the world, run a programme named PISA¹¹.

PISA (PROGRAMME FOR International Students Assessment) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of a sample consisting of 15-year-old students coming from many different countries around the world.

In PISA programme and more specifically the PISA year 2012, the survey was focused on the best way to measure the Creative Problem-Solving Student's skills in tackling real problems that may come up in everyone's lives. The survey tested the student's performance in creative problem solving, which measured their capacity to respond to non-routine situations on order to achieve their potential as constructive and reflective citizens. It provided the rationality for assessing problem-solving skills and describes performance within across the 44 countries and economies that took part in the assessment.

The results regarding Greek context pointed out that there were not any valid data in the number of students examined for their creative problem skills nor in the number of students that were sampled for the assessment of problem solving or were administered the assessment of problem solving. (OECD, PISA 2012 RESULTS: Creative Problem Solving, STUDENTS SKILLS IN TACKLING REAL-LIFE PROBLEMS, VOLUME V)

Case study

THE CLIENT:

Fast-moving consumer goods industry

THE NEED:

Creative problem solving

SEVEN SIGMA INNOVATION¹² is an innovation consulting firm based in Athens, Greece, focused on helping our clients envision and build the future, instead of being overrun by it. Their consulting network expands across the globe in the fields of

¹¹ PISA 2012 Results: Creative Problem Solving: Students' skills in tackling real-life problems (Volume V) (2012) Retrieved from <https://www.oecd.org/education/pisa-2012-results-volume-v.htm>

¹² <https://sevensigma.gr/Creative-problem-solving.html>

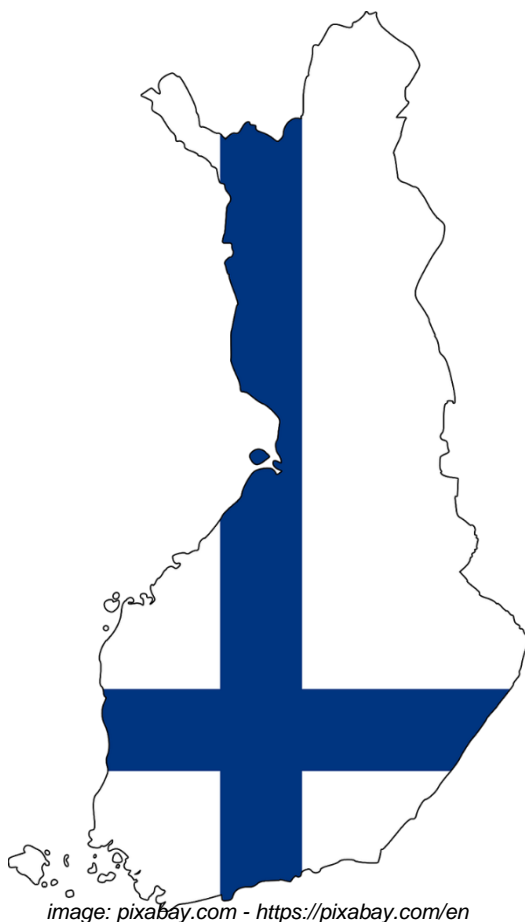
creativity, inventive problem solving and change management. They work with a large number of academic and research institutes –operating across a wide spectrum of domains– that can contribute their knowledge to addressing your challenges. Aiming to hone the brainstorming skills of their client’s project groups and accelerate their ability to solve problems creatively, they are organizing training workshops that are focused on the utilization of TRIZ methodology to facilitate ideation, enhance patent analysis and patent design-around, and ultimately spark innovation.

TRIZ is a problem solving, analysis and forecasting tool that relies on the study of the patterns of problems and solutions, not on the spontaneous and intuitive creativity of individuals or groups. TRIZ has been developed by over 1500 person-years of research and the study of over two million of the world’s most successful patents, indicating that all innovations emerge from a small number of inventive principles and strategies.

RISE and Seven Sigma are **TRIZ-certified organizations** delivering TRIZ masterclasses and technology transfer workshops.

4.2 Finland

National policies and context



According to the 2012 OECD’s Programme for International Students Assessment (PISA) comparing the relative performances in problem solving in 43 different countries (OECD, 2014), Finland scored 523 points and is ranked as the 1st European country and 10th in the global ranking.

In Finland, the reform in Vocational Education and Training (VET) we are referring to in the IO2 Work-Based Learning has changed the way how students create their personal study path. Instead of specialising in specific occupational tasks, the students are encouraged to study more general, multidisciplinary subjects. This rhetoric comes from the working life changes, where routine tasks are taken over by automation and digitalisation, and human workforce is needed for more expert and complex tasks.

Because of this change, social and mathematical competences

are required from the graduates, as they need to be mobile and adaptable to different contexts. Key skills to acquire are communication skills, ability to use information and communication technologies, digital literacy, critical thinking, creativity and problem-solving skills.

VET training has by nature a more balanced way to prepare students to existing needs of the labour market and to equip the graduates with skills for lifelong and continuous learning. When looking closer to desired graduate attributes, students are expected to have strong cognitive skills and social skills. In addition, skills for self-understanding and self-regulation have become more and more important, as they are connected to motivation, time, resource management and self-assessment.

According to national reports in education, several studies indicate that social skills, creativity and problem-solving skills will become ever more important in the working life. In Finland, graduates in higher education are reported to have good capacity in the mentioned skills in general, with the exception of graduates in technology. In VET, the skills mismatch of graduates entering the labour market is more severe when compared to workers with higher education. The expectations for VET graduates call for a better command of management and leadership skills, customer service, sales skills and innovation in order to better collaborate with the graduates from higher education at the workplace.

The reform on VET has given the educational institutions more freedom to organize the trainings to meet the local needs, but has put more emphasis on quantitative indicators, e.g. amount of degrees and parts of degrees achieved in the institution, graduate employability and enrolment to further education.

Based on research in work-oriented and project-based learning in VET, creative problem solving is best achieved when students are engaged in cooperative learning. Students experience shared responsibility to complete the project and during the process, they develop and use creative problem solving in making decisions on how to manage the different stages of project work. The sense of community from the experience facilitates creative problem solving. Project learning can be seen as a mean to develop students' socio-emotional skills by working in a group, developing self-regulation and emotional skills in both work-related and open contexts.

Case-study 1.

Title: The Epic Program

In the Epic Program student teams develop new, innovative solutions to practical challenges by using tools and methods of team-based production development adopted from NASA, the National Aeronautics and Space Administration of the USA. The usability of the solutions and concepts are tested, evaluated and further developed with various methods and using experimentation and prototyping. The origins of the program are based on a collaboration between a

Finnish company and the NASA for creating a learning platform for the space administration. Also, in the coming years a large percentage of the whole aerospace industry's workforce of engineers and scientists will be retiring creating a challenge in the industry where much of the resources is focused around human capital. One of the main concerns at NASA is the ability to attract the best and brightest graduating engineers and scientists to work at NASA. In order to create global interest in space and STEM subjects, NASA initiated the Epic Challenge program, running since 2015. The students have developed hundreds of different concepts for NASA. In addition, eight student teams have received external funding for further development of these concepts.

The Program is a collaboration between the Riveria College, North Carelia Education Consortium, University of Eastern Finland, Karelia University of Applied Sciences, the Teacher Training School in Joensuu, Valamis (a Finnish company) and the NASA. Cooperation between different educational institutions secures a smooth flow from one educational sector from the other. Local companies are involved in the Program to provide the students practical challenges and to sponsor the activities. Internationality is present in the Program not only through the international collaboration, but also via the student body as the challenge attracts also international students. As the students work digitally through the Learning Experience Platform developed by Valamis, it allows them to form teams regardless of location, to build on each other's strengths, and to exchange knowledge simultaneously in different parts of the world.

For the students the Epic Program gives an opportunity to develop new concepts and prototypes and for the winning team, even to travel to Houston, the headquarters of NASA. For teachers, the program offers upskilling on methods for innovation. The companies in the region benefit from new concepts and solutions when developing their business models.

The practical challenges for creative problem solving have included e.g. use of an empty space in a housing building for student entrepreneurship among international students. The teams are facilitated by local experts and the companies in the region. After a training, the innovation processes rely on self-directed teams and collaborative learning. Student teams report their solutions and prototypes in Showrooms at the end of the semester.

The Program was given a reward in 2018 by the Federation of Finnish Enterprises for an accomplishment in developing new models for entrepreneurship education and finding solutions for global challenges.

Sources: <https://www.valamis.com/company/news/finnish-students-and-the-nasa-epic-challenge-invite-companies-to-join-them-in-creative-problem-solving>

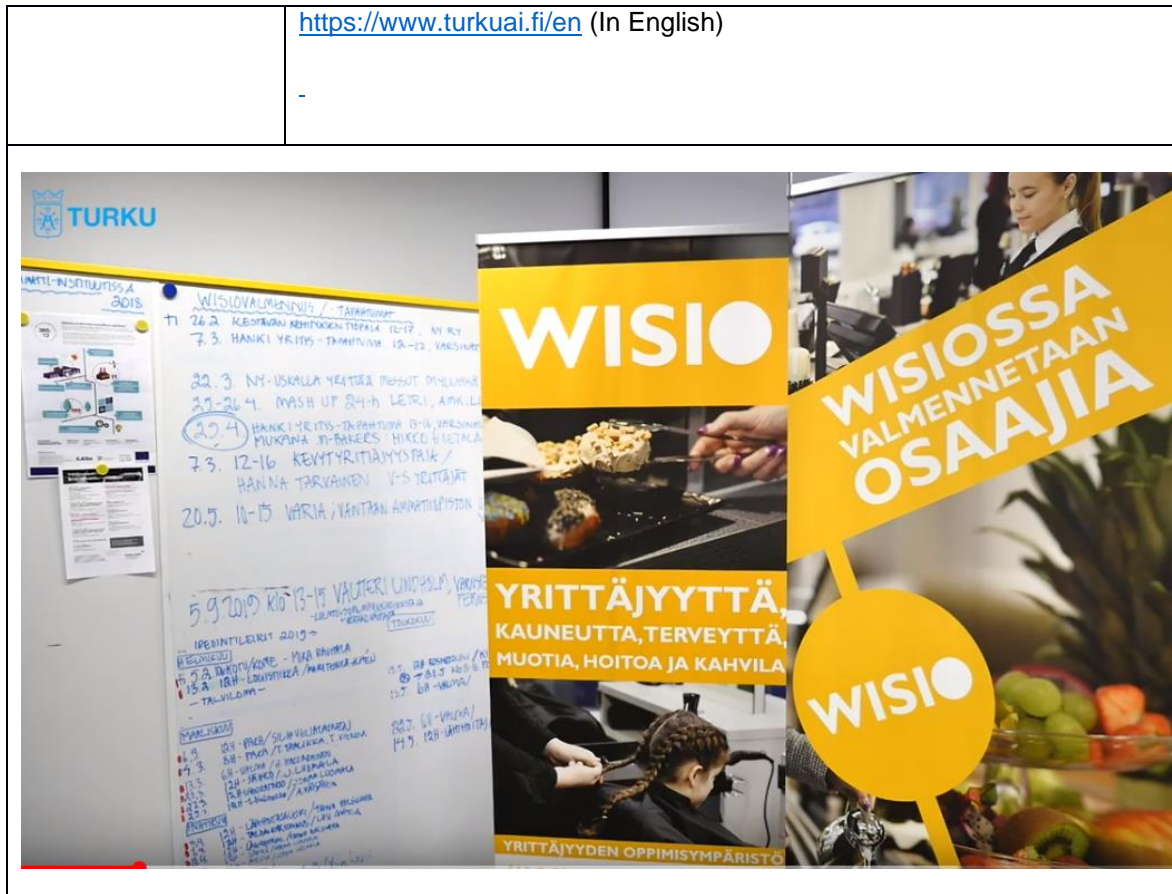
InnovatiVET E+ project n. 2017-1-DK01-KA202-034250 IO3 - Creative Problem Solving and Design Thinking

Criteria	CPS	Yes, how	No, how
Contributes to a VET teacher's continuing professional development plan	x	Techniques of open innovation, project-based and problem-based learning are applicable to VET. Multi-disciplinary approach benefits to teacher collaboration cross boundaries in the curricula.	
Is supporting development of divergent thinking skills	x	The challenges range from very open-ended problems to very practical, working-life oriented and organization-specific problems.	
Is supporting development of lateral thinking skills	x	Students are encouraged for self-regulated learning, both individually and in teams. The methods used structure learning and thinking skills.	
Is supporting development of creative skills	x	The nature of the challenge is designed for creative problem solving and thinking out-of-the box. Space exploration widens the horizon of problem solving and helps to loosen rigid barriers of what is possible and what is needed.	
Is supporting employability of students	x	Students are encouraged for self-employment. The Epic Challenge is embedded to the studies in entrepreneurship in all the participating educational institutions.	
Is supporting development of DT toolkits for teachers	x	Teachers in the educational institutions participating in the program receive further training in innovation methods, design thinking and creative problem solving.	
Is developing industrial currency of teachers and working-life relevancy of education	x	Collaboration with industries is vital, because program is based on a sponsoring model.	
Has an element of innovation relevant to teachers	x	National curricula encourage teachers to engage with innovation and development, and they are able to integrate the projects in the curricula through entrepreneurship course modules.	
Has proof of teacher & employer co-design	x	The challenges come from the local businesses and work organizations, and the stakeholders are involved in the Showrooms when students report their new concepts and solutions.	

Table 1. CPS in Finland

Case-study 2.

Country:	Finland (FI)
Category:	Creative Problem Solving
Title of Best Practise:	Multi-use learning environment
Organization name:	Turku Vocational Institute (TAI)
Description of the best practise	<p>Turku Vocational Institute is one of the largest upper secondary vocational schools in Finland. The Institute has created a multi-purpose learning environment to facilitate learning entrepreneurship as a cross-disciplinary topic.</p> <p>The WISIO learning environment is designed to be a flexible space in order to cater for a range of different user groups and purposes. Students take part in 12-hour challenge camps and can try out their concepts with real customers. Furniture can easily be grouped for all kinds of purposes and the space can be divided for meetings or for customer service.</p>
Aim/s of the best practise in relation to VET:	<p>Student ideation and idea exploration is an integral part of learning and teaching entrepreneurship.</p> <p>In the WISIO learning space students are able to join 12-hour camps for creative problem solving of working life oriented challenges. The multi-purpose learning space can easily be transformed to meeting rooms to simulate working in teams or to serve customers. Students can try out their concepts with real customers passing by using the space or in the venues designated for customer service.</p> <p>In the near proximity of the space there are other venues where students can practice work tasks in professional contexts: a cafeteria, a tailoring shop, a beauty salon, and a room for organizing activities for children and elderly people.</p> <p>Entrepreneurship is one of the cross-cutting topics of the curricula in the Institute and a designated teacher for entrepreneurship studies is hosting the use of the space and organizes several events and meetings during the day.</p>
Further reading/Direct Links to Best Practise: <i>(website, books, journals, articles)</i>	<p>WISIO learning space:</p> <p>http://www.turku.fi/toimipaikat/wisio (In Finnish)</p> <p>https://www.youtube.com/watch?v=dz9RuH8aDjA#action=share (With English subtitles)</p> <p>Turku Vocational Institute:</p>



Criteria	CPS	Yes, how	No, how
Contributes to a VET teacher's continuing professional development plan	x	The flexibility of the space allows teachers to instigate change to ensure relevant knowledge, practices and challenges to stay up-to-date. Teachers can experience new teaching methods and develop their competences	
Is supporting development of divergent thinking skills	x	The modularity promotes modern learning methods in a changing environment which can help facilitate creative ideas by exploring a multitude of possible solutions Student ideation through the camp supports the development of divergent thinking	
Is supporting development of lateral thinking skills	x	Innovation camps organised within the premises indicate that ideas are generated based on change and current ways of thinking. Students are encouraged to find their own solutions to problems encountered,	

		<p>engaging creative and lateral thinking faculties</p> <p>Interaction with customers brings relevancy and increase lateral thinking</p>	
Is supporting development of creative skills	x	<p>Students interacting with customers need to adapt to unpredictable situations which foster creativity. Also, by participating in the innovation camps, students need to suggest new and innovative solutions which support the development of creative solutions</p>	
Is supporting employability of students	x	<p>Students running their own business for a short period of time are more aware of the different aspect of running a business, increasing their adaptability to the job market and supporting their employability</p> <p>Through the camps, students are more aware of the challenges the society is facing and acquire relevant skills</p>	
Is supporting development of DT toolkits for teachers	x	<p>Through the camp, the students must imagine the challenge from multiple perspectives and take into consideration the point of views of their team members, using integrative thinking as well as experimentalism</p>	
Is developing industrial currency of teachers and working-life relevancy of education	x	<p>The working-life relevancy of the education is strengthened by proposing relevant challenges to be faced, as well as for students to be put in real-life situations</p>	<p>Naturally it necessitates teachers to map the necessary development of their industrial currency in order to be able to teach the relevant courses. This does not ascertain that the industrial currency is actually developed.</p>
Has an element of innovation relevant to teachers	x	<p>The camp must be innovative by nature</p>	<p>The businesses run by the students do not need to be innovative, nor their behaviour or way of running it</p>
Has proof of teacher & employer co-design	x	<p>The innovation camp is based on company's needs and require teacher/employer collaboration. Regarding the businesses run in the space, teachers might need to</p>	

		cooperate with other businesses and customers	
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Table 2. CPS in Finland

4.3 Italy

Defining the Italian scenario regarding the "Problem solving" methodology, the study "Enhance the logical-linguistic and logical-mathematical problem-solving skills in middle secondary school was used as the main reference. Adaptation and validation of the short version of Creative Personality Test "(TCD-As) in Italy"¹³.

This research explores how students' ability to solve problematic situations can be developed (Wiggins, 1998; Lumbelli, 2009; Biasi, 2010; Boonen et al., 2013) in relation to the logical-linguistic and logical-mathematical disciplinary areas through valorization of their creative dimension.



image: pixabay.com - <https://pixabay.com/en>

As amply highlighted in the European reference framework and in the "National Indications for the Curriculum", the Italian school is called to propose «situations and contexts in which pupils reflect to understand the world and themselves, [...] find stimuli to develop the analytical and critical thinking, they learn to learn, they cultivate fantasy and original thought "(MIUR, 2012, p.24).

¹³ <https://docplayer.it/122917164-Giornale-italiano-della-ricerca-educativa-italian-journal-of-educational-research.html>

The research is the result of the joint work of the four authors, in particular paragraphs 1 and 4 were written by G. Moretti; paragraphs 2 and 3.2 by V. Biasi; paragraph 3.1 by A. Morini; paragraph 3.3 da A. Giuliani.

Other key competences include the ability to understand different types of texts and the ability to solve problematic situations, functional abilities especially for making decisions and knowing how to find effective solutions to solve problems.

Identifying strategies aimed at encouraging students' development of the ability to solve problematic situations is undoubtedly one topic of broad scientific interest (Wiggins, 1998; Biasi, 2010; Boonen et al., 2013; Asquini, 2016). As Lumbelli (2009) states, it is necessary to offer students the opportunity to deal with situations that can help to develop problem solving skills understood as a capacity for reflection, self-evaluation and self-control.

Integrating teaching with evaluation strategies and tools that make use of problematic situations pertaining to everyday life allows the implementation and enhancement of knowledge and skills possessed and helps to develop the ability to make use of what has been acquired both in formal and informal contexts.

Gariboldi and Cardarello (2016) also underline the importance of using teaching strategies and methodologies that involve students in active, reflective and situated learning processes. Such an educational organization requires a cultural transformation by all the actors involved in the school system. Antonietti and Molteni (2014) also reflect on the importance of enhancing in the educational and school contexts, models and tools capable of promoting creativity as a resource in relation to the artistic-musical, scientific, logical-mathematical and logical-linguistic disciplines

In this direction, the scientific community is reflecting on how developing tools that can detect and promote students' competence in solving problem situations and on how they can promote their transfer even in real-life contexts (Castoldi, 2009; Jonassen, 2011).

Based on the results of the research, it can be said that problem solving is confirmed as an effective cognitive challenge and flexible teaching resource, easily adaptable and contextualizable both in an interdisciplinary curricular dimension and in relation to specific disciplinary areas. It is therefore important to encourage teachers to promote an approach aimed at strengthening the problem solving capacity in relation to the logical-linguistic (Lumbelli, 2009) and logical-mathematical (D'Amore, 2014) disciplinary areas and to introduce in the didactic context "Tasks of Realities" that are configured as relevant cognitive challenges capable of detecting both disciplinary knowledge and skills and transversal skills.

CPS BEST PRACTICES- CASE STUDY



*Problem
Posing and Solving nel
Sistema Educativo*

Based on European indications and research conducted in the Italian school, the Italian Ministry of Education has launched a very important project, which involves second grade schools (also VET schools) entitled PP&S (Problem Posing & Solving). The project is part of the initiatives, promoted by the Italian Ministry of Education (MIUR) Directorate-General for school systems, aimed at supporting innovation in secondary education.

Country:	Italy
Category:	Creative Problem Solving
Title of Best Practise:	The PP&S (Problem Posing & Solving) Project
Organization name:	Italian Ministry of Education – MIUR
Description of the best practise	<p>The PP&S (Problem Posing & Solving) Project is part of the initiatives, promoted by the Directorate General of the MIUR school systems, aimed at supporting innovation in secondary education.</p> <p>The project has among the main proposers the AICA, the CNR, Confindustria, the University of Turin and the Polytechnic of Turin</p> <p>The project, focused on the problem solving methodology, intends to exploit the innovative potential of information technology as a key to innovation. The impact on the scientific application domains (physics, chemistry, natural sciences ...) is immediate but the innovation potential is significant in all disciplinary areas, including socio-humanistic ones.</p> <p>The project is structured as a service to be offered to teachers to support their daily work through:</p> <ul style="list-style-type: none"> • A strong commitment to collective reflection both in the presence (using a precise calendar of meetings) and online. • The creation of a demonstration environment; proposing themes and materials that can stimulate the creativity and content choices of teachers; training and tutoring. <p>Fundamental in this regard are:</p> <ul style="list-style-type: none"> • the development of the ability to reinterpret one's own domain know-how in an Advanced Computing Environment (ACE), o • the use of an e-learning software platform for the recording of objectives of shared learning and placed at the goal of the didactic action, of the planned didactic paths, of the verification tests used, of the evaluation methods and of its

	<p>results, as a useful and unifying national reference for schools, teachers and students.</p> <p>The teachers obviously can choose which ACE to adopt, under conditions that:</p> <ul style="list-style-type: none"> • is equipped with a powerful symbolic manipulator. • is integrated with the educational content management platform that the school intends to adopt. • can count on a robust international community of users as a reference and support for the choices they intend to make.
<p>Aim/s of the best practise in relation to VET:</p>	<p>The aim of the project is to contribute concretizing the change envisaged at the regulatory level with the transition from "ministerial teaching programs" to National Indications for High Schools and Guidelines for VET Institutes. A change that entrusts the teacher with a freer management of knowledge and the autonomous planning of the most suitable didactic itineraries for the achievement of the learning outcomes that Indications and Guidelines decline and set for the whole national territory.</p> <p>The project find its the motivations in the results of a careful analysis of the critical issues in school preparation:</p> <ul style="list-style-type: none"> • weakness in preparation for tackling quantitative problems • the almost exclusively disciplinary nature of the training system; • the large prevalence of a didactic approach to descend from the general (theory) to the particular (applications, too often confined to an ancillary role); • the loose relationship between school education and the cultures of the world of work; • the delay in the impact of Computer science in the content and organization of training activities. <p>Among the teaching materials, developed by the teachers involved, there are several problems require logics and approaches of the working / production contexts.</p> <p>These are problems that have strict relevance and applicability in the areas of production, service management, research and development, design and management of operational processes. The problems are proposed with a "Storyboard" card that identifies the nature of the problem, the work constraints, the objective of solution.</p> <p>The role of the storyboard is considerably important as the students to whom the problem is proposed or, more generally, an area in which to identify the problem (s), have generalist culture. Therefore, it is important to use the</p>

	formulation of specific logic, on which the ability of the subject in training must mature, on the basis of the skills acquired in terms of abstraction, modelling, computational thinking.
Further reading/Direct Links to Best Practise: <i>(website, books, journals, articles)</i>	https://minerva.miurprogetttopps.unito.it/

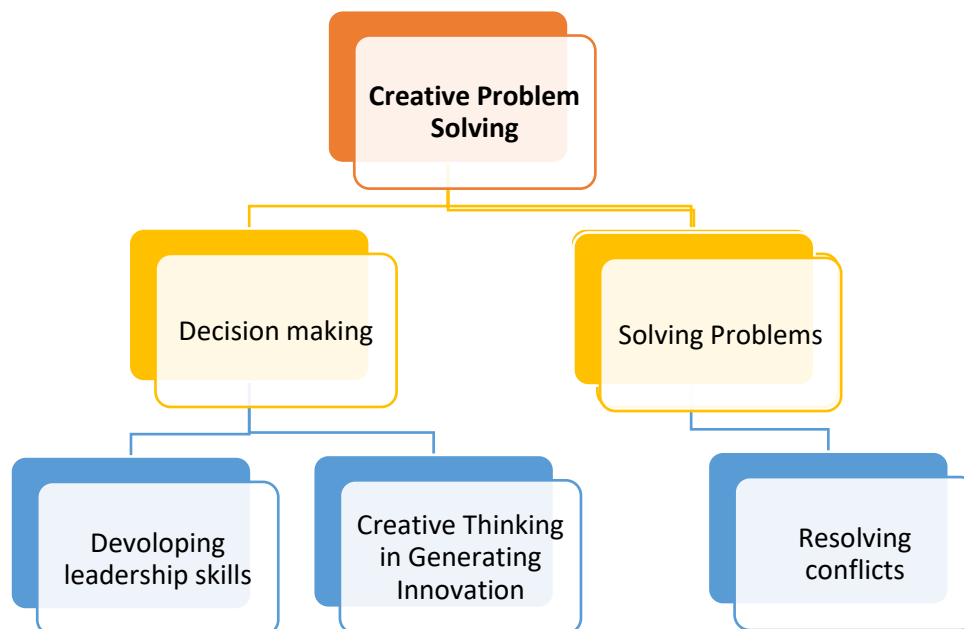
Criteria	CPS	Yes, how	No, how
Contributes to a VET teacher's continuing professional development plan	x	The project is structured as a service to be offered to teachers to support their daily work	
Is supporting development of divergent thinking skills	x	The aim of the project is to encourage learners to develop an integrated training space that interconnects logic, mathematics and IT.	
Is supporting development of lateral thinking skills	x	Students are encouraged for self-regulated learning, both individually and in teams. The methods used structure learning and thinking skills.	
Is supporting development of creative skills	x	The project activities stimulate the ability to model concrete and daily situations in mathematical terms (posing) and solving (solving) the problems connected to it with logical-mathematical reasoning (later generalizable to theoretical topics) and with the help of Maple Advanced Computing Environment.	
Is supporting employability of students	x	The key competences of the students are strengthened thanks to the project's activity, and, consequently, their employment opportunities	
Is supporting development of DT toolkits for teachers	x	The project promotes educational innovation and growth of teachers, through numerous opportunities for training, meeting and collective reflection opportunities, both in presence and online (through a dedicated platform).	
Is developing industrial currency of teachers and working-life relevancy of education	x	Among the teaching materials, developed by the teachers involved, there are several problems that require logics and approaches of the working / production contexts. These are problems that have strict relevance and applicability in the areas of production, service management, research and development, design and management of operational processes. The problems are proposed with a "Storyboard" card that identifies the nature of the problem, the work constraints, the objective of solution.	
Has an element of innovation relevant to teachers	x	The main objective of the project is to activate a didactic innovation process based on the growth of a Problem Posing & Solving culture that cross-invests the disciplinary structure with a more mature use of information technologies.	
Has proof of teacher & employer co-design	X	The project also has among its partners the most representative national association of industrial entrepreneurs "CONFINDUSTRIA", which participated in the planning of the activities together with the teachers involved.	

4.4 United Kingdom

Creative problem-solving initiatives in UK

What it is?

Creative problem solving is a mental process that involves using original, “out of box” ideas to build strategies that resolve problem in an efficient and effective manner. The regular use of unique ideas to fix problems is a flexible strategy that prompt the development of the following skills:



Decision making: Decision making is one of the most essential ability today workplaces demands. At various stages of development and earning profits, both top executives and employees have to make decisions depending on the situation. There are several purposes employees have to achieve, therefore multitasking and sensible prioritising of goals and strongly shaped by decision making abilities. For example, there are many times employees provide suggestions to increase the productivity of the company. However, it is impossible for a manager to accept all the suggestions that employees furnish with. Talking about other examples can include identifying a faulty product and making decisions at once to stop the production process regardless of the massive loss of the raw materials already sanctioned for the production. Applying creative thinking while facing such dilemmas

can restrict generalizing situations and can improve skills to thoroughly evaluate such cases without relying on unsuitable assumptions and heuristic techniques

Creative Thinking in Solving Problems: Workplaces are extreme environments where apart from productivity, earning profits and image building there are many problems that keep arising in daily basis which need instant solving and if not solved can affect the workplace in negative ways. Certain problems demand special attention and quick solving techniques. In order to achieve this, problem must be researched well, otherwise there is the risk of getting solutions with insufficient information that can lead to faulty decisions and make problems worse. Hence, creative thinking offers the solutions to many problems by viewing each problem differently and seeking to find the solutions differently again. Some of the important steps in which creative thinking supports solving problems are:

- 1) Recognize the nature of the problem that is done through a thorough examination of the background information about it

- 2) Viewing problems from different angles: The approach of solving problems can be through two ways “intuitively or systematically. When you solve a problem intuitively, you react immediately and instinctively, without following a particular procedure and systematic problem-solving method is to adapt a solution from a prior problem and apply it to your current situation” (Butterfield, 2017). However, it must be understood that both the approaches are different and hence will produce results differently. The intuitive angle of viewing the problem is crucial while fast decisions are demanded and the second one is approached when things are more organized and systematic.

- 3) Find possible solutions to establish the problem: Although it is good to have more than one possible solution, not being able to find the best solution is often frustrating. For every possible solution, it is required that problem solvers get a clear idea about the negative and positive outcomes of each possible alternative.



image: pixabay.com - <https://pixabay.com/en>

According to the ADOBE Global report, which compared UK, USA and Germany policymakers and educators regarding problem solving, one of the obstacles to higher creative problem solving in the UK are standardised testing requirement. According to this report, 76% of educators in the UK are frustrated with the requirements applied in these tests which are limited on the range of diverge thinking when evaluating students, thus more likely to reward conventional forms of

problem-solving rather than more creative ways. Based on these concerns, the UK educational system has based its creative problem-solving implementation on the development of the following skills:

- *Learning through success and failure*
- *Working within diverse teams*
- *Independent learning*
- *Accepting challenges and taking risks*
- *Innovative thinking*
- *Processing and investigating*
- *Persistence, grit and entrepreneurial spirit*
- *Leadership and delegation*

Barriers	Solutions
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Lack of time of Educators	Additional professional development for educators
Lack of technology (Tools and training)	Allocating for budget towards technology for schools
Outdated Standardise testing	Encouraging incorporation of different disciplines in the curriculum
Students access to technology	Prioritising access to technology for underprivileged students

Additionally, to the solution referred above, the British government has implemented a long-term plan in partnership with the Ofsted, Qualifications and Curriculum Development Agency (QCA), The Training and Development Agency for School (TDA) and Schools, Students and Teachers network (SSAT) in 2008, named Creative Partnership to ensure a better incorporation of creative thinking into educational curriculum and vocational training education. One of the projects designed was the Playing for Success (PfS), which is an innovative out of school hours programme that successfully links sport to hard educational outcomes but does not focus on playing sport. Learning Centres are set up in sports clubs' venues where sport is used as a motivational and curriculum tool to improve young people's literacy and numeracy skills. Centres are staffed by experienced, qualified teachers, supported by assistants and volunteer mentors and each has developed a range of creative approaches to inspiring young people to learn. Another example is the Speedway Racing, where pupils interview riders and managers. In preparation for this, students consider appropriate questions to obtain an accurate profile and compile magazine articles.

4.5 Poland

Developing the Integrated skills strategy

Poland has made a commitment to develop a skills strategy as set out in the Partnership Agreement chapter - "Thematic Objective 10: Investing in education, training and vocational training for the acquisition of skills and lifelong learning".

The most important skills developed as part of general education in primary school were, among others, efficient communication in Polish and modern foreign languages, mathematical thinking, searching, organizing, critical analysis of information from various sources, creative problem solving, programming, teamwork and social activity.



image: pixabay.com - <https://pixabay.com/en>

The new core curriculum introduces compulsory educational classes for students in the field of career counselling, which are designed to support students in the process of making educational and professional decisions.

The directions of recent changes also put emphasis on social activity, and thus shaping the skills and attitudes of students useful in social life and future professional work. This applies to the obligation of schools to specify in the statute of the institution activities to organize and carry out tasks related to volunteering.

The acquisition of social competences such as communication and collaboration in a group is also to facilitate participation in team or individual projects as well as organization and project management.

Aid for gifted students is particularly important for economic, social, scientific and cultural development.

The integration of children with migration experience also occupies an increasingly important place in governmental activities.

Changes within the reform of vocational education undertaken are aimed at enabling more flexible cooperation of schools with employers, as well as the introduction of forms of professional development of teachers directly at the employer¹⁴.

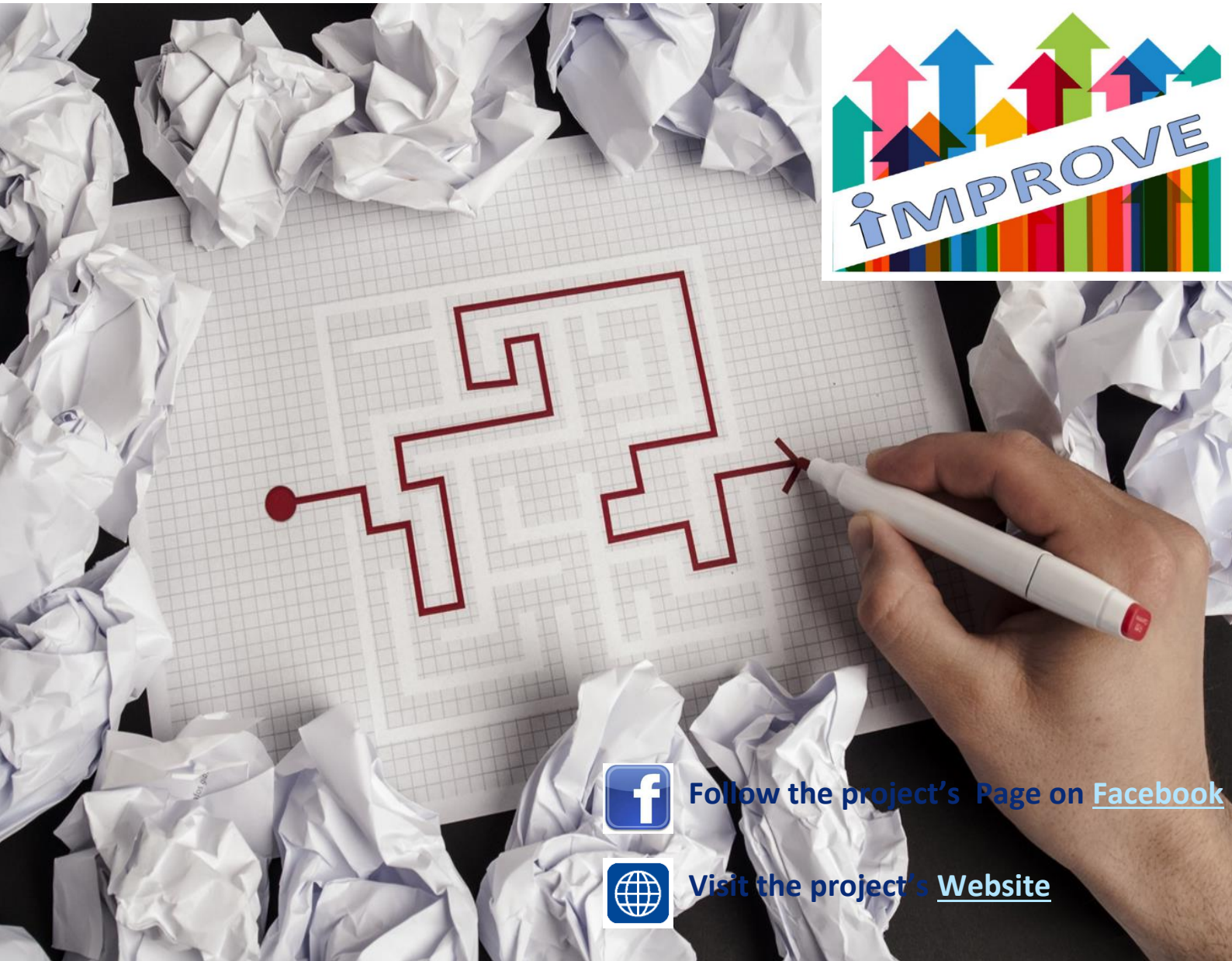
Case study

Country:	Poland
Category:	Creative Problem Solving (CPS) WORK BASED LEARNING
Title of Best Practise:	Project „Parasol Praca Przyszłość”
Organization name:	Centrum Profilaktyki i Edukacji Społecznej PARASOL -Center for Prevention and Social Education Miejski Ośrodek Pomocy Społecznej w Krakowie (Social Services Krakow City, Poland) Public financing
Give a brief summary/description of the best practise (maximum 100 words):	<p>The main goal of the program was social and professional activation of people at risk of social exclusion.</p> <p>The project Parasol Praca Przyszłość (umbrella, work, future) was to create a social enterprise by VET students.</p> <p>The business idea was to create Sezony Bistro Cafe (social enterprise).</p> <p>The concept of the restaurant: seasonal food prepared only from organic ingredients, deliver directly from the local, certified farmers.</p> <p>Social benefits and goals:</p> <ul style="list-style-type: none"> • Offers person-oriented services. • Promote and support organic food production and agriculture. • Promotes local food and traditional cooking. • Promote an innovative concept of Slow Food gastronomy in the city.

¹⁴ <https://www.cedefop.europa.eu/en/news-and-press/news/poland-developing-integrated-skills-strategy>

	<ul style="list-style-type: none"> • Promote a new lifestyle in the city, more concentrated on people and their wellness. • Promote local small businesses in food and agricultural sector. <p>The project duration from 1.08.2013r. to 30.06.2015r.</p> <p>60 VET students involved</p> <p>VET Student profile:</p> <ul style="list-style-type: none"> ○ age of 15-25; ○ living in Krakow and Lesser Poland; ○ not working or working with low incomes ○ having difficulties resulting from various life experiences, especially in the labour market; ○ open, motivated, creative <p>The project was successful and was involving different experts and social partners (food market, NGOs, media). Social enterprise has been inaugurated in 2015 then transformed to slow food bistro, was working till last year.</p>
<p>Aim/s of the best practise in relation to VET:</p>	<p>Project participants (VET students) have the opportunity to:</p> <ul style="list-style-type: none"> - participate in free courses and trainings in entrepreneurship (creating a business plan, conducting profitable business, legal aspects), in the field of operating a cash register; driving course (for some participants); in the field of website support, running an online store, online sales, fundraising, PR and sales; - participate in meetings with a vocational counsellor, study visits to social economy entities; - be finance 50 internships lasting at least 3 months; - participate in cooking and confectionery trainings; - participate in trainings with famous chefs and confectioners; - co-create a restaurant in each stage - from furnishing through development to full functionality; <p>Creative problem solving</p> <p>The first creative approach was to find innovative concept for the business.</p> <p>The problem solving was managed in a group of different experts and VET students.</p> <p>Creative problem solving to obtain funds for business development and to obtain the location for the restaurant.</p> <p>After training in entrepreneurship, all VET students should apply in a creative way the knowledge into the practice.</p> <p>The VET students were encouraged to use different tools to reach the final goal. They have used the crowdfunding platform to obtain</p>

	<p>financing for the restaurant. They have managed with marketing to collect funds and find ambassadors and sponsors. Crowd funding https://polakpotrafi.pl/projekt/sezony They worked as volunteers to prepare a gastronomic place.</p>
<p>Further reading/Direct Links to Best Practise: <i>(website, books, journals, articles)</i></p>	<p>parasolpracaprzyszlosc.org.pl https://youtu.be/a-xl6bQkUiw https://polakpotrafi.pl/projekt/sezony Sezony Bistro Cafe: ul. Limanowskiego 16, Kraków, Poland</p>



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