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Nurturing creative thinking

*by Panagiotis Kampylis
and Eleni Berki*



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Cultural Organization



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Series Preface

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The International Academy of Education is grateful to Panagiotis Kampylis and Eleni Berki for writing the present booklet. Dr Kampylis is a lifelong learner, primary teacher, teacher trainer and creativity researcher. He has authored and co-authored several scientific publications in the fields of creativity and innovation in education and training (E&T), arts education and information and communication technologies-enhanced (ICTs) learning. He is a research fellow at the European Commission, Joint Research Centre, Institute for Prospective Technological Studies (Information Society Unit). He contributes mainly to projects on ICTs for Creativity and Innovation in E&T, such as the study ‘Up-scaling creative classrooms in Europe’. Dr Berki is a Senior University Researcher at the University of Tampere, School of Information Sciences, in Finland. She has been a lifelong learner, researcher and teacher in further and higher education, and a quality management consultant in the European industry and in worldwide e-learning projects. She has studied and worked in China, Finland, Greece and the United Kingdom. She is multi-lingual and supports multiculturalism, equal opportunities and social inclusion policies.

The officers of the International Academy of Education are aware that this booklet is based on research carried out primarily in economically advanced countries and that the recommendations of this booklet need to be assessed with reference to local conditions and adapted accordingly. In any educational setting, guidelines for practice require sensitive and sensible applications and continuing evaluation of their effectiveness.

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Introduction

An agricultural example¹ shows that helping people flourish is an organic and unpredictable process. Like a farmer sowing seeds, someone creates conditions for children to grow as creative and critical thinkers. Creativity cannot be taught ‘directly’, but educational practice can provide the means, opportunities and a fertile environment for the creative mind to flourish.

We use the term ‘creative thinking’ in this booklet (rather than ‘creativity’) because creative thinking: (a) is the prerequisite for *any* creative process, output and outcome; (b) presupposes the active and *intentional* involvement of the person(s) who create(s); (c) can be fostered by *appropriate* education. Creative thinking is defined as the thinking that enables students to apply their imagination to generating ideas, questions and hypotheses, experimenting with alternatives, and to evaluating their own and their peers’ ideas, final products and processes.

Everyone has creative thinking skills and ideas, but children have more because they are not yet fully aware of rigid logic and convergent views. They are divergent, open, inventive and playful, which are features of creativity. Adults can also demonstrate their creativity, though it is suppressed through work and education. In principle, everyone can be(come) creative! Three factors contribute to be(com)ing creative: *skills, environment (including means) and motivation.*

In the following chapters, we consider all these factors in a (creative) learning space and in a school curriculum that enhances creativity. We analyse and emphasize the following three main points:

- all school subjects are creative and can be taught and learnt creatively;
- all environments can create and offer multiple, albeit very different, opportunities for students and teachers to reflect creatively; and
- all teachers, like all people, can be creative in their teaching practices.

The fostering of creative thinking is not always easy, and some advice from research, experience or guidelines from successful practice may be necessary. This booklet presents eight points taken mainly from three sources: (a) research on creativity recommendations; (b) research on classroom practices; (c) the authors’ own experiences. We offer simple guidance on school activities that enhance creativity and

1. www.ted.com/talks/sir_ken_robinson_bring_on_the_revolution.html

creative thinking in different school and learning spaces world-wide, as we firmly believe that practice drives research and theory. That is, focusing on improving practice uncovers the best specific ideas. What you learn along the way can be tested in the light of broader research; but practice – not research – should be the driver. With this in mind, the eight chapters of the booklet try to:

- provide evidence on human creativity through good/suitable examples;
- emphasize practical implications; and,
- highlight good practice(s) and recommend activities to nurture creative thinking.

The booklet contains eight key principles of creative thinking in no particular order of priority and with no hierarchical structure in mind. They are interlinked and interrelated and equally important for nurturing creativity in the educational context.

In order to nurture creative thinking in students effectively, we must re-think schooling and reflect on how new educational futures could be outlined by re-examining the following:

- what students learn (e.g. a diverse range of skills and subject content following their own learning pathways);
- how they learn (e.g. learning approaches and methods such as problem-based learning, constructivism, self-organized learning, instructional design, game-based learning);
- where they learn (e.g. in any location within school buildings–foyers, lounges, common spaces and corridors–home, a youth club, or indeed in the street);
- when they learn (e.g. after formal school hours and at any age);
- who they learn with (e.g. not only with teachers and classmates, but also with a range of other people, such as peers, experts, and people near to or far from them, and by themselves with self-organized learning methods, etc.); and
- for whom and why they learn (e.g. not just for themselves or for future employers, but also for their fellow citizens, society and industry, and for the world as a whole).

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1. Creativity can be promoted through all school subjects

Students' creative thinking can be nurtured in all school subjects and curriculum areas, and especially in cross-curricular activities.

Research findings

Creativity is not only a privilege of the arts or people associated with the arts. Creative thinking can also be fostered and demonstrated in all school subjects and curriculum areas. Even trivial subject-specific content can nurture creativity in students, provided that the pedagogical approach allows for the expression of creative thinking and imagination.

One of the main barriers to creativity in schools is the heavily charged curriculum. We need to rethink the traditional division of school subjects and skills, and design a more flexible, balanced and less-extensive curriculum with a provision for diverse and cross-curricular activities, such as projects, school blogs or magazines. Cross-curricular activities could nurture creative thinking and learning, but they require close collaboration between students and teachers with different backgrounds, knowledge, competencies and expertise.

Application in practice

Even the most detailed and traditional curricula do not tell teachers exactly how to teach, and they do not prevent students from participating in cross-curricular or other types of learning. Therefore, from the creativity perspective, there is still considerable freedom for teachers to decide for themselves what and how they teach creatively. Often original explanations of facts and challenging comments on traditional knowledge by themselves can be creative ways of viewing otherwise non-creative subjects. These and other forms of student participation should be encouraged because they can be eye-openers and could lead to non-conventional ways of thinking.

The following are some ideas for teachers who want to teach creatively in all school subjects:

- *Mathematics*: you can help your students to develop their problem-finding and problem-solving skills, and mathematical competence through creative and authentic activities. For

example, students could carry out a survey on the use of personal devices such as mobile telephones, computers or games among the members of the school community and create a report with tables and charts that could be published in the school newspaper or blog. Playing with cards, configuration games such as tangrams and other toys and observing other everyday practices can also be used for creative learning, if these activities are used to engage the students and are integrated into the mathematical exercises.

- *Science*: you can encourage students to experience science not as a set of facts but as a creative endeavour for understanding nature. For example, you can ask students to experiment with paper airplanes and report on the effects that their size, shape and material have on how they fly. Or, you can investigate basic science concepts such as forces by using playground equipment (e.g. seesaws and spring riders) or buoyancy through plastic toys.
- *History*: History can be studied as an exciting adventure that triggers students' imagination and connects the past with the present. For instance, starting from school history (e.g. searching the school archives for information about its foundation, ex-students and teachers, and the development of school premises, etc.), students can study local history and how it reflects specific historical periods. You should use open-ended questions and tasks as far as possible, e.g. 'what information could our school building provide for future historians?'
- *Geography*: Geography can contribute to the development of a range of creative thinking skills through open-ended and meaningful activities. This type of question can elicit creative thinking, raise awareness of global issues and create environmental consciousness: for example 'How can we show what our locality is like to people from another city or country?', 'What can we do to help protect our local environment?', 'What do maps tell us about life in X place?'

Suggested readings: Fisher & Williams, 2004; Kampylis, Berki, & Saariluoma, 2009; Starko, 2010.

2. Influence creative thinking through well-designed learning spaces

The way space is designed has a significant impact on creative thinking and learning. Learning spaces can bring people together and encourage their interaction and creative collaboration.

Research findings

The way in which space – physical or virtual – is designed can deliver unspoken messages about the dominant teaching and learning practices, and also shape and influence the learning that happens in it. It can, furthermore, influence creative thinking.

Sometimes even trivial details – such as furniture arrangements, the materials used and the technologies available – are instrumental in achieving positive learning experiences that can determine students' learning outcomes, while ensuring the well-being of students and teachers.

Inspired by evidence-based research on the impact of lighting, noise, furnishing, ventilation and indoor air quality, as well as by the principles of socio-constructivism, we can (re)design and (re)arrange space to take advantage of colour, light, sound, shapes and materials. Thus, collaboration and co-construction of knowledge is allowed, the possibility of thinking differently is opened up and innovative teaching is facilitated.

Application in practice

Even in a typical school with 'standard classrooms', teachers can work out creative arrangements for a variety of working spaces that encourage the active involvement of students. The following suggestions could help you achieve this:

- Design *with* your students two or three basic classroom arrangements, e.g. for whole class lessons, for teamwork or project-based activities, and for independent work. These arrangements should demand little time and the minimal moving of furniture. Students themselves can be empowered to make the changes and the transitions. Although these changes can cause momentary chaos, they also allow for creative teaching and learning practices.

- Use ‘pigeon hole’ units, individual pocket folders, or other communication means that allow you to provide your students with individual assignments, reading materials, comments, etc., without wasting a lot of time passing out papers.
- Experiment with everyday materials in order to transform the classroom into a creative learning place. For instance, try re-using cardboard boxes on a table to re-create carrel desks (small individual high-sided desks), as an alternative way to encourage independent study, when needed.
- Utilize new technologies in an innovative and cost-effective way to transform even the most conventional school buildings into stimulating learning spaces. For instance: (a) use video projectors to create inspiring and easily adaptable physical spaces by projecting powerful images and/or texts onto school walls; (b) ‘take the class on a trip’ to any location in the world through the Internet; or (c) run experiments through online laboratories² without leaving the room. In the absence of new technology, try to use older learning technologies, e.g. geographical wall maps, drawings and images produced by the students, etc. Or you can hold the lesson in several different ways, and afterwards compare and contrast the effectiveness and pleasure in teaching and learning.
- Discover alternative learning spaces to the classroom, either inside (e.g. a corridor, the school garden, etc.) or outside the school premises (e.g. a youth club, a park, etc.). Then, with one or more colleagues, co-organize a creative, project-based activity, involving mixed-age groups of students. Observe and monitor any differences you see in students’ involvement and interaction related to the new learning arrangements.

Suggested readings: Burke, 2007; Oblinger, 2006; Rudd et al., 2006; UNESCO, 2012.

2. Online laboratories are experimental facilities that can be accessed through the Internet, allowing students and teachers to carry out experiments from anywhere at any time. See, for instance, <http://ilabcentral.org/>

3. Increase the use of open-ended questions

Open-ended questions help students develop creative thinking by applying, analysing, evaluating and synthesizing information and knowledge.

Research findings

Teachers spend a great deal of their time asking students questions. Many different types of questions are used, but the main distinction is between closed questions and open-ended questions. Closed questions can be used to test comprehension and to aid retention of information (e.g. what is the capital city of India?). Open-ended questions have many possible answers that are not pre-determined (e.g. what if we had gills?). Open-ended questions can promote creative thinking and learning because they require students to find, combine and criticize information instead of simply recalling facts. Research shows that on average, approximately 60% of the questions asked in classrooms are closed-ended, 20% are procedural, and only 20% are open-ended.

One of the most ancient and effective questioning frameworks is Socrates' maieutic method, which highlights the importance of questioning in deep and active lifelong learning. Socratic questioning differs from random open-ended questioning in the sense that it is planned, disciplined and deep; the questions are selected to probe reasons and assumptions in order to engage in higher levels of thinking progressively – including analytical, critical and creative thinking.

Application in practice

It is a real challenge for teachers to develop a well-planned questioning method that encourages the active involvement of students and facilitates creative thinking. The following are some suggestions on how you could do this:

- Try novel ways of involving all students in asking and answering questions. For example, ask students to raise one green card when they agree and a red card when they disagree with the answer that someone else has given. Start first with closed-ended questions and go progressively to open-ended, higher-order questions.
- Focus on the actual experiences and thoughts of the students, rather than on what they have read or experienced second hand, by asking:

- Questions that seek clarification: e.g., 'Could you explain further?', 'Can you give an example/counter example of ...?'
 - Questions that challenge assumptions: e.g. 'What do you think is behind this assumption here?', and 'Is this always the case?'
 - Questions that probe reasons and evidence: e.g. 'Why do you say that?', 'How do we know that ...?', 'Is/are there any reason(s) to doubt this evidence?'
 - Questions that explore alternative viewpoints: e.g. 'What is the counter argument for X?', or 'Can/did anyone see X in another way?'
 - Questions that look for implications and consequences: e.g. 'But if X happened, what else would could result?', 'How does X affect Z?'
 - Questions about the question: e.g. 'Why do you think that I asked that question?', or 'Why was that question/problem important?'
- Simply asking more open-ended questions does not necessarily lead students to produce higher-order responses; so, increase the wait-time for answers as much as possible and create a positive climate by tolerating ambiguity and encouraging original responses.
 - Ask students, whenever you can, to explain how their answer emerged (e.g. based on their prior knowledge or experience; inspired by a similar situation (analogy), etc.).
 - Always encourage and treat students' questions with respect and interest; in other words, try to reward and assess not only their answers to your questions but also the questions they formulate/pose themselves.
 - Scrutinize your questioning technique(s) by audio or video-recording a number of your classes or by asking a colleague to observe you. Keep track of the percentage of closed- and open-ended questions you use, the students you question each time and the type of questions you use for each of them, etc. Reflect on the patterns of questioning you are using and check if they promote creative and critical thinking.
 - Try to find a better balance between oracy (e.g. dialogues and arguments) and literacy (e.g. written texts and online sources), and use both written and oral examinations for assessing students.

Suggested readings: Cotton, 1989; Fries-Gaither, 2008.

4. Engage learners in meaningful and authentic activities

Learners are most creative when they are involved in meaningful, challenging and authentic activities; these are more likely to generate interest and engagement.

Research findings

Learning and creativity are the outcomes of hard work, determination and persistence. Even when students have the potential to learn and/or create something, they still need the incentives to do so. Individuals who are intrinsically motivated tend to be more willing to spend the required time and energy to be creative than the individuals who are driven by external rewards, pressures and inducements. Students are more likely to express their creative potential when they are involved in meaningful and authentic activities that fit their personal interests and abilities, and are also intellectually challenging.

Application in practice

- Find out through conversation, questioning, etc., what arouses the interest and motivates your students, as well as what they already know.
- Use the above-mentioned information for designing meaningful activities and authentic tasks of different types (visual, auditory, kinaesthetic) that motivate all students and increase their engagement. Always take into account gender and individual differences, learning styles, and cultural and socio-economic background.
- Allow students to have personal choices and contribute to decisions that relate to their own learning. Take their suggestions and feedback on the selected activities and tasks seriously.
- Consider students' close friends' interests and hobbies, too! Friends at that age influence each other's learning a lot through their personal preferences and occupations.
- Offer, whenever possible, authentic learning opportunities to students and try also to involve others, e.g. experts, subject specialists, artists, parents, other teachers, etc., in order to stimulate interest and ensure engagement.
- Take advantage of the available open educational resources (such as lesson plans, simulations, quizzes and e-books that can be modified, reused, repurposed and shared) and align them

according to the needs, interests and prior knowledge of your students.

- Remember that, in order to advance effective creative thinking in students, the teaching approach is far more important than the content of the activity itself. Even trivial content can activate creative thinking, provided that the pedagogical pursuit allows for idea generation, recreation, experimentation and sensible risk-taking.
- Ask your students to follow a local newspaper or the municipality portal for one or two weeks, until they find real world problems, news and situations that capture their personal interest. Ask them to formulate a problem, connecting it with specific curricular areas. The formulation of a problem is very often a more creative process than its solution; raising new questions and new possibilities, while looking at old questions from a new angle requires pure creative thinking.
- Ask students to investigate these and other problems while working in small groups that they have formed themselves according to their preferences, in order to propose creative solutions, such as a written report, a blog post, a presentation for all, etc. Help them to understand that real-life problems can have multiple and diverse solutions. This can reveal the students' own creative potential!

Suggested readings: Amabile, 1996; Kampylis, 2010; Starko, 2010; Vosniadou, 2001.

5. Collaboration enhances creativity

Motivation, insights and novel ideas arise mainly during our interaction with others.

Research findings

Collaboration develops the students' ability to think both independently and with others, enabling them to consider a wide range of perspectives and, thus, increasing their creativity potential. In this sense, creative thinking is not only a characteristic of individuals but also the property of groups of individuals. Original products are created not only by individuals, but also by groups, organizations, communities and even by entire societies.

Several terms, such as group/team creativity and collaborative/collective creativity, are used to describe the common efforts of two or more individuals to achieve an innovative outcome that cannot be achieved by a single individual alone. Researchers agree that there are significant differences, but also interrelations between individual and collective creativity. Therefore, in order to explain collective creativity it is not enough to study individual creativity. We must also consider the role of each individual in a group, the group dynamics, and the socio-cultural and environmental factors, which are nowadays considered far more important than before in creativity pursuits.

Application in practice

Creative teachers can encourage collaboration and facilitate students' collective creativity by:

- Emphasizing the roles of the individual and of the collective (group effort) in creativity. For example, you can ask students to list a number of inventions (in the history of science) and/or discoveries (in history or geography), and ask them to analyse them and determine if they were the outcomes of individual or collective efforts.
- Engaging students in reflections about the role of others, such as peers, teachers and parents, in their own creative achievements.
- Acknowledging that cultural diversity is an opportunity for learning in general and for creativity in particular. Formulating mixed groups of students with diverse backgrounds, interests,

prior knowledge, abilities and learning styles ensures the plurality of thinking within the group and the possibilities for collaborative creativity.

- Providing students with as many opportunities as possible to collaborate with peers (virtually and face-to-face) and those beyond the classroom – such as experts and artists – in order to bring creative projects to a successful conclusion.
- Helping students to set up and run their own clubs, such as science clubs, school magazine editorial teams, school blog teams, school bands, theatre groups and dance ensembles in order to give them numerous opportunities to collaborate creatively. Other groups can also be planned and formed to accommodate other interests and activities, focusing on nature, mathematics, computers, literature/poetry reading, writing, broadcasting, etc.
- Understanding that collective creativity raises a range of issues, including peer-to-peer equality. The creative-thinking process must be productive *for all* students and allow them to express their multiple intelligences and interests. Everyone has the right to creative learning and self-expression, and also the duty to respect the same rights for others.
- Helping students to understand that not all collaboration leads to creativity. Effective collaboration for creativity expression needs to have some element of structure and continuous encouragement and facilitation by suitably trained teachers.

Suggested readings: Miell & Littleton, 2004; Sawyer, 2012; see also Bertolt Brecht's poem *Questions from a Worker Who Reads* (<http://bit.ly/12V8QPB>)

6. Make efficient use of educational technologies

Educational technologies enable communication and collaboration, and open up a range of profoundly new ways of using and creating information and knowledge inside and outside the school.

Research findings

Information, communication and collaboration are at the core of the educational process, and the rapidly evolving related technologies and applications (information and communication technologies – ICTs) have influenced, and often transformed, the ways we think, learn, communicate and create knowledge. ICTs encourage creative processes as they allow information to be represented in a variety of modes, which other media and tools cannot offer. They therefore support a diversity of learning styles. Thus, they enable learners to retrieve, evaluate and synthesize information, try out creative ideas, explore alternatives and solve problems in a personalized and active way.

ICTs have great potential for dissolving the boundaries between learning in and outside schools, for re-engaging marginalized learners and for motivating students and teachers. ICTs are used more effectively and creatively in schools when: (a) the students are in ‘control’ of learning (personalized learning); (b) peer learning and collaboration are facilitated; (c) feedback and assessment are optimized; (d) there is a diversity of teaching and learning strategies; and (e) teachers are pre-trained in their use as teaching and learning tools.

Nowadays, there is a consensus among researchers and educational stakeholders that the process of using technology to facilitate creativity in thinking and practice is not merely a technical matter. It is, mainly, a matter of adopting innovative pedagogical practices that utilize the existing and emerging technologies in a student-centred context for developing both creative thinking, and twenty-first century skills and competences, such as self- and peer-assessment, problem-finding and problem-solving, inquiry, communication and collaboration.

Application in practice

What can teachers do to take full advantage of the potential of ICTs to encourage creative thinking and twenty-first century skills?

- You can use available ICT tools (e.g. online social networks) for opening up new ways for learners to collaborate, communicate and connect with creative ideas, and people beyond time and school borders.
- You can help students to understand that creative use of ICTs offers opportunities for supporting the democratic decision-making processes and strengthens representative democracy. For instance, you can provide concrete examples that illustrate the power of individual contributions to bring about large-scale changes at the local, regional, national and/or international levels.
- You can use available technologies for ‘flipping’ teaching³ and learning routines so that you can spend more time interacting with students instead of lecturing. For example, you can use videos and online resources with the lecture and/or learning materials that students can access and study outside of class time. This flipping allows time during the class to be used more effectively for additional learning-based activities, differentiated instruction and collaborative learning.
- You can take advantage of the educational activities (e.g. virtual tours), programmes (e.g. open online courses), resources (e.g. online videos), and applications (e.g. games) that are offered – usually free of charge – by institutions such as libraries, science centres, museums, zoos, non-governmental organizations, foundations, universities, corporations and so on, for developing engaging, amusing, meaningful and authentic learning activities inside and outside school.
- You can improve students’ ability to transfer the creative and active ways (e.g. trial-and-error and learning-by-doing) they use when interacting with ICT devices and applications (such as games) to other situations inside and outside the school.
- You can use a great variety of digital resources, such as e-books, maps, illustrations, audios, videos, infographics, animations, simulations, games and 3D applications to trigger students’ interest and increase their participation.

Suggested readings: Bocconi, Kampylis & Punie, 2012; Cachia et al., 2010; Craft, 2012; Loveless, 2008.

3. See, for instance, http://en.wikipedia.org/wiki/Flip_teaching

7. Allow for mistakes and sensible risk-taking

Create a caring and encouraging learning environment where students feel free and safe to experiment with new ideas and take sensible risks.

Research findings

Failure is an 'integral' part of the creative process and creative people often have many failed ideas or products before finding their successful ones. The creative process is inherently risky, and risk-taking is among the key characteristics of a creative personality.

Unfortunately, teachers tend to minimize failure of all types. A recent study on creativity and innovation in education in European Union Member States revealed that schools prefer discipline to playful and risk-taking behaviour. The emphasis on the 'correct response' reinforces students' fears of making mistakes and this is one of the most widespread educational practices that inhibit creativity. As a result, students are not willing to take risks within school. They prefer to 'play it safe' and provide teachers with one 'correct response', instead of trying to explore more ideas and alternatives.

Teachers' willingness to allow their students to take risks, to explore and experiment is related positively to students' creative learning. In order to foster creativity, schools could try reinforcing a 'culture of tolerance' that encourages 'sensible risk-taking' by teachers and students.

Application in practice

You could try to create a secure and supportive learning environment where students feel safe enough to try new things and are not afraid to make mistakes or fail. The ownership of the activities (and outcomes) should lie with the students, allowing them to make high (strategic) level choices related to non-predetermined options leading to creative and unpredictable rather than predictable outcomes.

When planning in order to encourage creativity, you can consider the following:

- Act as role models for creativity by taking sensible risks, trying new things and adopting innovative teaching practices.

- Allow students the freedom to play with ideas and take sensible risks, while engaging in challenging and controversial issues from real life.
- Allow space and time for students to try new things and learn despite the pressures of assessment.
- Encourage initiatives linked to risk-taking and creative thinking, and take them into account in students' final assessments.
- Give students the opportunity to carry out peer reviews of materials where errors were made in order to help them recognize mistakes and reflect upon them.
- Engage students in problem-based and meaningful activities that allow experimentation, sensible risk-taking and learning through trial and error, discussion, argumentation and debate.
- Recognize, accredit and reward any prior experiential and/or informal learning that happens outside classroom through learning-by-doing and through trial-and-error.
- Provide students with role models of successful risk-taking, tolerance of ambiguity and continuous creative efforts in order to avoid linking a single failure with total failure.
- Ask the students to create a bulletin board, a presentation or an essay of 'Great Failures(?)' in order to understand that failure is an 'integral' part of any creative process and that creative efforts are not always accepted at the time they are initiated.⁴
- Ask students to reflect on their own past failures and current mistakes while trying new and creative endeavours, and observe the way they reflect and comment on them. Reward this reflection in the final assessment procedure.

Suggested readings: Blair & Mumford, 2007; Cachia et al., 2010; Craft, Cremin & Burnard, 2008; Sternberg & Williams, 1996.

4. For example, Edison's creative products, such as the ever-lasting light bulb, were not the outcome of single-try endeavours, but rather the result of multiple failures that Edison and his team analysed in a constructive way before achieving success.

8. Learn how to assess and reward creativity

Creative thinking can be evaluated by student-centred and reflective means of assessment which take into account both the learning processes and outcomes.

Research findings

Some assessment methods tend to foster creativity while others tend to inhibit it. Traditional assessment methods that focus on remembering facts do not usually take into account students' creative thinking. Instead, they encourage the avoidance of mistakes and risk-taking, knowing how to achieve the highest grades, and demonstrating one's abilities and skills in relation to others. On the other hand, formative assessment practices provide students with information and feedback on how they are progressing, considering their own prior achievements according to their own learning goals, and are better at fostering creativity than the summative ones. This is because they allow students to understand which skills they need to develop further and which content areas they need to improve. Formative assessment practices include self-assessment, peer feedback, learning diaries, portfolios, e-portfolios and presentations. In addition, these types of assessment can cover both individual and collaborative efforts, and creative group work, such as projects.

When students feel pressured by evaluative surveillance, monitoring and other major features of assessment, their willingness to take risks and explore creativity becomes limited. But when assessment is constructive and focuses on self-improvement, the students are more likely to take risks, seek out challenges, and develop and contribute ideas that are both novel and useful.

Application in practice

- Explain to your students why it is important to build their assessment on strengths and self-improvement and not on weaknesses and competition. Help them to focus on things they feel proud of; something they can do for the first time; something they feel they have improved at; something that was a challenge for them.

- Co-create with students a checklist or a matrix that will allow them to evaluate their own work (self-assessment) in a creative assignment that examines both the process and the outcome of learning according to several criteria, such as originality, novelty, appropriateness, completeness, elegance and consistency.
- Ask students to test each other (and you!) and give each other constructive feedback (peer-assessment) according to some pre-determined, well-accepted and comprehensible criteria, such as the ones mentioned above.
- Inform parents and other interested groups about the importance of also assessing creative thinking in order to avoid misunderstandings and resistance on their part about changing the traditional assessment practices.
- Encourage students through formative assessment feedback to take sensible risks, express creative thinking and share their ideas or adapt them to a different context (transferability).
- Motivate the students not by suggesting that their creative efforts will be credited and graded, but by pointing out the features of the task that are interesting to them. Help them to set challenging but realistic goals, both as individuals and as a team, and to find personal meaning in the task by providing a greater level of choice about how to complete it.
- Try to ensure that even summative assessment results are informative and useful. For instance, rather than congratulate the students who got 'A' on a test, as though the 'A' itself was the goal, comment on the high level of competence this grade signifies. Accordingly, help students to *understand that low grades are not a kind of punishment, but an indicator* that the student needs to exert more effort or needs more time or some assistance.
- Reduce the stress and anxiety that very often accompany assessment, particularly during the divergent phases of the creative process when students need freedom and comfort to generate and explore novel ideas. Try to provide constructive feedback – not criticism – at the early stage of idea generation.

Suggested readings: Beghetto, 2005; Copley, 2001; Lucas, Claxton & Spencer, 2013; Villalba, 2009. See also a short video related to children's creativity and its 'assessment' at <http://bit.ly/16NqRVS>.

Conclusion

This booklet emphasizes activities and learning tasks that enhance creativity. Opportunities for engaging learners in meaningful, authentic and creative subject activities can be found in *all* school subjects, in new and old learning spaces, and through collaboration and efficient use of educational technologies. Important principles for creative and critical thinking are the use of *open-ended questions*, the *allowance for mistakes* and *sensible risk-taking*. Assessing and rewarding creativity is an important component for appreciating and encouraging creativity.

Creativity is an attitude to change. A flexible and practical mind, willing to play with forms and ideas and turn them upside down in order to achieve a better future, is a creative mind. Creating and enjoying a good life, while looking for ways to improve it through problem-solving, is a habit of the human mind. The eight principles in this booklet offer a comprehensive guide for creative education. Democratic (all forms) creativity is a remarkable pedagogical innovation, but it is not always possible or desirable. Often, creative thinking for finding and solving problems and the adoption of creative learning paradigms are deliberately avoided. Teachers and students can and should, alone and/or with collaborators, find innovative methods and ideas and carry them out, even within the constraints of their learning spaces.

With or without advanced ICTs, multidisciplinary curricula and imaginative approaches, education at all levels should aim to nurture *manifold (creative, critical, caring and reflective)* thinking. This booklet targets teachers who, as role models of creative thinking, can use pedagogic techniques and cross-curricular activities to trigger the manifold thinking process. It will benefit the human mind and society to get as many wide-ranging thinkers as possible involved in a wide variety of ideas, knowledge and citizenship responsibilities. The main function of school is educating and preparing young people for the future. This future should be personally pleasant and fulfilling, and enable young people to make a meaningful and positive contribution to society. Manifold thinking for creating, communicating, integrating, acting ethically on knowledge and critically evaluating its effects and impact on other humans and the society can offer a holistic educational practice.

One should question: (a) what is the meaning of learning in the modern world? and (b) how can you achieve it creatively? – and why? Learning should lead to wellness of being and ‘human flourishing’ (*εὐδαιμονία*), with teachers as mentors of learning and creativity.

Suggested readings: Valtanen et al., 2008.

References

- Amabile, T. (1996). *Creativity in context*. Boulder, CO: Westview Press.
- Beghetto, R.A. (2005). Does assessment kill student creativity? *The educational forum*, 69(2), 254–263.
- Blair, C.S.; Mumford, M.D. (2007). Errors in idea evaluation: Preference for the unoriginal? *Journal of creative behavior*, 41(3), 197–222.
- Bocconi, S.; Kamylyis, P.; Punie, Y. (2012). *Innovating teaching and learning practices: Key elements for developing creative classrooms in Europe*. Luxembourg: Publications Office of the European Union. (JRC 72278.)
- Burke, C. (2007). Inspiring spaces: Creating creative classrooms. *Curriculum briefing*, 5(2), 35–39.
- Cachia, R. et al.. (2010). *Creative learning and innovative teaching: Final report on the study on creativity and innovation in education in EU member states*. Luxembourg: Publications Office of the European Union. (JRC 62370).
- Cotton, K. (1989). *Classroom questioning*. Portland, OR: Northwest Regional Educational Laboratory. (School Improvement Research Series.)
- Craft, A. (2012). Childhood in a digital age: Creative challenges for educational futures. *London review of education*, 10(2), 173–190.
- Craft, A.; Cremin, T.; Burnard, P. (Eds.). (2008). *Creative learning 3-11 and how we document it*. Stoke-on-Trent, UK; Sterling, VA: Trentham.
- Cropley, A.J. (2001). *Creativity in education and learning: A guide for teachers and educators*. London: Kogan Page.
- Fisher, R.; Williams, M. (Eds.). (2004). *Unlocking creativity: Teaching across the curriculum*. London: David Fulton.
- Fries-Gaither, J. (2008). *Questioning techniques: Research-based strategies for teachers*. Available online at <http://bit.ly/18hnmo3>
- Kamylyis, P. (2010). *Fostering creative thinking: The role of primary teachers*. Jyväskylä, Finland: University of Jyväskylä. (Jyväskylä Studies in Computing no. 115, S. Puuronen, Ed.)
- Kamylyis, P.; Berki, E.; Saariluoma, P. (2009). In-service and prospective teachers' conceptions of creativity. *Thinking skills and creativity*, 4(1), 15–29.
- Loveless, A.M. (2008). *Creative learning and new technology? A provocation paper*. In: J. Sefton-Green (Ed.), *Creative learning* (pp. 61-72). London: Arts Council England.

- Lucas, B.; Claxton, G.; Spencer, E. (2013). *Progression in student creativity in school: First steps towards new forms of formative assessments*. Paris: OECD Publishing. (OECD Education Working Papers, no. 86.)
- Miell, D.; Littleton, K. (Eds.). (2004). *Collaborative creativity: Contemporary perspectives*. London: Free Association Books.
- Oblinger, D. (Ed.). (2006). *Learning spaces*. Boulder, CO: EDUCAUSE.
- Rudd, T. et al.. (2006). *What if... Re-imagining learning spaces*. Bristol, UK: Futurelab.
- Sawyer, R.K. (2012). *Explaining creativity: The science of human innovation* (2nd ed.). Oxford, UK; New York, NY: Oxford University Press.
- Starko, A.J. (2010). *Creativity in the classroom: Schools of curious delight* (4th ed.). New York, NY: Routledge.
- Sternberg, R.J.; Williams, W.M. (1996). *How to develop student creativity*. Alexandria, VA: Association for Supervision and Curriculum Development.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). (2012). *A place to learn: Lessons from research on learning environments*. Montreal, Canada: UNESCO Institute for Statistics. (Technical Paper no. 9.)
- Valtanen, J. et al.. (2008). Manifold thinking and distributed problem-based learning: Is there potential for ICT support? In: M.B. Nunes; M. McPherson (Eds.), *Proceedings of the IADIS International Conference e-Learning 2008* (Vol. 1, pp. 145-152). Amsterdam: IADIS Press.
- Villalba, E. (Ed.). (2009). *Measuring creativity: Proceedings of the conference, 'Can creativity be measured?' Brussels, May 28-29, 2009*. Luxembourg: Publications Office of the European Union. (EUR 24033 EN.)
- Vosniadou, S. (2001). *How children learn*. Geneva, Switzerland: International Academy of Education (IAE)/International Bureau of Education (UNESCO/IBE). (Educational Practices Series, no. 7.)

Notes

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