

Module 19: Nature of Creativity

Aims of the module

- Introduce participants to the nature and role of creativity in education
- Increase awareness of how creativity is manifest in early years science
- Offer guidance on the pedagogical similarities between creative development approaches and inquiry based science teaching in the early years
- Explore the role of the teacher in supporting the synergies between inquiry and creativity.
- Provide time for planning to foster creativity in early years science education

Links to the Content Design Principles and Outcomes

4. Teacher education should promote understandings about the nature and framings of creativity, characteristics of creative teaching and learning, and how creativity is manifest in early years science.

4.1 Teachers should be able to recognize how creativity is manifest in early years science and have knowledge of distinctions between features of creative teaching and creative learning.

5. Teacher education should provide knowledge about how children’s creativity development could be enhanced and assessed within science education.

5.1 Teachers should have detailed knowledge about the synergies between inquiry and creativity, such as play and exploration, motivation and affect, dialogue and collaboration, problem solving and agency, questioning and curiosity, reflection and reasoning; and teacher scaffolding and involvement, to support children’s creative learning and advance their creativity within science education.

6. Teacher education should provide pedagogical content knowledge to stimulate inquiry and problem solving in science education.

6.5 Teachers should be able to foster opportunities for children’s agency and creativity in learning in inquiry and problem solving – in particular the importance of children making their own decisions during inquiry processes, making their own connections between questions, planning and evaluating evidence, and reflecting on outcomes.

12. Teacher education should provide knowledge about early child development, the purposes and aims of science education, and their place in the early years curriculum.

12.3 Teachers should have knowledge of the role of creativity in child development and in the field of science.

12.6 Teachers should be able to support the diverse interests and needs of young

children in engaging creatively within the field of science.

Rationale for the module

What is creativity?

Creativity, in essence the generation of novel ideas, is possible to exercise in all aspects of life. In problem solving contexts of a mundane as well as unusual nature, humans can choose to adopt a creative mindset or attitude, and trial possible options and ideas. It is useful to distinguish between high creativity and everyday creativity, between 'Big C Creativity', seen in some of Gardner's 1993 studies of highly creative individuals, for example, Einstein and Freud) and 'little c creativity' that Craft (2000; 2005) suggests focuses on agency and resourcefulness of ordinary people to innovate and take action. Boden (2001, 2004) conceptualizes creativity as personal and historical, the latter domain-changing creativity is aligned to Big C creativity, whilst the former is linked to individuals who adopt creative dispositions in everyday contexts, and is often described as democratic or 'everyday creativity' (Beghetto and Kaufman, 2007).

Whilst creativity is recognised as a slippery elusive concept and is differently defined across the disciplines, it is commonly seen as a novel response that is valuable in the context of its production. It has been described as "the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)" (Sternberg and Lubart, 1999, p.3). Thus creativity involves the capacity to generate, reason with and critically evaluate novel suppositions or imaginary scenarios. It is about thinking, problem solving, inventing and reinventing, and flexing one's imaginative muscles and critical reflexivity (Cremin, 2014).

So, creativity is recognised as both a process and state of mind involving the serious play of ideas and possibilities. Increasingly it is understood as a social phenomenon and research over the course of the late 20th century has increasingly focused on the role of dialogue and collaboration in creativity (John-Steiner, 2000). Sternberg (2010, p.394) argues that creativity as a novel response is a habit that can be both encouraged and discouraged. But why encourage it?

Why is creativity in education important?

Craft (2010) asserts that in the current uncertain and constantly changing world (with changes in family demographics, the climate, and national security) creativity is essential – a 'fundamental life skill' that, as Parkhurst (2006) too acknowledges, is needed so that future generations "survive as well as thrive in the twenty-first century". Robinson (2015) takes this further when arguing that:

Being creative is at the heart of being human and of all cultural progress.... The answer now is not to suppress our creativity but to cultivate it more seriously and with a greater sense of purpose. As the challenges that face students become more complex, it's essential that schools help them all to develop their unique capabilities for creative thought and action. (Robinson, 2015, p.137)

For many creativity is important for the development of the child and citizen, it is seen as inherently valuable and the social dimensions of the creative citizen are highlighted and discussed by researchers. For example Chappell (2008) highlights the interplay between individual, collaborative and communal creativity, and Chappell and Craft (2011) explore children's engagement with the ethics of creativity and how children make and are made by creative activity.

Others have made the case for creativity in relation to the development of knowledge and skills for the new economy (e.g. Seltzer and Bentley, 1999; Shaheen 2010). These authors assert that there are economic benefits in developing creative ability and suggest that fostering children's creativity in schools contributes to the building of human capital and consequently to the "wealth of nations" (Walberg, 1988). Framed within a 21st century neo-liberal narrative this economic imperative demands flexible innovative thinkers who are knowledgeable, competent and enthusiastic. Creativity is seen as vital to this.

In the recent years creativity has increasingly become the focus of "curriculum and pedagogy" (Wilson, 2005) and an "official agenda" for improving schools (Burnard, 2006), at least in many European countries. However difficulties have also been documented. In particular the pressure of accountability in education is widely seen to suppress or even 'kill' children's creativity.

Why is creativity in early years education important?

Craft (1999) emphasizes that creativity needs to be fostered by the education system(s) from the early years onward and in these and later years needs to be recognized as 'little c' or everyday creativity which has problem solving and meaning making at its core. When a young child's way of seeing the world or a particular phenomenon has been disturbed and require a novel response - a 're-representation from one way of seeing things to another, a new way of seeing things' (Wegerif, 2010, p.54) then it is argued that creative and 'authentic' learning has occurred.

What are the issues for teachers?

Teaching creatively and *teaching for creativity* are differentiated by a key English report: the former as meaning 'using imaginative approaches to make learning more interesting and effective' (NACCE, p. 89) and the latter being forms of teaching that are intended to develop young people's own creative thinking or behaviour. Thus a frequent professional concern is the challenge of orchestrating teaching creatively and teaching for creativity and achieving a balance between structure and freedom. Sawyer (2004 a,b) describes creative teaching as 'disciplined improvisation' which makes high demands on teachers as they seek to use routines in the context of wider curriculum requirements and to work flexibly in order to offer creative opportunities and build new knowledge and understanding.

Teachers' attitudes and beliefs about creativity can also create challenges. Based on myths and misunderstandings, some people view creativity as an ability that people are born with or without, and, as such, it is presumed it is impossible to be developed. As research has repeatedly shown, this is unfounded (e.g. Amabile, 1996; Nickerson, 1999). Another prevailing myth is that creativity is the preserve of the arts or arts education, yet as others

have demonstrated, and the Creative Little Scientist research exemplifies, creativity is possible in all domains (e.g. van Oers, 2010; Mirzaie, Hamidi and Anaraki, 2009). But if teachers see creativity only as 'Big C' or paradigm-changing (e.g. Gardner, 1993; Csikszentmihalyi, 1996; Simonton, 1994), and do not recognise their own creativity this will obstruct their efforts to foster creativity in children.

In the classroom teachers may feel socially obliged to claim to value creativity even if they do not (e.g. Runco and Johnson, 2002) and may feel the need to use a transmissive style to retain order (e.g. Besançon and Lubart, 2008). Additionally, research evidence suggests they may be unaware that their pedagogic practice actually inhibits creativity (e.g. Dawson et al., 1999).

The lack of clarity in how to assess creativity may also contribute to teachers' hesitation in documenting and evidencing children's creativity. There are a number of different ways of approaching the conceptualisation of creativity assessment from psychometric point of view, which sees creativity as generalized, objectifiable and measurable to a componential one which involves the assessment of the process as well as the product.

An additional concern for teachers may be balancing standing back to enable learner agency and intervention to 'ensure' instruction is offered. Research has proved the value of the pedagogic practice of respecting children sufficiently to stand back from their endeavours in order to observe their interests, needs and direction of learning and then build upon this (e.g. Cremin et al. 2006; Fawcett and Hay, 2004; Tobin, Hayashi and Zhang, 2011). However, fostering creativity through standing back rather than through frequent intervention requires professional restraint and well developed skills of close observation.

Overview of the module

The module consists of the following activities:

1. **Introduction:** An introduction to the nature and role of creativity in education and in early years in particular followed by an introductory activity
2. **Presentation on creativity in science education**
3. **Sharing own experiences:** Opportunities for teachers to share their classroom experiences of fostering creativity in general and in science-based activities
4. **Focusing on similarities between creative approaches and inquiry based science** approaches to teaching and learning
5. **Discussion of classroom examples** from Creative Little Scientists and Creativity in Early Years Science Education projects - What helps children be creative? What is the teacher's role?
6. **Discussion of implications for planning** the environment and the teacher's role.
7. **Reflections** on what has been gained from the module – both content and process.

Module at a glance

Time	Task	Materials	Grouping
00.00	<p>1. Introduction to the nature of creativity</p> <ul style="list-style-type: none"> • Presentation of facilitator(s) and his/her/their role/s • Presentation of the main aims and objectives of the module • Overview of the module <p>A brief presentation on the nature of creativity (in general)</p>	<p>Powerpoint presentation</p> <ul style="list-style-type: none"> • Aims • Links to Content Design Principles and Outcomes • Session rationale 	Whole group
00.10	<p>Introductory task</p> <p>3-4 tables with resources In groups of 4-5</p> <p>Highly creative, unique and intelligent beings from a different planet are coming to visit the Earth among other planets to choose where to settle and share their creativity, intelligence and overall 'know-how' of how to live a happy, fulfilled life 15 minutes to: Invite the groups to examine the materials and make a novel response - designing <i>something</i> that they can present to the visitors as both a welcome and a symbol of our race that would help these creative, unique and intelligent beings choose Earth</p> <p>10 minutes to:</p> <ol style="list-style-type: none"> look at one another's creations present your creation/explain your choice (to the visitors from a different planet) in a creative and convincing way share the process that led you to all your decisions <p>Presentation on why creativity is essential in education</p>	<p>Task 1 materials:</p> <ul style="list-style-type: none"> • A4 paper (approximately 100 sheets per group) • pipe cleaners (minimum 5 per group) • straws (minimum 5 per group) • different pieces of cloth (minimum 5 per group) • paperclips (minimum 10 per group) • paper plates (minimum 3 per group) • sticky tape (1 per group) • paper cups (3 per group) <p>The activity is inspired by similar activities designed by NASSA</p>	Small groups (4-5) – different sizes
00.30	<p>2. Presentation on creativity in science education</p> <ul style="list-style-type: none"> • Presentation of definition of creativity in the CLS project • Presentation of Creative dispositions in CEYS • Participants briefly discuss how they approached the introductory activity and whether they felt they had been creative • Where are the elements of creativity in the task? • Where are the elements of science in the task? 	<p>PowerPoint presentation linking to work of the CLS partnership and literature review on Creativity and Education</p> <p>Task 2: Creativity and science: A3 recording sheet/table and post it notes for recording elements/features of Creativity and science experienced during the introductory activity</p>	Whole group Small groups for discussion (same as in the previous activity)
0.45	<p>3. Opportunities for participants to share their classroom experiences</p> <p>When do they feel they foster creativity</p>	<p>Task 3: Fostering creativity - A3 Recording sheet/table and post it notes for recording own classroom experiences with all</p>	Pairs + Whole group

	<p>in their classrooms (in general)? When do they feel they foster creativity in their science-based lessons? Classroom examples</p> <p>Any issues – what are their concerns (the role of the teacher, their attitude and beliefs about creativity, assessment, school expectations, parental perspectives? etc.)</p>	challenges and positives	
1.05	<p>4. Focusing on similarities between creative approaches and inquiry based science approaches to teaching and learning</p> <ul style="list-style-type: none"> • Presentation of synergies between creative approaches to teaching and inquiry based learning <p>Discussion of the teachers strengths and weaknesses in this regard</p>	<p>Present then offer paired discussion:</p> <p>Task 4: The use of synergies – analysis (Which of the synergies do you feel you practice already, which is more challenging?)</p>	<p>Pairs Whole group</p>
1.20	Break		
1.50	<p>5. Discuss and analyse classroom examples from CLS or CEYS</p> <p>Task for groups</p> <p>Divide the group of teachers into groups of 4 to 6. Provide 1- 2 templates per group (groups can have the same templates). Invite groups to discuss:</p> <ul style="list-style-type: none"> • How and whether children’s creativity was fostered? • Which features of creativity can you notice? • What are the opportunities for children's decision making and creativity? • What is the agency of the children? • What is the role of the teacher? • Is the group or individual creative work assessed and by what means? <p>Ask groups to record their responses to each question, including any questions or issues raised.</p>	<p>Powerpoint slides of task</p> <p>Copies of 3 episodes or templates from CLS for example Selected templates: BE_Sandbox GE_Building blocks UK(EN)_Habitat</p> <p><i>For each group</i> Copies of 2 examples Task 5: A3 Analysis Recording sheet Flip chart and pens</p>	3 groups
2.30	<p>6. Implications for planning- creation of a mini action plan Use the recording sheet</p>	<p>Task 6: Implications for planning – action plan Handouts and/or 2-4 copies of A3 Recording sheet Flip chart and pens</p>	<p>Individually Whole group</p>
2.45	<p>7. Reflections on what has been gained from the workshop</p> <p>- In what ways did the different activities and discussions support your developing creative thinking? - How far have the aims of the session been met?</p>	<p>Powerpoint slides of aims Flip chart Evaluation form</p>	Whole group
3.00	End		

Teacher education pedagogy

1. An introduction to the nature and role of creativity in education and in early years in particular and an activity

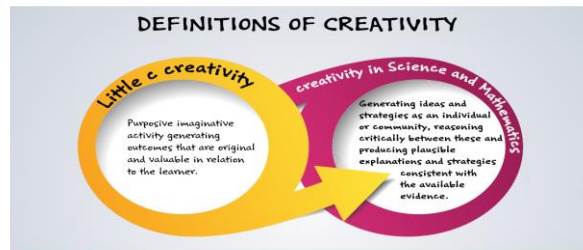
This module draws on the previous work of the Creative Little Scientists project in particular the literature review on creativity in education. The introductory activity challenges participants to demonstrate "the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)" (Sternberg and Lubart, 1999, p.3) and thus experience purposeful creative interaction with peers first-hand. We suggest using examples from the rationale about the nature and role of creativity.

There are also elements of science experienced in the activity. All materials have different physical properties (characteristics) and behave in different ways that make each useful for different purposes. As the participants examine and explore the materials available, their existing understanding of the materials and their specific properties are tested and confirmed or challenged. As the participants produced their welcome to Earth symbol, they will have selected objects based on their understanding of the properties of each material and on their reflection concerning the life on Earth. The pipe cleaner for example, may be selected as it is flexible and can be bent and twisted for a specific use, the adhesive tape for its flexibility and stickiness, the straw for its rigidity.

Exploring materials in different contexts and using and applying knowledge of materials in everyday activities supports the gathering of evidence about the properties of materials. A list of properties of materials / key vocabulary could be added (e.g. flexible, strong, fragile, hard, elastic, rigid). After having presented their symbol a subsequent activity could be to talk with each group about why they selected each material and used it in the way that they did, thus creating opportunities to explicitly reinforce the scientific elements of the activity and provide assessment opportunities (can each recognise the name of the material / describe its properties, name the property).

2. Presentation of the nature of creativity in science

This section of the workshop is more led, we suggest exploring with participants both the VLS definition of creativity and the creative dispositions in order to enable them to reflect upon the introductory activity and their own creativity in that. This helps participants to be prepared for the forthcoming activity and enables them to consider their own practice (step 3) in the light of this information. The participants also analyse the introductory activity eliciting both its creative and scientific elements. This can be a useful introduction to creative dispositions listed below (e.g. ability to come up with something new, imagination, motivation etc.) as well as to elements of science as listed above (e.g. physical properties).



‘Creative Little Scientists’ definition of creativity in early years science and mathematics education

Creative Dispositions

Sense of initiative
Motivation
Ability to come up with something new
Ability to make connections
Imagination
Curiosity
Ability to work together
Thinking skills

The pedagogical synergies between creative and inquiry-based approaches

Play and exploration
Motivation and affect
Dialogue and collaboration
Questioning and curiosity
Problem-solving and agency
Reflection and reasoning
Teacher scaffolding and involvement
Assessment for learning

3. Opportunities to share their classroom experiences of fostering creativity in general and in science-based activities

This shifts the focus to the classroom and prompts reflection and discussion. This second task provides an important opportunity to explore participants’ experiences and expertise. Since the previous part of the workshop equipped participants an understanding of creativity and its role, the discussion should contribute to raising awareness of participants’ own activities, attitudes and beliefs connected to creativity that have contributed to fostering children’s creativity.

4. Focusing on similarities between creative approaches and inquiry based science approaches to teaching and learning

This presentation focuses on the practice of teaching and learning and is separated from the earlier focus on definitions and creative dispositions in order not to overload teachers with information without enabling them to ground their new knowledge in the context of the classroom. The similarities- pedagogical synergies prepare the ground for the next step, applying these to the classroom examples.

5. Discussion of classroom examples to examine - What helps children be creative? What is the role of the teacher?

The classroom examples have considerable potential to foster interest and encourage debate. However participants may need support initially in engaging with the evidence shown in the episodes and templates. It is helpful if the module facilitators are familiar with the background to the episodes/templates selected and provide a brief introduction to each one at the start of the activity. Details can be found in the relevant Country Reports found on the CLS website www.creative-little-scientists.eu under deliverables D4.3 Country Reports. The recording sheet with the six key questions helps focus discussion and provides a basis for sharing analyses with others.

6. Discussion of implications for planning both of the classroom environment and the teacher's role.

This part of the session draws both on participants' previous experience and on the insights gained through tasks 3 and 4. Discussion of implications for planning both of the classroom environment and the teacher's role consolidates acquired knowledge and experience of creativity as well as provides focus on the implementation of newly discovered connections between experienced activities/presentations and own practice.

7. Reflections on what has been gained from the workshop – both content and process, in relation to the aims of the workshop.

It can be useful to relate the feedback from this activity to key points made in relation to tasks 3,4 and 5 – to provide an overview of implications for the teacher. This helps provide awareness of the gained insights and their implementation in the classroom.

Background reading

Defining creativity in early years science

This workshop draws on both the definition of creativity in early years science adopted by the CEYS project (Creative Little Scientists, 2012) and key features of inquiry -based approaches to science education. You may find it useful to provide opportunities for participants to become familiar with these prior to the workshop. For example:

- Module 4 Focus on inquiry-based science – link with creativity
- Module 5 Focus on practical investigation which fosters creativity
- Module 6 Collaboration and group work

The executive summaries of the Final Reports of the Creative little Scientists project

- D6.5 Final Report on Creativity and Science and Mathematics Education for Young Children EXECUTIVE SUMMARY
- D6.6 Recommendations to Policy Makers and Stakeholders on Creativity and Early Years Science EXECUTIVE SUMMARY

also provide an accessible introduction to the definitions of creativity and inquiry used during the session, with illustrations from the classroom. These documents can be found on the CLS website at <http://www.creative-little-scientists.eu/content/deliverables>.

Cremin, T. et al (2015) Creative Little Scientists: exploring pedagogical synergies between inquiry-based and creative approaches in early years science. *Education 3-13*, 43(4), 404-419.

This article built on the work of the Creative Little Scientists Project provides a useful introduction to the pedagogical synergies identified by the project between IBSE and CA to science learning and teaching.

Newton, D. P. and Newton L. D. (2009) Some student teachers' conceptions of creativity in school science, *Research in Science & Technological Education*, 27(1), pp 45-60.

This article by Newton and Newton reports findings from their study of teachers' view of creativity in science and highlights common issues and challenges.

Suggested classroom examples for use during the module

The following classroom examples would act as useful starting points for discussion.

From the *Creative Little Scientists* project at <http://www.creative-little-scientists.eu/content/deliverables>.

Selected Classroom Episodes: BE_Sandbox, GE_Building blocks and UK(EN)_Habitat Curriculum Materials

Title	Age group	Country
Investigating Materials	5-6	England
Investigating Snails	3-4	England

However, it is important to review and select examples appropriate to your context and audience. Other examples can be found on the CLS and CEYS websites.

Module resources

The following documents are provided as separate files in the Module folder for adaptation and use as appropriate during the module:

- Powerpoint presentation
 - Task 6 Implication for planning – action plan
- Recording sheets for the different activities:
 - Task 2 Creativity and Science: A3 recording sheet
 - Task 3 Fostering Creativity – Analysis of own experience
 - Task 4 The use of synergies– Analysis of own use of synergies
 - Task 5 Analysis recording sheet – examples from practice
- Handouts
 - Handout showing definition of creativity and synergies

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