Module 6: Collaboration and Group Work

Aims of the module

- Participants to understand what benefits lie in the use of collaboration and group work in early years science education and
- Participants to be able to plan activities which require group work and collaboration in order to enhance creativity in science education.
- Introduce participants to features of dialogue, collaboration and group work.
- Share strategies for stimulating and fostering children's creativity through collaboration in groups.
- Increase awareness of different ways for providing opportunities for children's creativity through collaboration and group work.

Links to the Content Design Principles and Outcomes

15. Teacher education should promote teachers' use of group work to support children's inquiry processes and creative learning.

15.1 Teachers should have knowledge of the value of collaboration for inquiry and creative thinking and learning.

15.2 Teachers should be able to purposefully use a variety of patterns of collaboration, shifting between individual and collaborative activity over time, to support children's inquiry processes and creative learning.

15.3 Teachers should be able to organize group work, aligning ways of grouping children, task design, teaching and assessment strategies in different ways to promote collaboration amongst children in science and mathematics.

15.4 Teachers should be able to use resources and teacher intervention appropriately to foster collaboration in science and mathematics.

15.5 Teachers should be able to assess group work.

15.6 Teachers should be able to use effective strategies for sharing ideas and discussions from different groups.

Rationale for the module

Why is group work and collaboration important?

Collaboration is viewed as a key aspect of inquiry based learning. In addition to supporting the development of social skills, there is evidence that suggests that collaborative learning is associated with higher performance (Kutnick 2005). Working collaboratively goes beyond what is often seen in classrooms, where children in groups work on related but individual tasks in a supportive way with shared outcomes (co operation). Collaboration entails 'participating in joint activity that is mutually supportive, working towards a common goal and developing shared understanding' (McGregor 2012:78). A key notion here is that collaboration enables the group to achieve more than could be achieved were they to work individually.

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Collaboration supports creativity, as creativity research increasingly recognises the essentially social, collective and collaborative nature of creative processes and that dialogic engagement is characteristic of classroom creativity (Vass 2007; Wegerif 2005).

Collaboration also provides opportunity for dialogic engagement. If children are afforded opportunities to explore and work in small groups, this may make them more attentive to their own thoughts and the thoughts of others, encouraging monitoring and self-regulation (Larkin, 2006; Littleton et al., 2005:50-51)." Mercer (1996) proposes that it is when working in groups that children's talk progresses from disputational and cumulative talk to exploratory talk (in which understanding is co constructed).

Dialogue is a critical feature of both creativity and inquiry-based education. There is considerable work exploring the nature of creative dialogue, which indicates that dialogic engagement is inherent in everyday creativity in the classroom (Littleton et al., 2005; Mercer and Littleton, 2007; Rojas-Drummond et al., 2006; Wegerif, 2005, 2010; Vass, 2007). Dialogic talk as discussed by Alexander (2008) is that in which engages children in thinking, exploring ideas and developing a shared understanding and forms the 'foundation of learning' (2008:9). In science learning it is widely accepted that language not only enables children to externalise, share and develop their thinking (Carlsen 2008), but also helps them consolidate their ideas (Chi et al. 1994) and develop verbal reasoning skills (Mercer, Wegerif, and Dawes 1999). As Varela (2010) posits, the communication of scientific ideas and ways of thinking allows children to listen to others' strategies and ideas, developing increased awareness which may prompt a desire to restructure their own in the face of other more plausible or consensual ones.

What are the issues for teachers?

There is evidence that children benefit from adult support in developing their collaborative reasoning and engaging creatively (Naylor et al., 2007). In contrast, Kramer and Rabe-Kleberg (2011) note that in problem-solving contexts without their teacher, preschool children' s collaborations often display creativity, enhancing their understanding of scientific processes. These researchers claim that open dialogue between children and teachers, and space/opportunities for children to experiment alone and in peer groups are prerequisites for learner creativity in science. However, Johnson's (2011) research into dialogic teaching in supporting early years scientific development concluded that adult support and dialogic interaction were crucial in encouraging children to observe, make links and develop further lines of inquiry. The teacher needs to ask probing questions to and draw out children's explanations and reasoning (Harlen & Qualter, 2009). The challenge for the teacher is how to achieve the fine line between joining in and encouraging exploratory talk without dominating the dialogic exchanges.

A challenge can be designing tasks which achieve equality of involvement and quality engagement (Galton et al 2009). Watkins suggests that for tasks to be effective in promoting collaboration they must require all group members to both work together and to contribute through their different voices and roles. Furthermore, to promote collaborative interaction and learning, the task needs to be one which does not require a 'right answer' as such but rather is open and demands higher order thinking.

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An awareness of culture is significant here; the increasing culture of accountability in schools can emphasise individualism (Watkins, 2011) On a classroom level, a culture of paired talk and interaction develops a class structure, which supports collaborative learning.

The grouping of children is a key consideration. Whether children are group according to ability or a mixed group is a key aspect to address. Harlen and Qualter (2014) draw on Howe's (1990) research, which indicated that groups that had varied ideas made greater progress supporting an argument for mixed ability groupings. This may contrast with how many classrooms are organized.

Group sizes is a further aspect which merits consideration, it has been suggested that 4 is an ideal group size, more than that and there is increased likelihood of group members going off task, and in addition a group of 4 enables children to talk in pairs and then share as a foursome (Feasey,2011 p.48).

This is frequently a concern for teachers. It is useful here to draw on the work of Barnes (1976) who argues that the learning from group discussion during practical activity needs to be followed by a wider discussion of the implications of what has been done / observed / discussed in order to consolidate learning.

Overview of the module

The module consists of the following activities:

1. **Introduction:** An active introduction to the central role of collaboration and group work in both creative and inquiry-based approaches to learning in science, followed by an interactive introductory and reflection.
2. **Opportunities for participants to share their classroom experiences** of planning to nurture collaboration and group work, challenges and successful strategies
3. **Discussion of classroom examples** from Creative Little Scientists and Creativity in Early Years Science projects to examine: What helps children collaborate? What are the consequences for task design- for teacher's role?
4. **Reflection on grouping** and how different types might foster children's creativity.
5. **Discussion of implications for planning** both of the classroom environment and the teacher's role.
6. **Reflections on what has been gained from the module** – both content and process, in relation to the aims.

Module at a glance

Time	Task	Materials	Grouping
00.00	**1. Introduction** • Presentation of facilitator and his/her/their role/s • Presentation of the main aims and objectives • Overview	Powerpoint presentation • Aims • Links to Content Design Principles and Outcomes • Session rationale • Outline of the session	Whole group
00.15	Introductory task Marshmallow & spaghetti challenge	• packs of spaghetti (approximately ¼ pack per group)	Small groups (4-5) – different sizes

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	In groups of 4 15 minutes to construct the tallest and strongest tower to support an egg using marshmallows and spaghetti. 10 minutes to present / look at one another's structures. Facilitator/Tutor is a 'Talk Detective' noting the roles teachers played- significant contributions	• marshmallows (1 pack per group)  • eggs (boiled or chocolate - less messy!) The science museum has this activity on their website http://www.sciencemuseum.org.uk/educators/teaching_resources/activities/spaghetti_challenge.aspx	
00.40	• Reflection on features of Group work and collaboration • Feedback from facilitator/tutor/Talk Detective about the spaghetti-marshmallows challenge: teachers working together towards a shared goal-solving problem thus obliged to collaborate to solve it •Where are the elements of IBSE & creativity in the activity? Importance of dialogue in the task	PowerPoint presentation Linking to work of Mercer and Alexander	Whole group
00.55	**2. Opportunities for participants to share their classroom experiences** Challenges and positives Any issues regarding. grouping – what are the concerns of teachers with collaborative working?	Task 1: Reflection on collaboration and grouping – own classroom experience A3 Recording sheet (or a handout) and post it notes for recording challenges and positives	First in pairs + Whole group discussion
1.10	3**. Task for groups** (A, B and C) Analysis of classroom interactions 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: • How far are the children collaborating? • How is the group work arranged? • What are children doing? Which goals are fostered? • What is the agency of the children? What are their roles, for example, who is in charge? • What is the role of the teacher? • Is the group work assessed and by what means? • Is creativity fostered and how? Ask groups to record their responses to each	Powerpoint slides of task Copies of episodes or templates from CLS for example Selected templates: FR_Magnet attraction or not FR_IceCreamSticks *For each group* Copies of classroom examples Task 2: Analysis recording sheet for examples from practice – handout (or A3 recording sheets) Flip chart and pens	Groups of 4-6

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	question, including any questions or issues raised.		
1.30	Break		
2.10	4**. Reflection on grouping** and relationship to creativity in early years science education – drawing on own practice Referring back to definition of creativity in early years science from CLS and list of creative dispositions. Share first in pairs, then get into small groups of 4 Brief feedback with whole group –record comments. Keep and display record sheets for reference later in the session Invite each group to share their responses with the rest of the class. Record key points in relation to the planning of the group work, role of the teacher, role of the children, resources and materials used, the assessment of the group work. Ask the teachers to reflect on ways in which creativity was fostered within the classroom examples discussed. Draw on the frameworks for creativity and inquiry and the similarities between creativity and inquiry. Encourage the teachers to reflect on the processes of group discussion during the session - ways in which they experienced collaboration and the impact on their learning. Questions that could be considered include: • Who was leading the group discussion at different points? • What was the role of each member in the group? • What was the role of the teacher educator? • Was the group discussion assessed? How might you assess the group discussion (as a participant or an educator)? • In what ways were the ideas of the different groups shared? • To what extent was creativity fostered? In what ways?	Powerpoint slides Task 3: Handouts on definition of creativity in early years science and on creative dispositions or 1 A3 Recording sheet for each group Flip chart and pens	Pairs ⇒groups of 4 + Whole group
2.30	5. **Implication for planning**- creation of a mini action plan Use the recording sheet	Task 4: Handout – Implication for planning: mini action plan and 1 copy of A3 Recording sheet per group Flip chart and pens	Individually Whole group
2.45	6. **Reflections on what has been gained from the workshop** - In what ways did the different activities support your developing thinking? - How far have the aims of the session been met?	Powerpoint slides of aims Flip chart Evaluation form	Whole group
3.00	End		

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Teacher education pedagogy

1. An active introduction to the central role of collaboration and group work in both creative and inquiry-based approaches to learning in science. This module draws on the theoretical framework of Mercer's and Alexander's work and the role of exploratory talk-hypothetical reasoning talk. You may find it useful to provide opportunities for participants to become familiar with these prior to the workshop. The introductory task provides participants with an opportunity to experience collaboration and group work while engaging in dialogue. The role of facilitator/talk detective is to make features of collaboration and group work explicit by documenting/noting down (through careful observation) the demonstrated features of collaboration and group work.

2. Opportunities for participants to share their classroom experiences of planning to nurture collaboration and group work, challenges and successful strategies. This second task provides an important opportunity to explore participants' experiences and expertise. The use of grouping is discussed and the experiences compared.

3. Discussion of classroom examples to examine: What helps children collaborate? What are the consequences for task design-for teacher's role? 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 four key questions helps focus discussion and provides a basis for sharing analyses with others.

4. Reflection on grouping and how different types might foster children's creativity. The additional layer of analysis in this task (building on recording in task 3) – in asking participants to reflect on opportunities for creativity is important in making connections between grouping and creativity *explicit.* The activity helps participants to consider in more specific terms how they might be evidenced in the classroom.

5. 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 collaboration and grouping as well as provides focus on the implementation of newly discovered connections between group work and creativity.

6. 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 2, 3 and 4 – to provide an overview of implications for the teacher. This helps provide awareness of the gained insights and their implementation in the classroom.

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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

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.

Features of dialogue and dialogic teaching

Language is often seen as the pre-eminent cultural tool and advocates of dialogic pedagogies (e.g. Alexander, 2008) maintain that classroom talk is 'central to the meaning making process and thus central to learning' (Mortimer & Scott, 2003: 3). Such a pedagogy requires teachers and learners to actively comment and build on each other's ideas, pose questions, and construct shared interpretations and 'common knowledge' (Edwards & Mercer, 1987). For the teacher, it emphasises the importance of open-ended higher order questioning and the facilitation of an 'educated' discourse. It encourages pupils to articulate and justify their own points of view, appreciate and respond to others' ideas, and take extended turns in whole-class and group interactions (Mercer & Littleton, 2007).

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: FR_Magnet attraction or not
FR_IceCreamSticks in D4.4 Appendix Selected Episodes of Practice

From the *Creativity in Early Years Science Project at* http://www.ceys-project.eu
Curriculum Materials

Title	Age group	Country
Crime Scene investigation	7-8	England
Everyday materials	5-6	England
A wisp of air	7-8	Belgium
The liquid tower	6-7	Belgium

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Properties of materials: problem solving and reasoning	4-5	England
Bath bombs	3-5	England
Investigating Materials	5-6	England
Bees and their communities	4-5	Greece

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 1 Reflection on collaboration and groupng – own classroom experience
- Task 4 Implication for planning – action plan

- Recording sheets for the different activities:
  - Task 2 Analysis recording sheet –examples from practice

- Handouts
  - Task 3 Handout of definition of creativity and on Creative dispositions.

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