CREATIVE LITTLE SCIENTISTS: Enabling Creativity through Science and Mathematics in Preschool and First Years of Primary Education

D2.1 Guidelines for the background literature reviews

www.creative-little-scientists.eu

The project CREATIVE LITTLE SCIENTISTS has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 289081.

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D2.1 Guidelines for the background literature reviews

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Website: http://www.creative-little-scientists.eu

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2	Institute of Education, University of London (UK)	IOE
3	The Open University (UK)	OU
4	Bishop Grosseteste University College Lincoln (UK)	BG
5	University of Eastern Finland (Finland)	UEF
6	Artevelde University College (Belgium)	AUC
7	Goethe University Frankfurt (Germany)	GUF
8	University of Minho (Portugal)	UMinho
9	National Institute for Laser, Plasma and Radiation Physics (Romania)	NILPRP
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Document Revision History

Revision	Date	Organisation	Description
0	21.10.11	OU / BG / UMinho / AUC / IoE / UEF/ GUF / EA	First Release (Initial Literature Review outlines, Description of main Tasks)
1	24.10.11	OU / BG	Initial Comments/Finalization of the Structure
2	25.10.11	OU / BG / AUC	Second Release (Comments / corrections)
3	26.10.11	OU / BG / IoE / UEF / UPJV / AUC / GUF / EA	Comments / corrections
4	27.10.11	OU / BG / AUC Project/Scientific Manager (EA)	Comments / finalizing / formatting
5	28.10.11	Project/Scientific Manager (EA)	Final Release (Finalization including integration into CLS template)
6	01.11.11	Quality Manager	Comments
7	02.11.11	Project/Scientific Manager (EA)	Submission of deliverable

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OVERVIEW OF DELIVERABLE

From 1 October 2011 for thirty months, *Creative Little Scientists* project is exploring how creativity is enabled in science and mathematics in preschool and first years of primary education (up to the age of 8) focusing on nine European countries. Bringing together a consortium of experts in early childhood, creativity in education, cognitive psychology, comparative education studies and teacher training from Belgium, Finland, France, Germany, Greece, Malta, Portugal, Romania and the UK, it seeks to provide a clear picture of existing and possible practices together with their implications and challenges. Drawing on a range of analytic work, the project will propose guidelines, curricula and exemplary materials for relevant teacher training extrapolating and exploiting the findings beyond the nine sample countries, at the European level.

Creative Little Scientists is divided into six work packages, details of which can be found in the Description of Work Grant Agreement.

Work Package 2 defines the detailed conceptual framework for *Creative Little Scientists* and comprises six tasks encompassing four literature reviews introduced in section 1.1 below, together with a synthesis and conceptual framework for the project. This document represents a culmination of the first task in Work Package 2, which is to produce guidelines for the background literature reviews. It comprises D2.1, the first of the two deliverables of Work Package 2 and is completed at the end of the project's first month. In this deliverable the specific areas that need to be the foci of and addressed by the different background literature reviews are defined. Furthermore, D2.1 sets the structure for each of the consortium-internal reports that will be prepared to provide input to the development of the conceptual framework (D2.2), which is the major output of Work Package 2. Finally it gives an overview of Work Package 2 and its objectives, and explains the modes of working among the partners of the consortium as well as the final outputs and agreed internal milestones for all Work Package 2 tasks.

Deliverable D2.1 is in itself the outcome of a very intense process of collaboration between all partners. This process began right at the start of the project and before the project's Kick Off meeting (on 6 and 7 October 2011), with an initial background research. It developed during the Kick Off meeting in four relevant thematic vision building workshops on:

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- creativity in education;
- science and mathematics in preschool and first years of primary education;
- creativity in science and mathematics education in preschool and first years of primary education; and
- teacher training practices for preschool and primary teachers.

It was further formalised in a teleconference meeting amongst task leaders on 14 October 2011 and in subsequent e-mail exchanges between task leaders and other partners.

It could be said that this deliverable is just 'the tip of the iceberg', representing only the end product of an animated and busy process of sharing expertise, meaning making and vision building around the core subject areas of *Creative Little Scientists*.

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1. INTRODUCTION

1.1 Overview of Work Package 2 With Goals

'Creative Little Scientists' (CLS) Work Package 2 (WP2) seeks to define the project's detailed conceptual framework, setting out the parameters to be addressed in all subsequent stages of the study. As indicated in the project's description of work, the work package will comprise four detailed and comprehensive literature reviews each generating a consortium-internal report which will contribute to the development of a synthesizing overview drawing across all four, enabling the development of the Conceptual Framework (Deliverable D2.2). The contributing tasks in building the Conceptual Framework are as follows:

Task 2.2 Review of Science and Mathematics Education for children up to the age of 8[1], exploring links between mathematics and science education and links with creativity in education.

Task 2.3 Review of Creativity in Education with a particular interest in the links between creativity and inquiry in early years science education.

Task 2.4 Review of Teacher Training for preschool educators and primary teachers

Task 2.5 Review of Comparative Education

Task 2.6 Synthesis: Development of the Conceptual Framework forming basis of future phases of the research.

WP2 is, then, focused on the defining of concepts i.e. looking at how these concepts are located and developed in research and policy – and setting out the scope of the study overall. As indicated, WP2 leads to the Deliverable D2.2, the conceptual framework for the study which as discussed in section 3 of this deliverable, will include:

- Definition of key terms (prose introduction)
- Background to this study
- Focus of this study
- Glossary of key terms

[1] Hereafter, we will use the term 'early years' to refer to 'children up to the age of 8'.

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1.2 Modes of Working

WP2 as a whole is co-ordinated by OU and BG teams: Anna Craft, Teresa Cremin, Jim Clack, Ashley Compton. Within WP2, each task team is led by a designated task leader as follows:

Task 2.1: Guidelines for the background literature reviews – OU and BG working with all other partners.
Lead Contact: Anna Craft: A.R.Craft@exeter.ac.uk

Task 2.2 Review of Science and Mathematics Education – IOE working with EA, BG, UEF, GUF, UMinho, NILPRP, UoM, UPJV
Lead Contact: Esme Glauert: E.Glauert@ioe.ac.uk

Task 2.3 Review of Creativity in Education - OU working with IoE, GUF, UPJV
Lead Contact: Teresa Cremin: T.M.Cremin@open.ac.uk

Task 2.4 Review of Teacher Training – AUC with EA, IoE, OU, BG, UEF, GUF, UMinho, NILPRP, UoM, UPJV
Lead Contact: Hilde Van Houte: hilde.vanhoute@arteveldehs.be

Task 2.5 Review of Comparative Education - UEF, UoM
Lead Contact: Sari Havu-Nuutinen: sari.havu-nuutinen@uef.fi

Task 2.6 Synthesis: Development of the Conceptual Framework – OU and BG working with all partners
Lead Contact: Anna Craft: A.R.Craft@exeter.ac.uk

Dropbox is being used as the working repository for this Work Package. All partners have been given access to this repository where each task is delineated with its own folder, and where several general folders of material can also be found.

Task leaders are each to devise and initiate their own pattern of activity with their team they are working so as to start the literature review process, thus each team will have a unique pattern of operation however each will ultimately generate:

- one Excel-based bibliographic overview: incorporating both policy and research (see example in Appendix 1);
- two set of rubrics: one for policy and one for research (Excel spreadsheets given as Appendices 2 and 3);
- a prose review of the literature using a frame for writing (see 2.2 – 2.5 below).

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The operational guidelines for each literature review as of 31 October 2011, as decided by each team, can be seen in Appendices 4-7.

It needs to be noted that the difference between Research and Policy is defined as follows.

Research involves conceptual or empirical work generating findings which may or may not engage with Europe-wide, national, regional or local policy. On the whole we are trawling research since 1990 with a few 'landmark' exceptions. The rubric for research (Appendix 3) encompasses full bibliographic reference including web links, country/region where the research was undertaken, sample size as appropriate, research questions explored, methodological approach, research methods, a summary of key findings and space for any other comments, together with the reviewer. Completion of a rubric on a research document does NOT mean it will necessarily be included in the relevant literature review/s. Whether included or not and reasons for this are therefore also to be recorded in the rubric.

Policy refers to documents, statements and initiatives that are led by government or equivalent bodies at Europe-wide, national, regional and local levels. Links between policy and research: where research studies evaluate conceptually or empirically policy interventions, such work will be counted as 'research' and will be placed in the 'research' section of the rubric though its placing in the literature review may vary according to the review teams. With regard to policy, on the whole we are trawling policy since 2000 with a few 'landmark' exceptions. The rubric for policy (Appendix 2) encompasses bibliographic reference and web link, date it was written, country and region it applies to, period for which it applied, whether mandatory or guidance, and then key messages and other comments. Completion of a rubric on a policy document does NOT mean it will necessarily be included in the relevant literature review/s. Whether included or not and reasons for this are therefore also to be recorded in the rubric.

In generating this work, each partner involved in each task will contribute their own

- bibliographic overview (ONE encompassing both policy and research)
- set of policy rubrics (using above definition)
- set of research rubrics (using above definition)

The task leader for each task will work on the generating of the Literature Review for that area, by the deadlines required (see 1.3). In addition to contributing to the

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tasks of which they are part, where information relating to other tasks proves elusive, partners may be asked to contribute relevant information.

Guidelines for bibliographic overviews are stored in Dropbox, as are blank rubrics and examples. Task leaders will create sub-folders for each partner in which to store their developing work. Partners will ensure their Dropbox work is kept updated so the task leader is aware of its growth. The reviews generated by tasks 2.2 – 2.5 will then be synthesised by OU and BG teams to offer a conceptual framing for the overall project (Task 2.6).

Task leaders are holding regular teleconference meetings by Skype and work is being collected in the shared Dropbox repository which all partners have access to. Collaborative discussions are also to be held in the project's virtual communication environment Moodle where final versions (i.e. deliverables) will be deposited. All dates for Skype meetings, notes of meetings and all work in progress on each task together with collected e-resources, will be stored in Dropbox.

1.3 Agreed Deadlines

We have devised internal milestones to the timeline for Work Package 2 ensuring timely delivery of D2.2, along with key responsibilities as follows:

Friday 18 November 2011: Internal WP2 Milestone 1 (all partners for work package working through task leaders)

- Policy and research rubrics populated fairly fully in Dropbox–these will be from across the 9 countries and Europe more generally
- Drop box organised; this includes storing any e-resources there clearly labelled
- List of resources supplied to other task groups completed

Friday 16 December 2011: Internal WP2 Milestone 2 (all partners for work package working through task leaders)

- Policy and research rubrics very fully populated in Dropbox
- Dropbox organised; this includes storing any e-resources there clearly labelled
- List of resources supplied to other task groups updated
- First Draft of each review written

Friday 13 January 2012: Internal WP2 Milestone 3 (all partners for work package working through task leaders)

- Completed full rubric in Dropbox
- E-resource collection complete for each review

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- Literature review completed – approx 10-15,000 words each [though this will vary]

Friday 10 February 2012: Internal WP2 Milestone 4 (OU lead)

- Clarifications with other partners complete
- First draft of synthesis – undertaken and circulated to partners - approx 15,000 words

Friday 9 March 2012: Internal WP2 Milestone 5 (OU lead)

- Views of partners taken on board, final clarifications made
- Conceptual framework (synthesis of all literature reviews) complete: approx 20-25,000 words

Saturday 31 March 2012: Internal WP2 Milestone 6

- Adjustments to report made as a result of quality assurance process in consultation with Anna Craft, Teresa Cremin, Ashley Compton
- Conceptual framework delivered via the Project Co-ordinator to EU.

2. TASKS OVERVIEW

2.1 Common features to each Literature Review

Each literature review should share certain features in common:

- *Bibliographies* to be written in Excel, using Harvard Referencing System (see Appendix 1)
- *Rubrics* to be written using Excel framework (see Appendices 2 and 3) in folders in Dropbox
- *Content and overlaps:* Each review will need to be as full as possible, and also looking at the various methodologies used in the studies. The OU researcher is to be alert to overlaps.
- *Age span*: Where research / policy crosses into upper primary years but is relevant to the lower years, this too will be included
- *Balance of research to policy:* The research section may be larger than 'policy' and other sections
- *Boundaries and decisions for inclusion/exclusion*: Each will encompass explanation of what has been included and why; as well as what has been excluded and why
- *File names:* Task teams to label files as seen as appropriate within the team, in such a way that the focus is clear, i.e. latest drafts are evident and authors

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visible. For deliverables, i.e. D2.1, this document, delivered at end of M1, and D2.2, the Conceptual Framework, delivered in M6, the following project-wide mode of file naming will be used:

DX.Y_Short_Title_DDMMYY_PartnerInstitutionAbbreviated_InitialsOfFirstAuthor

e.g. D2.1_Guidelines_Lit_Review_311011_OU_AC (document authored by Anna Craft on 31 Oct 2011)

Partners who review this document and suggest changes, should do so (using 'track changes' in Word), add their initials to filename and send back to Anna, who will take into consideration suggested changes and compile an updated version with a new date.

- *Tense:* Reviews to be written in present tense.
- *Translation:* Short summaries of key policy materials in particular to be put into Dropbox where necessary – a slightly longer rubric may be necessary in some cases.
- *Length:* We recognise that reviews may vary in length according to how much literature is found – there are differing amounts of literature available for each topic. However we are aiming for each task to generate a review of 10-15,000 words. OU and BG with task leaders will review this as they emerge. The over-arching synthesis may be 20-25,000 words, again to be reviewed as the work unfolds.

2.2 Science and Mathematics Education Review framing (T2.2)

The proposed framework for this review is designed to address key aims of the work package. In particular it will provide a basis for

- Identifying links between science and mathematics related curiosity and inquiry, and creativity;
- Links between certain teaching and learning approaches, and creativity;
- Definitions and aspects of creativity and related concepts in science and mathematics education.

It will provide a review of current perspectives and debates in research, policy and practice in science and mathematics education to examine links between science and mathematics in learning and teaching and the potential for creativity. This will involve consideration both of what is meant by creativity in science and mathematics education and the kinds of conditions under which this might be fostered. There will be a strong emphasis on the use of inquiry and problem solving

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in science and mathematics education[2] respectively and their links to creativity. The review will also identify current issues and research methodologies in the field to inform the design of later phases of the project.

The scope of the review reflects the importance of re-evaluating goals for science and mathematics education and of drawing on the growing research evidence related to young children's learning and effective pedagogy, in seeking to enhance opportunities for creativity in science and mathematics education.

The proposed content for Task 2.2 is as follows although in common with the other reviews, the sub-headings are likely to develop somewhat as this literature review gets under way.

1. RESEARCH

1.1 Aims for science and mathematics education
Perspectives on nature of science and mathematics
Goals of science and mathematics education in Europe and more widely
Clarification of key terms

1.2 Children's learning and development
Approaches to studying young children's learning and development
Skills and processes associated with inquiry
Understanding the nature of science and mathematics
Conceptual development, conceptual change
Attitudes to science/mathematics and in science/mathematics
Informal learning
Active learning
Links between science and mathematics
Links to creativity in learning

1.3 Research into pedagogy in science and mathematics in the early years
Approaches to research into pedagogy in science and mathematics in the early years
Goals of science/mathematics education and models of learning - their implications for teaching
Roles of exploration and investigation, role of wonder, fantasy (link stories – reality), romance

[2] In mathematics teaching, the education community often refers to 'Problem-Based Learning' (PBL) rather than to 'Inquiry-Based Learning' (IBL). In this deliverable we will use the term 'Inquiry-Based Science Education' (IBSE) to refer to both inquiry-based and problem-based education in science and mathematics.

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Roles of teacher - scaffolding processes, concepts, social interactions, promoting positive attitudes, differentiation (zone of proximal development)
Children's awareness of their own thinking, metacognition
Social interactions with peers, roles of group work
Communication in science and mathematics – varied modes, role of language, arts, ICT etc.
Contexts - classroom environment (physical, social, intellectual), making connections across the curriculum
Approaches integrating science, mathematics, movement, language, ... (integrated lessons, activities, ...)
Issues of diversity, gender
Assessment practices and their impact on learning
Teacher subject knowledge and attitudes, perception, interests
Links between approaches in science and mathematics - attitudes, inquiry
Potential for creativity in learning and teaching

1.4 Inquiry based science education (IBSE) in the early years

What is meant by inquiry based science education – international perspectives
Learning about inquiry in mathematics and science, learning through inquiry
Skills and processes associated with inquiry
Studies of inquiry-based science education in practice – insights, challenges
Connections to creativity

1.5 Nature of research approaches to mathematics and science education in the early years

2. CURRENT PERSPECTIVES AND ISSUES IN POLICY AND PRACTICE

2.1 Europe generally

Directions in current policy, aims for science/mathematics education, approaches to learning, teaching, assessment; include focus on IBSE

2.2 Perspectives from countries represented in the consortium

Perspectives and issues in each country

2.3 Approaches and issues in practice

Common and contrasting themes and dilemmas across consortium and more widely
Potential to contribute to policy and practice across the EU

3. KEY THEMES AND IMPLICATIONS FOR THE PROJECT

3.1 Common themes

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3.2 Contrasting perspectives in research/policy/practice

3.3 Issues and implications for CLS project – research questions and methodological issues

2.3 Creativity Review Framing (T2.3)

Areas to be covered in this task were identified by the team as a whole led by OU, based on extensive experience in the field of creativity research. These are considered to be the key research issues that need to be trawled so as to situate creativity in early years education, both historically and in order to encompass the current and recent policy context within Europe and the nine participating partner countries in *Creative Little Scientists*.

1. RESEARCH

1.1 Nature of creativity and innovation in education

Creative processes/models of creativity and innovation
Approaches to / conceptualisations of creativity and innovation in relation to learning (encompassing 'development' of creativity)
Overlaps and distinctiveness between creativity and innovation

1.2 Nature of creativity in the early years

Approaches to / conceptualization in curriculum
Approaches to / conceptualizations in relation to pedagogy (encompassing 'creative teachers' and also class/school ethos)
Approaches to / conceptualizations in relation to learning potential in early years

1.3 How is creativity documented / evaluated in the early years?

Approaches to / conceptualizations of assessment (encompassing 'predictive potential' of creativity and possibly innovation)

1.4 Nature of research approaches to creativity in early years

2.1 Europe generally

2.2 Perspectives from countries represented in the consortium

2.3 Issues / approaches compared and contrasted

3.1 Emerging commonalities

3.2 Emerging tensions / dilemmas / issues for CLS

3.3 Emergent working definition/s of creativity in the early years for CLS

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2.4 Teacher Training Review Framing (T2.4)

Task 2.4 (teacher training) is focused on mapping the conceptual issues rather than operational practices. Teacher training can be defined as initial teacher training or continuous professional development. They differ by means of policy, practice and profile of the leaner. However they are both building on a broad framework of higher and adult education-related parameters, as mentioned in the outline. In the project we are mainly interested in examples of teacher training in which people do succeed in providing and organizing science and mathematics education which fosters creativity and/or inquiry. Areas to be covered follow.

1. STARTING DEFINITIONS

Initial teacher training for preschool and primary school teachers
Continuous professional development for preschool and primary school teachers
Lifelong learning

2. CURRENT ISSUES IN POLICY

2.1 Issues (i.e. perspectives, regulations) regarding initial teacher training and continuous professional development concerning science and mathematics in Europe generally. Exploring:

General issues with regard to teacher training
How 'creativity' as a concept is represented
How 'inquiry' is represented

2.2 Issues (i.e. perspectives, regulations) regarding initial teacher training concerning science and mathematics in different countries of Europe. Exploring:

Competences of the teacher trainer
Competences of the student following initial teacher training
Inflow of the student
Curricula (content of programmes/courses)
In-service teacher education: learning process, learning materials, instruction, learning environment, …
Internships and/or teacher practice
Assessment
How 'creativity' as a concept is represented
How 'inquiry' is represented

2.3 Issues (i.e. perspectives, regulations) regarding continuous professional development concerning science and mathematics in different countries of Europe. Exploring:

Aims of continuous professional development

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Learning and instruction
Inflow of the learner following the professional development course
Assessment
How 'creativity' as a concept is represented in policy documents
How 'inquiry' is represented in policy documents

3. KEY FINDINGS IN RESEARCH

3.1 Research methods mentioned in the articles

3.2 Key findings regarding initial teacher training programmes for preschool and primary school teachers concerning science, mathematics, and creativity. Exploring:

Competences of the teacher trainer
Competences of the student
In-service teacher education: learning process, learning materials, instruction, learning environment, …
Internships and/or teacher practice
Assessment
Learning outcomes
How 'creativity' as a concept is represented
How 'inquiry' is represented

3.3. Key findings regarding continuous professional development for preschool and primary school teachers concerning science, mathematics, and creativity. Exploring:

Competences to be reached
Professional development aims
Learning and instruction
Learning outcomes
How 'creativity' as a concept is represented
How 'inquiry' is represented

4. LESSONS TO BE LEARNED FROM POLICY AND RESEARCH

4.1 Initial teacher training

4.2 Continuous professional development

4.3 Discussion

2.5 Comparative Education Review Framing (T2.5)

Task 2.5 is to focus on relevant *comparative education studies* (such as those focusing on international assessments such as TIMSS or PISA or other more narrowly conducted comparisons) to be able to find the issues which have been the foci of these comparisons and to reveal how education in key areas of the project

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differs. This review will enable the identification of the list of factors for the mapping and comparison of existing approaches in WP3. The areas to be covered in this review report which have been chosen as the key elements that it is anticipated need to be addressed, notably mainly form research studies, are at present envisaged as follows:

1. INTRODUCTION

1.1 Defining comparative education

Short outline (to include whether any of the participating countries in this study have policies on participation in comparative reviews)

1.2 Comparative education in early years in Europe

2. COMPARATIVE STUDIES which include European countries - as well as those beyond - focusing on

Science and mathematics education
Creativity in education

3. METHODOLOGIES USED

Description of methods used in comparative studies
Advantages and challenges of used methods

4. CONCLUSION

Main results of review (similarities and differences)
Strengths and weaknesses of comparative studies
What we need to do in CLS in terms of comparison

2.6 Synthesis: Development of the Conceptual Framework (T2.6)

This synthesis task will bring together the concepts and issues identified in the four literature reviews, highlighting intersections as well as areas that do not overlap. It will highlight emergent areas for research and will therefore draw together areas of focus for the study, including refining research questions. The overall conceptual framework will emerge from Task 2.6 and be closely linked with it.

OVERALL CONCEPTUAL FRAMEWORK (DELIVERABLE 2.2)

The overall conceptual framework will bring together conceptual ground covered in the four literature reviews and will set out the following.

Definition of key terms (prose introduction plus appendix glossary of these)

Background to this study

- Overview of each lit review

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- Identification and articulation of overlapping conceptual ground between creativity, science/mathematics education and early years
- Exploration of comparative approaches and emergent teacher education issues
- Identification of methodological issues within the literature

Focus of this study

- Identification of precise ground for exploration in empirical work
- Articulation of research questions for this study
- Clarity on epistemological and ontological foundations (and therefore on methodological framing and methods) for this study

Appendix: Glossary of key terms

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APPENDIX 1: EXAMPLE BIBLIOGRAPHIC FILE

Institution	Bibliographic List - For Creativity Review 2.3 including research and policy NB Arial 10	Research	Policy
OU	Clarke, C. and Douglas, J. (2011) *Young People's Reading and Writing: An in-depth study focusing on enjoyment, behaviour, attitudes and attainment. [online] Available from: http://www.literacytrust.org.uk/assets/0000/8266/Attitudes_towards_Reading_Writing_Final_2011.pdf* [Accessed 31st May 2011].	Y	
OU	Craft, A. (2003) 'Creative Thinking in the Early Years of Education', *Early Years,* 23(2):147-158.	Y	
OU	Cremin, T. (2009) 'Creative teaching and Creative Teachers', in Wilson, A. (ed*) Creativity in Primary Education*, pp. 36-46, Exeter, Learning Matters	Y	
OU	Csikszentmihalyi, M. (1996) *Creativity: Flow and the Psychology of Discovery and Invention*, New York, Harper Perennial.	Y	

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APPENDIX 2: POLICY RUBRIC TO BE USED BY ALL PARTNERS

BLANK RUBRIC FOLLOWED BY EXAMPLE COMPLETED RUBRIC

Full bibliographic reference (& web link if any)	
Country / region	
Date written	
Period this applied emerging / current / previous)	
Status (Mandatory or Guidance)	
Age this relates to	
Key messages	
Other comments	
Used in review? (Yes / No)	
Reasons for inclusion or exclusion	
Reviewer	

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Full bibliographic reference (& web link if any)	National Advisory Committee on Creative and Cultural Education (1999) All Our Futures. London:DfEE
Country / region	England
Date written	1999
Period this applied (emerging / current / previous)	This was not a government policy per se but a set of committee recommendations which led to government reviews e.g. Roberts review (2006)
Status (Mandatory or Guidance)	Guidance
Age this relates to	5 to 18
Key messages (in relation to CLS)	The report recognised creativity as linked to culture, proposed a democratic conception of creativity and produced a subsequently widely used (by English policy makers) definition of creativity as' imaginative activity fashioned to produce outcomes that are original and of value...'; The report perhaps itself a response to agendas of performativity which took hold in the 1990's, contributed to an evolving creativity discourse and policy drivers which included increased attention creativity in the curriculum (DfES, 2003, QCA, 2005), and the codifying of National Curriculum creative thinking skills for 5-16 year olds. The Creative Partnerships initiative in England also emerged in 2002 from the NACCCE Report's recommendations with the aim to "develop school children's potential, ambition, creativity and imagination" by "building sustainable partnerships that impact upon learning between schools, creative and cultural organisations and individuals" (Creative Partnerships website, 2007). This was followed by the Roberts Review of creativity and economy (Roberts, 2006), to which Government responded (DCMS, 2006), and which was in turn followed by a Government Select Committee (2007), which recommended further integration of creativity in the curriculum, and the development of a 'Cultural Offer' (Arts Council, 2008). Thus this landmark document led to policy developments which paid close attention to arts, culture and education, with a strong emphasis on democratic or everyday creativity as exemplified within it.
Other comments	The report arguably also influenced strong role afforded creativity within Scottish Curriculum
Used in review? (Yes / No)	Yes
Reasons for inclusion or exclusion	In England this document was significant heralding a decade of creativity in policy and practice
Reviewer	Teresa Cremin, OU

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APPENDIX 3: RESEARCH RUBRIC TO BE USED BY ALL PARTNERS

BLANK RUBRIC FOLLOWED BY EXAMPLE COMPLETED RUBRIC

Full bibliographic reference (inc web links)	
Country / region (where research undertaken)	
Sample (i.e. size, age, group)	
Research questions (as stated or implied)	
Methodological approach (as stated in paper)	
Research methods	
Key findings	
Other comments	
Used in review? (Yes / No)	
Reasons for inclusion or exclusion	
Reviewer	

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Full bibliographic reference (inc web links)	CHAPPELL, K., CRAFT, A., BURNARD, P., CREMIN, T (2008), Question-posing and Question-responding: the heart of 'Possibility Thinking' in the early years. Early Years, Vol 28, Issue 3, October 2008 pp 267-286. http://www.informaworld.com/10.1080/09575140802224477
Country / region (where research undertaken)	England (South)
Sample (i.e. size, age, group)	1. Infant school (in suburb of small city): Reception class of 4-5 year olds and their teacher 2. Primary school (in village): Y2 class of 6-7 year olds and their teacher.
Research questions (as stated or implied)	What are the dimensions of question-posing and the categories of question-responding and their interrelationship within Possibility Thinking?
Methodological approach (as stated in paper)	Co-participative, qualitative, case study
Research methods	Video data representing range of play and of individual, paired, group activity + gender balance; Episodes of a child/children's immersion in sustained focused playful activity were selected (8 from infant school, 10 from primary school) and additional criteria used to identify key sections for detailed transcription and analysis. Unit of analysis: a single discernable action. Detailed interpretive commentaries developed for each transcript. Analysis involved video-stimulated review with teaching staff and comparison with own observations, and triangulated analysis in uni research team, deductive & inductive framing
Key findings	Taxonomy of question-posing and question responding with three main dimensions: Question Framing : i.e. manifestation of the purpose inherent within questions for adults and children (leading, service and follow-through questions); Question Degree : i.e. manifestation of the degree of possibility inherent in children's questions (possibility narrow, possibility moderate, possibility broad); Question modality (verbal / non-verbal)
Other comments	
Used in review? (Yes / No)	Yes
Reasons for inclusion or exclusion	In field of Possibility Thinking this is a landmark paper
Reviewer	Anna Craft, OU

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APPENDIX 4: Guidelines for Science and Mathematics Education Literature Review 2.2: Draft 1 30.10.2011

Very many thanks for your ideas about how you might best contribute to this task. Below are some suggestions for ways of working. Do please let me know if you have any further suggestions or questions.

1. Division of work

I have drawn up a grid of the particular areas of expertise you identified and used it to devise a proposal for how we might work in the first phase of populating the bibliography and rubrics. (The grid can be found as an appendix to this document). Do let me know if there are any mistakes or omissions!

a) I am proposing that partners might start by concentrating on the following areas in relation to the outline for the task (shown in dark shading on the grid)

1 Research

1.1 Aims for science and mathematics education – BG, IoE, UMinho
1.2 Children's learning and development – GUF, UEF, UPJV
1.3 Research into pedagogy – BG, IoE, UoM
1.4 Inquiry-based science education – EA, NILRP, Uminho
1.5 Nature of research approaches – IoE, OU

2 *Current perspectives and issues in policy and practice*Europe generally – UoM, EA, NILRP
2.2 All partners need to contribute to this.
2.3 and 3 will draw together themes from across the review.

b) This is not meant to be restrictive as many of us have expertise across several areas and the grid will help us to make sure we draw on this. So do please also add to the bibliography in relation to other sections as our work progresses.

2. Procedures

- As with all tasks in WP2, partners will contribute to a common bibliographic list (using Harvard conventions). This can be found in a separate folder within Task 2.2 in Dropbox. I will add some science/mathematics examples.
- To avoid duplication it will be vital to keep the bibliography up to date and I suggest that we each enter several key references at a time before completing the associated details in the relevant rubric.
- Each partner will develop rubrics for research and policy. These can be found in the folders provided for each partner.

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- There is also a separate folder in Dropbox for all partners to add e-materials on policy and research.

3. Deadlines

M1 - Friday 18 November 2011 – initial set of literature under consideration written into the bibliographic list by each partner and research and policy rubrics fairly fully populated – both in Dropbox. E-material collection in drop box by each partner under way.

M2 – 16 December 2011 – bibliographic list and rubrics extended. First draft of literature review completed

M3 – 13 January 2012– completed full rubric in Dropbox with e-resource collection. Literature review complete.

M4 – 10 February 2012 – OU leads on first draft of synthesis - all partners consulted.

M5 – 9 March 2012 – OU takes on board views of all partners, conceptual framework.

M6 – 31 March 2012 – OU team responds to quality assurance process, conceptual framework delivered to EU.

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Appendix: Task 2.2: Areas of expertise and proposed allocation of responsibilities 30.10.2011

Key:	**Dark shading – proposed areas for initial focus for developing bibliography and associated rubrics** **Grey shading – areas of expertise**

1. RESEARCH	**GUF**	**UEF**	**UPJV**	**BG**	**IoE**	**UoM**	**EA**	**NILRP**	**UMinho**	**AUC**	**OU**
1.1 Aims for science and mathematics education											
Perspectives on nature of science and mathematics Goals of science and mathematics education											
Clarification of key terms											
1.2 Children's learning and development											
Approaches to studying young children's learning and development											
Skills and processes associated with inquiry											
Understanding of the nature of science and mathematics											
Conceptual development, conceptual change											
Attitudes *to* science/mathematics and *in* science/mathematics											
Informal learning											
Active learning											
Links between science and mathematics											
Links to creativity in learning											

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1. RESEARCH	GUF	UEF	UPJV	BG	IoE	UoM	EA	NILRP	UMinho	AUC	OU
1.3 Research into pedagogy in science and mathematics in the early years											
Approaches to research into pedagogy in science and mathematics in the early years											
Goals of science/mathematics education and models of learning - their implications for teaching											
Roles of exploration and investigation, role of wonder, fantasy (link stories – reality), romance											
Roles of teacher - scaffolding processes, concepts, social interactions, promoting positive attitudes, differentiation (zone of proximal development)											
Children's awareness of their own thinking, metacognition											
Social interactions with peers, roles of group work											
Communication in science and mathematics – varied modes, role of language, arts, ICT etc.											
Contexts - classroom environment (physical, social, intellectual), making connections across the curriculum											
Approaches integrating science, maths, movement, language, ... (integrated lessons, activities, ...)											
Issues of diversity, gender											
Assessment practices and their impact on learning											
Teacher subject knowledge and attitudes, perception, interests											
Links between approaches in science and mathematics - attitudes, inquiry											
Potential for creativity in learning and teaching											

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1. RESEARCH	GUF	UEF	UPJV	BG	IoE	UoM	EA	NILRP	UMinho	AUC	OU
1.4 Inquiry based science education (IBSE) in the early years											
What is meant by inquiry based science education – international perspectives											
Learning about inquiry in mathematics and science, Learning through inquiry											
Skills and processes associated with inquiry											
Studies of inquiry-based science education in practice – insights, challenges											
Connections to creativity											
1.5 Nature of research approaches to maths and science education in the early years											
2 CURRENT PERSPECTIVES AND ISSUES IN POLICY AND PRACTICE											
2.1 Europe generally											
Directions of travel in current policy – aims for science/mathematics education, approaches to learning, teaching and assessment (include focus on IBSE)											
2.2 Perspectives from countries represented in the consortium											
Perspectives and issues in each country											
2.3 Approaches and issues in practice											
Common and contrasting themes and dilemmas across the consortium and more widely											
Potential to contribute to policy and practice across the EU											

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3 KEY THEMES AND IMPLICATIONS FOR THE PROJECT											
3.1 Common themes											
3.2 Contrasting perspectives in research/policy/practice											
3.3 Issues and implications for CLS project – research questions and methodological issues											

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APPENDIX 5: Guidelines for Creativity in Education Literature Review 2.3

Dear colleagues, both core partners (GUF, IOE, OU, UPJV), and non-core(policy only) partners i.e. everyone else (AUC, BG, EA NILPRP, UEF, UMinho, UoM)

Our goal

Our aim is to create a cutting edge synthetic review of creativity in education in the early years- NOT just in Europe but more broadly and then applied to Europe and to this project. This will contribute to the conceptual framework of the project.

Developing practice as reviewers on CLS

As we are achieving this goal between us we need to be assiduous in recording what we are reviewing as we work over the next months. We are using one bibliographic list for this to avoid repetition, to ease referencing and to help us see the breadth of the work as it unfolds.

I am requesting therefore that we each:

1. Identify and record half a dozen reviews that we can contribute at a time
2. List these in the bibliographic list (in the 2.3 Dropbox folder) - whether policy or research- *before* we undertake the reviewing
3. Undertake the reviewing and paste the rubrics into our own institutional rubric for policy or research as appropriate
4. Move on to identify the next 6, (as per 1 above) first listing them in the bibliography (as per 2 above) and then moving to reviewing and pasting (as per 3 above).

Again as per 2.4 teacher training, I would ask each partner to add their first half a dozen **key pieces to the Bibliographic list by Nov 6th,** for many partners this will be 6 relevant policy documents since 2000 with regard to this age phase.

We will be using Harvard referencing - (http://libweb.anglia.ac.uk/referencing/harvard.htm)

Each partner has a named institutional folder in one of the two folders: core or non core partner. This contains your rubric/s.

Policy Rubrics

Each core and non-core partner has a rubric for policy in their folder

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Research Rubrics

Each core partner also has one of these in their folder. Core partners please note whilst numbers are insidious, this is a massive review, so we will need to read widely and rapidly, drawing on significant work.

E-materials

Please add any e-resources which are clearly labelled, but as Hilde notes for 2.4 any e-materials which are not in English but are key or landmark statements or research, should be summarized in English. These resources will be particularly useful for the OU team as we try to read across the documents and revisit some for more details.

A reminder of the deadlines

- 6 November 2011: Initial set of literature written into bibliographic list by each partner.
- 18 November 2011: Rubrics being developed and further populated. Additional entries in bibliographic list starting to be expanded into rubrics in Dropbox. E-materials collection in Dropbox by each partner under way as appropriate .
- Early December 2011: Bibliographic list and rubrics in Dropbox and being populated, e-materials being collected by each partner.
- Friday, 13 January 2012: Completed full biblio lists, rubrics and e-resources all in Dropbox, Lit Review for Task 2.4. complete.

Outline of Task 2.3 – Creativity in Education

Teresa Cremin, OU [Task 2.3 leader]
With Jim Clack, Anna Craft (OU), Esme Glauert, Andrew Manches (IoE), Annette Scheersoi (GUF), Olga Magalakaki, Thalia Magioglou (UPJV)

- Where research / policy crosses into upper primary years but is relevant to the lower years, this will be included.
- The research section may be larger than the 'policy' and 'issues arising' sections.

Areas to be covered**:**

1. RESEARCH

1.1 Nature of creativity and innovation in education

Creative processes/models of creativity and innovation
Approaches to / conceptualisations of creativity and innovation in relation to learning (encompassing 'development' of creativity)
Overlaps and distinctiveness between creativity and innovation

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1.2 Nature of creativity in the early years

Approaches to / conceptualization in curriculum

Approaches to / conceptualizations in relation to pedagogy (encompassing 'creative teachers' and also class/school ethos)

Approaches to / conceptualizations in relation to learning potential in early years

1.3 How is creativity documented/evaluated in the early years?

Approaches to / conceptualizations of assessment (encompassing 'predictive potential' of creativity and possibly innovation)

1.4 Nature of research approaches to creativity in early years

2. POLICY

2.1 Europe generally

2.2 Each country represented in project

2.3 Issues / approaches compared and contrasted

3. ISSUES ARISING

3.1 Emerging commonalities

3.2 Emerging tensions / dilemmas / issues for CLS

3.3 Emergent working definition/s of creativity in the early years for CLS

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APPENDIX 6: Guidelines for Teacher Training Literature Review 2.4

Dear partners of Task 2.4 (AUC, BG, EA, GUF, IOE, NILPRP, OU, UEF, UMinho, UoM, UPJV),

As we are in this task with many (every partner of the project), we slightly changed the guidelines and the structure of the repository in Dropbox. We apologize for any inconvenience caused by this changed instruction.

New guidelines

As you all know each partner has to search for research literature and policy documents in this task. Each partner has to add *e-materials*, has to develop a *bibliographic overview* (using one list) and has to develop *rubric documents*. You can find more details in the document 'Guidelines for Background Literature Review' (Dropbox subfolder 'Scope of review').

Task 2.4 (teacher training) is focused on mapping the conceptual issues rather than operational practices. Teacher training can be defined as initial teacher training or continuous professional development. They differ by means of policy, practice and profile of the leaner. However they are both building on a broad framework of higher and adult education-related parameters, as mentioned in the outline. In the project we are mainly interested in examples of teacher training in which people do succeed in providing and organizing mathematics and science education which fosters creativity and/or inquiry.

Since we know that there aren't many research documents on initial teacher training and professional development for preschool and primary school teachers (in the domain of science and mathematics, fostering creativity or not), we'd like to invite every partner to search for research documents. However you can also mention to us your area of expertise and specific contributions for the research literature. Could you please send it to us by Monday next week?

Bibliographic list

To identify easily the different documents of each partners and to avoid duplication, we are going to use only **one overviewing bibliographic list** (for policy and research documents). You find this list (an Excel-sheet) with examples for Task 2.4 in Dropbox (subfolder 'Task 2.4' > subfolder 'bibliographic list'). To start, we would like that every partner add their first **key pieces** on the list **by the end of next week**.

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We all have to use the Harvard referencing system (http://libweb.anglia.ac.uk/referencing/harvard.htm).

Rubric documents

Each partner has to develop two set of rubrics: one for policy and one for research. You can find more details for these rubrics in Dropbox. (subfolder 'scope of review' > D 2.1 Guidelines for Background lit Review).

Policy Rubric

You can find the Excel-spreadsheet for policy in Dropbox (subfolder 'Task 2.4' > subfolder 'rubrics' > subfolder 'rubrics policy').

Research Rubric

You can find the Excel-spreadsheet for research in Dropbox (subfolder 'Task 2.4' > subfolder 'rubrics' > subfolder 'rubrics research'). Note that the Excel-spreadsheet for research is adjusted to Task 2.4. We made some additional suggestions to have more details on the teacher training programmes or professional development programmes. These additional suggestions are in accordance with the outline of Task 2.4 (see subfolder scope Task 2.4).

E-materials

Any e-resources which are clearly labelled. E-materials which are not in English but are key or landmark statements or research, should be summarized in English.

Structure of Dropbox subfolder 'Task 2.4 Teacher training'

1. Scope of Task 2.4

2. Guidelines Task 2.4: you can find the detailed guidelines for Task 2.4 in this subfolder

3. Bibliographic list: one list for research and policy (used by every partner). Please keep this list up to date, add only references you are going to review and add this reference first to the list before adding it in the policy or research rubric.

4. Rubrics: This subfolder is divided in two subfolders – rubrics policy and rubrics research – each divided in 11 subfolders (the 11 partners of this task).

5. E-materials partners: this subfolder is divided in different subfolders using the names of the partners. The partners add their e-materials in these subfolders.

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6. Review teacher training: guidelines for the review text shall be developed by mid November

A reminder of the deadlines

- End of next week (4 November 2011): Initial set of literature (key pieces of each partner) written into bibliographic list by each partner.
- 18 November 2011: Bibliographic list being further populated and starting to be expanded into Rubric, both in Dropbox. E-materials collection in Dropbox by each partner under way.
- Early December 2011: Bibliographic list and rubrics in Dropbox and being populated, e-materials being collected by each partner. By 16th December there will be a first draft. Afterwards a feedback round will follow.
- Friday, 13 January 2012: Completed full biblio lists, rubrics and e-resources all in Dropbox, Literature Review for Task 2.4. complete.

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APPENDIX 7: Detailed guidelines for Comparative Education Literature Review 2.5

The Task 2.5 Review of comparative education is led by UEF and UoM and all other partners (GUF, IOE, OU, UPJV,AUC, BG, EA, NILPRP, UMinho) are assisting with information.

In Task 2.5 we aim to create an extensive view of comparative education research done in Europe and even more broadly in the world. Through this review we aim to figure out the areas which have been compared in the key areas of this project (creativity, science and mathematics education) and what kind of implications these comparisons can reveal for the project. The synthesis created in this task contributes the conceptual framework and especially the focuses on WP3.

In this task we concentrate on research documents, but also policy documents generally focusing on comparative education are needed. Especially country based guidelines of findings are welcome.

Based on the aims of this task, I suggest you to start to assist us taking account of the following issues:

1. Identify and record as many as you can (4-6) research reviews in which comparative aspect of creativity, mathematics or science education is involved. Following the guidelines of previous task of WP2 we start to record the information using one bibliographic list for this to avoid repetition and to help us see that all sub-areas (mathematics, science education, creativity and all countries are well presented). THUS list these in the bibliographic list (in the 2.5 Dropbox folder) - either policy or research. I'll inform you if there is overlap with the references.
2. Work with rubrics separating the policy and research documents. *Based on the information provided through the rubrics we aim to produce the synthesis (see outline of Task 2.5). Thus it is extremely important that you provide information as detailed as possible.*

Deadlines

We would like to ask you to insert the key references to the bibliographic list by **Monday 7 November 2011**. Thus on Tuesday 8 November 2011 we will be ready for working with rubrics.

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Fri 18th on November we need to have rubrics fairly fully populated in Dropbox. See the general agreed deadlines from the guidelines for WP2.

Rubrics and Policy and Research documents

Each partner has a named institutional folder. This contains your rubric/s for both policy and research documents. See folder for UEF –refer to examples loaded please. All materials you use in rubrics, please notice that it must be summarized in English. There is separate folder for other e-materials, which you see relevant for the Task 2.5.

Like other tasks, we will be using Harvard referencing
(http://libweb.anglia.ac.uk/referencing/harvard.htm)

Outline of Task 2.5 – Review of Comparative Education

Task 2.5 is to focus on relevant *comparative education studies* (such as those focusing on international assessments such as TIMSS or PISA or other more narrowly conducted comparisons) to be able to find the issues which have been the foci of these comparisons and to reveal how education in key areas of the project differs. This review will enable the identification of the list of factors for the mapping and comparison of existing approaches in WP3. The areas to be covered in this review report which have been chosen as the key elements that it is anticipated need to be addressed, notably mainly form research studies, are at present envisaged as follows:

1. INTRODUCTION

1.1 Defining comparative education

Short outline (to include whether any of the participating countries in this study have policies on participation in comparative reviews)

1.2 Comparative education in early years in Europe

2. COMPARATIVE STUDIES which include European countries - as well as those beyond - focusing on

Science and mathematics education
Creativity in education

3. METHODOLOGIES USED

Description of methods used in comparative studies
Advantages and challenges of used methods

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4. CONCLUSION

Main results of review (similarities and differences)
Strengths and weaknesses of comparative studies
What we need to do in CLS in terms of comparison

With your expertise we are able to create the review of comparative education and find the key guidelines for further work. Thus any comments or questions are warmly welcome!

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