Creativity in Early Years Science Education

Guidance on constructing a Professional Learning Journey Portfolio

The project CREATIVITY IN EARLY YEARS SCIENCE EDUCATION has received funding from the European Union Erasmus+ Programme (2014-2017) under Grant Agreement nº 2014-1-EL01-KA201-001644.

The Professional Learning Journey Portfolio

These guidance notes are not meant to be prescriptive, but offer a common structure and some possibilities for inclusion within the portfolio. As the project progresses, ongoing support for developing the **Professional Learning Journey Portfolio** will be given by your CEYS co-ordinator. It is suggested that the project teachers' portfolios are organised into four main sections as noted below. Section 1 is background information about the project which is included within the guidance notes. The three other sections of the Portfolio will be created by the 25 plus project teachers across Europe and over the period of the project. A range of suggestions about what might be collected and documented in these are offered in this guidance and some material is also included here for reference in Section 4.

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In addition to the portfolio, teachers are invited to keep a Research diary and are asked to submit this or extracts of it at the end of the project, as well as their portfolio at the end of summer 2016 after the Summer School in Greece. Discussion and support about what might be included in the research journal will be offered.

Both the Portfolio and the Research diary are crucial tools for teachers on the project to prompt reflection and enrich understanding of the insights developing about science and creativity in the early years with children aged 3-8 years. They also represent a rich and significant resource for the CEYS team who are seeking both to support and to document this research and development project in order to enable new materials to be made available to the profession, both student teachers and those who are currently practitioners. As the wider project team may well wish to use elements of your portfolio for exemplar materials and/ or training so we hope teachers will keep these carefully, they will also be of considerable use professionally as a resource which reflects professional learning.

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Section 1 General Information

A) Background

School in Europe today would benefit considerably from acknowledging and fostering the link between science education and creativity. There is increasing recognition of young children's capabilities and the importance of early years education in building on early experiences and promoting knowledge and understanding, skills and dispositions.

Interestingly, an inherent link seems to exist between creativity and science education. Science intrinsically involves inquiry and invention, which are triggered by curiosity, intuition, imagination, all of them elements closely related to creativity; it is also widely accepted nowadays that effective science education is based on inquiry, which can lead to wonderment, and is fuelled by curiosity.

Creativity has moved away from the traditional link with the arts to a focus on problem finding and problem solving. Motivation has an important role to play in creativity too.

In the teaching and learning of science, a more creative approach based on curiosity and inquiry would be beneficial, involving, for instance, opening up opportunities for children to raise questions, make decisions, and be able to take risks and unlock their creativity. Creativity, in this framework, is focused on generating and evaluating ideas and strategies in science

There is on the whole consensus that any materials to be used by teachers should be designed in collaboration with them and with the involvement of all relevant stakeholders in order to be relevant and have the maximum potential for impact. Collaboration between schools and higher education institutions not only improves initial teacher education but also contributes to school development and teachers' professional development.

B) Project outline and aims

CEYS is an Erasmus+ funded partnership that is aiming to develop a teacher development course and accompanying materials, this could also be used in professional development to promote the use of creative approaches in teaching science in preschool and early primary education, in the frame of inquiry-based educational environments.

CEYS builds on the findings of the FP7 *Creative Little Scientists* project (grant number 289081) October 2011 - March 2014 which researched creativity in early science and mathematics among 3-8 year olds in 9 partner countries. http://www.creative-little-scientists.eu/

CEYS involves partners from across Europe. The coordinators Dimtris Rossis and Fani Stylianidou are based in Ellinogermaniki Agogi, in Athens, Greece. England has two partners Esmé Glauert and Jill Trevethan at UCL, the Institute of Education (IOE), London and Teresa Cremin and Tatjana Dragovic from the Open University (OU) working with Jessica Baines Holmes from Brighton University. In addition, Dan and Adelina Sporea are partners from Romania where they work in Institut Nationale de Crecetare Dezvoltare Pemntr Fizica Laserilor (INFLPR) and Bea Merck and Jozefien Schaffler who work in Arteveldehogeschool (AUC), Belgium.

Participating teachers will take part in professional development workshops held in the participating countries aimed at promoting the use of creative approaches in science teaching. They will have an opportunity to take part in curriculum development as co-designers in the iterative phases of development of the CEYS course, enhancing their ownership and thus facilitating their adoption of the approach though the use of action research.

CEYS overall aims to:

1. Propose concrete **training materials** that can be used in teacher education for preschool and primary teachers in order to foster their use of creative and inquiry-based approaches in science teaching.
2. Involve **teachers as co-designers** in the iterative phases of development of its interventions, sharing their ownership and thus facilitating their adoption.
3. Implement and validate a number of **training activities** at national and international levels with the scope to improve preschool and primary teachers' knowledge and skills.
4. Develop a **systematic evaluation methodology** in order to identify the impact of the proposed training process and materials in terms of both effectiveness and efficiency.

The aims of the teacher focused part of the CEYS project (including five curriculum development workshops) are:

- to promote the use of creative approaches in early years science teaching;
- for participating teachers to take part in professional development and in curriculum development as co-designers in the iterative phases of development of the CEYS course, enhancing their ownership and thus facilitating their adoption of the creative approaches though the use of action research;
- to support the process of development of appropriate content for the CEYS professional development training of teachers i.e. the CEYS Training Course for early years teachers that will be based on the participating teachers' feedback.

C) The process of the teacher focused part of the CEYS project

Workshop Focus	**Main Focus of the Term**
Summer 2015 **Workshop 1:** The first workshop will focus on introducing teachers to action research; the key principles/frameworks underpinning the project, the pedagogical synergies from CLS, spider web of curriculum dimensions; the contextual factors and the key priorities from CLS in order to help them identify an area for their AR project. This will be further supported by teachers completing the initial survey (see Appendix B) and discussing this and revisiting the project expectations, the portfolio and its role in the wider project. The session will also involve an activity exploring some of the CLS materials enabling the teachers to ascertain the ways in which they might document their focus children's learning. The work set will involve experimenting with some of the CLS materials/strategies for the remainder of the	**Phase 1: Getting Started and Planning** *In this phase teachers will be developing their knowledge and understanding of the project's remit, of action research as a tool for CPD and curriculum development* *They will also be considering ways in which they might develop their practice within CEYS principles and how they might seek in the autumn term to document the children and their own professional learning.* *During the latter part of this term, teachers are invited to make use of the currently available CLS materials to support them as they explore teachings science creatively and pay increased attention to creativity in this context. Through this they are expected to identify at least two foci for AR in autumn term.*

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summer term in order to identify appropriate research questions to bring to the second workshop in early autumn preparing to commence their AR first cycle. Time set aside for written reflection highlighting effective teaching and learning strategies and management of change. (Appendix C)	
Autumn 2015 **Workshop 2 : early autumn term** This workshop will help teachers to refine their research questions connected to spider web; identify justify and document their choices for focus children; and offer support for planning an extended learning sequence with appropriate resources within which the AR cycle will be nested. They will be exploring ways to identify and document children's learning in order to extend their repertoires (e.g. observational proforma - see Appendix D and supporting documentation see Appendix E) reading and discussing articles about doing AR in science; considering ethical issues (see Appendix F). Time set aside for written reflection highlighting effective teaching and learning strategies and management of change. (Appendix C). The work set will involve undertaking the AR first cycle and bringing materials to workshop 3. **Workshop 3 :later autumn term** This workshop will involve discussing and peer reviewing the teachers' first AR cycle; examining the data as documented and the insights gained. A key focus will be drawing out strategies adopted to facilitate change and any challenges encountered and ways to overcome these. Again reading articles about science and creativity, the teachers will begin to explore the development of quality indicators for classroom material. They will also be supported in planning another extended learning sequence with appropriate resources within which the second AR cycle will be nested in the Spring term. The work set will involve undertaking the AR second cycle and bringing materials to workshop 4. Time set aside for written reflection highlighting effective teaching and learning strategies and management of change. (Appendix C)	**Phase 2: Developing the first action research cycle and exploring quality indicators** *With support, teachers will plan and implement an AR cycle to start early in the Autumn Term. They will be trying new strategies, reviewing and evaluating their effectiveness and sharing practice. Thus implementing and evaluating the first AR cycle.* *In this phase teachers will also be identifying and gathering a range of start data from their focus pupils* *As the term progresses teachers will become better acquainted with using, appropriate, workable ways of documenting any evidence of impact on the children's behaviours, attitudes and learning and on reflecting upon their own learning. They will also work to develop quality indicators for classroom material.*

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Spring 2016 **Workshop 4:** This workshop will involve discussing and peer reviewing the teachers' second AR cycle; examining the data as documented and the insights gained. Again reading articles about science and creativity will be undertaken. In addition a focus on leading staff development in school will enable the teachers to make us of their own and others' insights and share these with staff. At this session each participating teacher will be encouraged to bring a teacher from their school for at least part of the day. Additionally, arrangements for the summer school will be discussed. Time set aside for written reflection highlighting effective teaching and learning strategies and management of change. (Appendix C)	**Phase 3: Action research cycle two and staff development in school** *In this phase teachers will implement and evaluate the second AR cycle.* *Teachers will continue to document any evidence of impact on the children's behaviours, attitudes and learning and reflect upon their own learning.* *In addition teachers will support school staff in various ways e.g. through a staff meeting, team teaching and being observed in order to enable all staff to foster creativity in science.*
Summer 2016 **Workshop 5:** This workshop will in part take the form of a presentation to head teachers and other senior leaders in order to disseminate the new insights. The final teacher survey (Appendix B) will be undertaken and arrangements for the summer school will be finalised. There will be a focus on the possible ways in which teachers may contribute to their country's professional dissemination conference in 2017. Time set aside for written reflection highlighting effective teaching and learning strategies and management of change. (Appendix C)	**Phase 4: Synthesising and presenting findings across both AR cycles** *Towards the middle of the Summer Term the linked CEYS coordinator will support the teachers as they gather their end-of-project data and prepare to share this at the final workshop as a form of dress rehearsal for the Summer school. They will also be engaged in contributing to the protypical design materials* *In this phase teachers will need to return to all parts of their data and reflect upon, analyse and evaluate the impact of their project development work, both on the focus children's and on their own pedagogic practice:* o *What key issues has this work raised?* o *What are the implications for further development?*

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D) Teachers as action researchers

This section offers a brief overview of the underpinning principles of action research as well as some guidance about how to approach an action research project.

Action research is one way of implementing change and introducing new ideas into classrooms and schools based on evidence of what is currently happening in particular circumstances. It is a process by which practitioners and schools initiate questions relating specifically to their particular contexts and seek solutions by examining and assessing their own work and considering ways of working differently.

One of the advantages of action research is that it gives schools the opportunity to lead and manage change for themselves. It involves collecting a range of evidence on which to base rigorous reflection. It is based on the following assumptions:

- Teachers and schools work best on issues they have identified for themselves.
- They need time and space to reflect on, evaluate and to experiment with practice in order to respond to the circumstances and needs of particular children, schools and communities.
- Teachers and schools can best help each other by working collaboratively.
- Action research involves collecting a range of evidence (qualitative and quantitative) on which to analyse strengths and weaknesses.
- Action research contributes to a culture of self-evaluation and school improvement.

When teachers carry out an action research project it is likely that it will have an impact on others. Hitchcock and Hughes describe the principal features of action research as '*change* (action) and *collaboration* between researchers and researched' (1995:27). As such, it is important that the research is justifiable, has clear aims and objectives, and stands up to ethical scrutiny (see below).

Action research is systematic and cyclical with reflective practice at the centre of that cycle. It also involves interrelated, overarching strands of data collection and analysis.

- The first is an analysis of personal practice, how it links to theory (which may be implicit or explicit), and what effects it has on others. It also involves documenting changes over time as you become more aware of thought and action, and perhaps change your (and others) beliefs and / or actions.
- The second is an analysis of the context in which you work and the subject or issue you are interested in (including the people you work with) and the effects of your beliefs and practices on these (and the effects of your context and other people on you). The context is not just your school, but can include the bigger picture such as educational policies and social issues.

Hitchcock and Hughes (1995: 29) cite an often-used illustration of action research involving a cycle of planning, acting, observing, reflecting and change (and then planning etc. again). However, we would argue that the process of reflecting is intrinsic to every stage and aspect of action research and reflects McNiff et al's (2003) stance that a project should involve 'putting the "I" at the centre of the research'. Furthermore, 'observing' (and other forms of data collection) may precede action – for example the collection of 'baseline' data; and action and reflection are both likely incorporate change to greater or lesser degrees.

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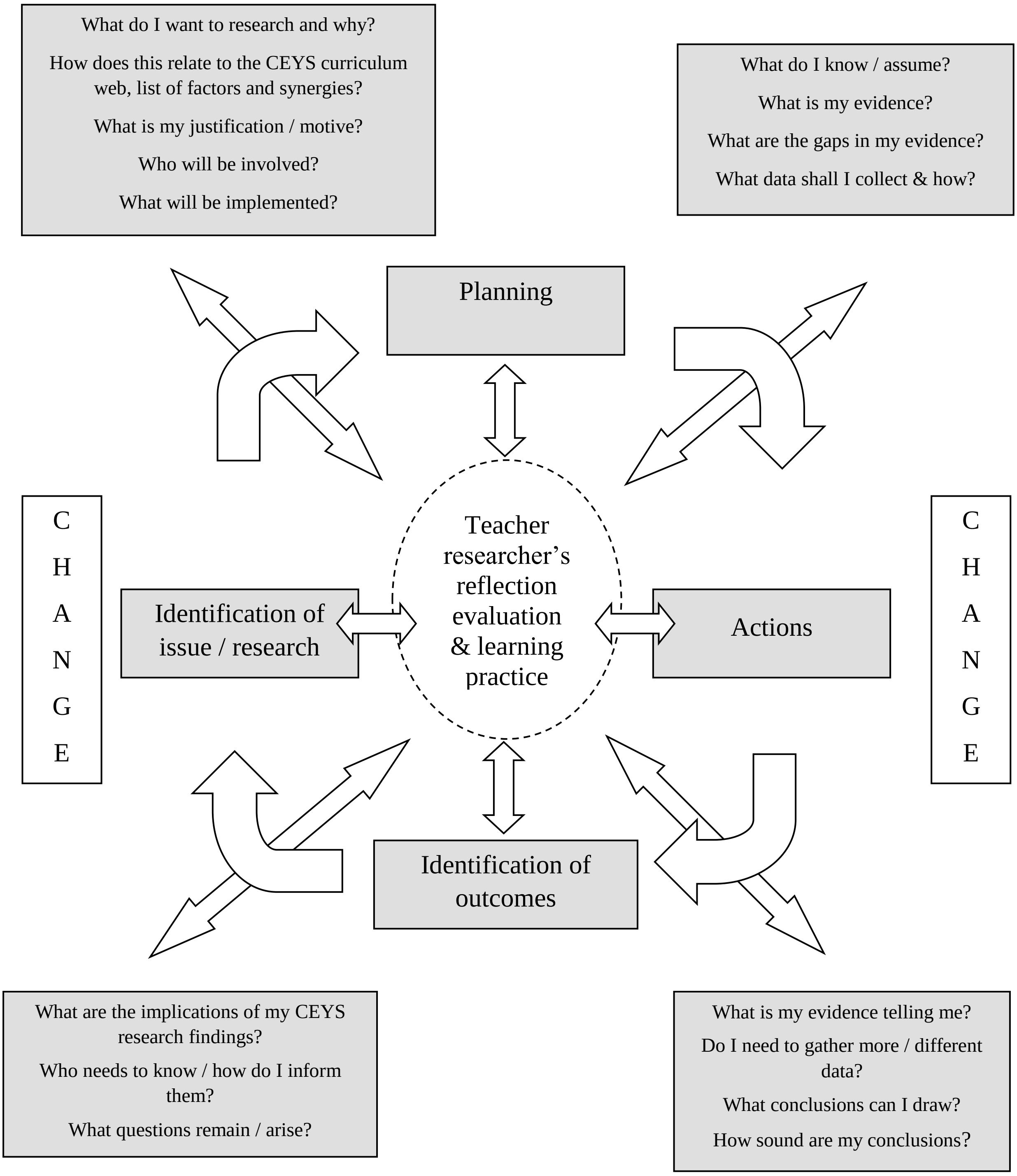
Therefore, the cycle shown below represents the project stages as the inner boxes and shows ongoing reflection about one's values, learning and interaction with the research process, as well as ongoing review of the evidence to support and inform that process.

Figure 1: *The CEYS action research cycle*



Adapted from Cremin et al., (2008: 10)

In this portfolio you will find some materials intended to support teachers in their action research activities, including sample questionnaires and reflection sheets as well as guidance on ethical issues. However, each project, although focused upon an aspect of CEYS and strands of the spider web, will be different. We would encourage teachers to think about the values that underpin their

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work and how these relate to their research question, and the methods that they employ to enable the collection of reliable and valid data.

E) Research Ethics

It is important to consider the ethical issues relevant to any research project, including action research. The very nature of action research, being infused with *change* and *collaboration* (Hitchcock and Hughes, 1995) demands particular attention to ethics. Kemmis and McTaggart's (1982) key principles for ethical action research are to:

1. Observe protocol
2. Involve participants
3. Negotiate with those involved
4. Report progress
5. Obtain explicit authorization before you observe, examine files, correspondence or other documentation
6. Negotiate descriptions of people's work
7. Negotiate accounts of others' points of view
8. Obtain explicit authorisation before using quotations
9. Negotiate reports for various levels of release
10. Accept responsibility for maintaining confidentiality
11. Retain the right to report your work
12. Make your principles of procedure binding and known (pp195-6).

In order to be able to engage in such collaborative reflection (and ethical practice) it is important to discuss with participants what it is you are intending to do (giving meaningful information about your aims and objectives). Practically (but also ethically), there are also legal issues to consider including child protection matters. You might want to take photographs or gather information that is different from what you would normally expect to find out in the course of your work as a teacher. It may be imperative that you negotiate parental consent (e.g. to photograph children, especially if the photos are to be made public) and children's assent as well. It is important to obtain appropriate consent to use these everyday practices for research purposes and informing people of your research aims can raise its profile and provoke people's interest. You could use the project summary (see Appendix A) or adapt the ethical proforma in Appendix F. You may want to refer to the BERA (2011) Revised Ethical Guidelines for Educational Research, which are freely available to downloadfrom
http://content.yudu.com/Library/A2xnp5/Bera/resources/index.htm?referrerUrl=http://free.yudu.com/item/details/2023387/Bera

You might want to consider the following 'frequently asked questions' when thinking about the ethics of your research and any information you might want to give participants (or parents / carers):

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- What is the project about?
- What is the justification for the project?
- What are its aims?
- How will the study be conducted?
- What does being involved mean for different people?
- Can a participant opt out?
- Will there be any disadvantages?
- Will participants be anonymous?
- What will happen to the data collected?
- How will data be stored and protected?
- What will be the benefits of being involved?
- How and when will the findings be disseminated and to whom?

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Section 2 Focus Children

We ask you to select a small focus group of 3 children and make some close observations of their engagement and learning in science over the period of the project. It is suggested that in this section of the file, you gradually include a range of information and data on these three focus children. Keeping each child's information separate.

Selecting children

We suggest you select three children in your class who are more, less and much less experienced or confident as scientists and investigators. Generally it is wise not to include children with severe special needs or statements. Please seek a mixed gender group that reflects the diversity of your school community.

Documenting children's learning and engagement

We ask teachers to document the three children's responses to the new actions taken in the two AR cycles in Autumn 2015 and Spring 2016. Thus making termly observational notes on each of their 3 focus pupils in these two terms. Appendix D is included for this purpose and additional notes to help are offered in Appendix E. there will be time set aside to discuss the use of these proformas and reflective prompts doing the workshop. . In addition to providing contextual information, this might encompass making use of:

- *photographs* - especially as a series of digital images in sequence
- *children's drawing and writing* – this might also include photographs of any work created outdoors and their engagement and production of artefacts in science based activities
- *audio-video recording* -
- *observational notes* - this might include notes of conversations and comments made by the children. These could be on post it notes or in sections in your reflective diary (see below) but we would also value notes within the core observation proformas.
- *children's reflections on their learning*

The workshops will provide opportunities for reflection upon these three learners and enable you to include additional data relating to them. Over the year this will build up into a detailed profile of these three young learners as young scientists in different contexts in school, outdoors and in other contexts e.g. perhaps in museums or science centres.

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Section 3 Teachers' Professional Learning

It is suggested that this section of the file is subdivided into three sections, including:

A) Teachers' attitudes to and reflections upon creativity and science (see appendix B)

B) Teachers' reflections as part of their AR cycles

Each of these subsections would include a diverse range of data and materials, for example in Section A, the CEYS initial and end of project survey (Appendix B) can be included, as well as any documents could be included. In Section B for example, reflections upon the two AR cycles, see Figure 1 could be included. You may choose to keep a reflective diary documenting your actions and their consequences, or you may choose to complete this as a series of blogs. Additional related material is also possible to include such as planning documents and notes from staff meetings.

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Section 4 Additional Information

It is suggested that in this section of the file, teachers include such things as information on ethics , parental permission slips and project contact information, as well as notes for example on a notes from the 5 workshops, or notes from meeting with their CEYS coordinator. Additionally, any reference readings given out or notes on these or staff meeting plans might be included.

A) Project Contact Information

Greece: Ellinogermaniki Agogi

Coordinators: Dimitris Rossis, drossis@ea.gr, Fani Stylianidou, fani@ea.gr

Schools and teachers: each school name, teachers name and email address, school address, phone number and admin email

UK: UCL//IOE

Coordinators: Esme Glauert, E.Glauert@ioe.ac.uk, Jill Trevethan, J.Trevethan@ioe.ac.uk

Schools and teachers: each school name, teachers name and email address, school address, phone number and admin email

UK: The Open University

Coordinators: Teresa Cremin, Teresa.cremin@open.ac.uk, Jessica Baines Holmes, J.M.Baines-Holmes@brighton.ac.uk and Tatjana Dragovic Tania.Dragovic@open.ac.uk

Schools and teachers: each school name, teachers name and email address, school address, phone number and admin email

Romania: National Institute for Laser, Plasma and Radiation Physics Laser Metrology Laboratory

Coordinators: Dan Sporea, dan.sporea@inflpr.ro, and Adelina Sporea, adelina.sporea@inflpr.ro

Schools and teachers: each school name, teachers name and email address, school address, phone number and admin email

Belgium: Artewelde Hogeschool

Coordinators: Bea Merckx, Bea.Merckx@arteveldehs.be and Jozefien Schaffler, Jozefien.Schaffler@arteveldehs.be

Schools and teachers: each school name, teachers name and email address, school address, phone number and admin email

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B) References

BERA (2004) *Revised Ethical Guidelines for Educational Research*. Nottingham, British Educational Research Association.

Cremin, T., Mottram, M. Collins, F. and Powell, S. (2008) *Building Communities of Readers* London: PNS/UKLA

Griffin, G. A. (1983) Introduction: the work of staff development, in: Griffin, G.A. (Ed.) Staff Development, Eighty-Second Yearbook of the National Society for the Study of Education, Chicago, IL, University of Chicago Press

Guskey, T.R. (2002) Professional Development and Teacher Change, Teachers and Teaching: theory and practice, 8:3, 381-391

Hitchcock, G and Hughes, D (1995) *Research and the Teacher* (2nd edition). London, Routledge Falmer.

Hopkins, D (2002) *A Teacher's Guide to Classroom Research* (3rd edition). Maidenhead, Open University Press.

Kemmis, S and McTaggart, R (1982) *The Action Research Planner* (3rd edition). Victoria, Deakin University.

McNiff, J, Lomax, P and Whitehead, J (2nd edition) (2003) *You and Your Action Research Project*. London, Routledge Falmer.

Morrow, V (2005) Ethical issues in collaborative research with children in A. Farrell (Ed) *Ethical Research with Children*. Maidenhead, Open University Press. pp.150-165

MacNaughton, G and Smith, K (2005) Transforming research ethics: the choices and challenges of researching with children in A. Farrell (Ed) *Ethical Research with Children*. Maidenhead, Open University Press. pp. 112-123

Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*, New York, Basic Books.

Siraj-Blatchford I., Sylva, K., Muttock, S., Gilden, R. and Bell, D. (2002). *Researching Effective Pedagogy in the Early Years*. Department of Education and Skills Research Report RR 356. Norwich: DfES. p. 24.

van den Akker, J. (2007). Curriculum Design Research. In Plomp, N. and Nieven N. (Eds.) *An Introduction to Educational Design Research.* SLO Netherland Institute for Curriculum Development. pp. 37 – 53.

Whitehead, J (1989) Creating a living educational theory from questions of the kind, "How do I improve my practice", *Cambridge Journal of Education*, 19(1), pp.41-52

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Appendix A: CEYS Project summary sheet

Invitation to participate in a European project aimed at fostering creativity in early years science

CEYS

Creativity in Early Years Science Education

CEYS PROJECT

Why creativity in early years science?

School in Europe today would benefit considerably from acknowledging and fostering the link between science education and creativity. There is increasing recognition of young children's capabilities and the importance of early years education in building on early experiences and promoting knowledge and understanding, skills and dispositions.

Interestingly, an inherent link seems to exist between creativity and science education. Science intrinsically involves inquiry and invention, which are triggered by curiosity, intuition, imagination, all of them elements closely related to creativity; it is also widely accepted nowadays that effective science education is based on inquiry, which can lead to wonderment, and is fuelled by curiosity.

Creativity has moved away from the traditional link with the arts to a focus on problem finding and problem solving. Motivation has an important role to play in creativity too.

In the teaching and learning of science, a more creative approach based on curiosity and inquiry would be beneficial, involving, for instance, opening up opportunities for children to raise questions, make decisions, and be able to take risks and unlock their creativity. Creativity, in this framework, is focused on generating and evaluating ideas and strategies in science

There is on the whole consensus that any materials to be used by teachers should be designed in collaboration with them and with the involvement of all relevant stakeholders in order to be relevant and have the maximum potential for impact.

Collaboration between schools and higher education institutions not only improves initial teacher education but also contributes to school development and teachers' professional development.

What is CEYS?

CEYS is an Erasmus+ funded partnership that is aiming to develop a teacher development course and accompanying materials, this could also be used in professional development to promote the use of creative approaches in teaching science in preschool and early primary education, in the frame of inquiry-based educational environments.

Participating teachers will take part in professional development workshops held in the 4 participating countries aimed at promoting the use of creative approaches in science teaching. They will have an opportunity to take part in curriculum development as co-designers in the iterative phases of development of the CEYS course, enhancing their ownership and thus facilitating their adoption of the approach though the use of action research.

THE CEYS OBJECTIVES

Propose concrete training materials that can be used in teacher education for early years and primary teachers in order to foster their use of creative and inquiry-based approaches in science teaching.

Involve teachers as co-designers in the iterative phases of development of its interventions, sharing their ownership and thus facilitating their adoption.

Implement and validate a number of training activities at national and international levels with the scope to improve early years and primary teachers' knowledge and skills.

Develop a systematic evaluation methodology in order to identify the impact of the proposed training process and materials in terms of both effectiveness and efficiency.

Erasmus+

The CEYS project is funded by the Erasmus+ programme

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What you can gain from participating in CEYS

- 5 days professional development and support focused on creativity in early years science education (travel costs will be covered)
- Opportunity to collaborate with the local CEYS project team and the other lead teachers
- Professional development and mentoring sessions from the CEYS team (including minimum of 2 visits to each lead school during the year)
- Opportunity to attend a summer school in summer 2016 to work with colleagues across Europe sharing their own practice and profiling the work undertaken in their school
- Opportunity to liaise and partner with teachers from 25 schools across Europe (in Greece, Belgium, Romania and the UK)
- Opportunity to actively participate in the development and validation of teacher education resources in close collaboration with key stakeholders

THE CEYS PARTNERS

UCL Institute of Education
INFLPR
arteveldehogeschool
The Open University
ELLINOGERMANIKI AGOGI

What your school can gain from participating in CEYS

- Support to enable the quality and efficacy of teaching science creatively to be raised across the school
- Opportunity to liaise and partner with some of the other 25 CEYS schools across Europe (in Greece, Belgium, Romania and the UK)
- Opportunities to liaise with CEYS project partners who are actively involved in a variety of EU-funded and national projects as well as a large network of schools
- Reports on the European project recognising the school's contribution
- Support for schools that wish to participate in e-Twinning projects which promote school collaboration in Europe through the use of Information and Communication Technologies (ICT)
- High profile and publicity as part of the CEYS project nationally and the CEYS European network

For more information on the course and the project visit the official website at
www.ceys-project.eu

Or contact

Dimitris Rossis
Ellinogermaniki Agogi
Tel.: +30 210 8176790
e-mail: drossis@ea.gr

IKY

Appendix B: Survey of teachers' attitudes, experience and beliefs about creativity and science in Early Years

Creativity in Early Years Science Education

Survey of teachers' attitudes, experience and beliefs about creativity and science in Early Years

1. Please indicate your views on the importance of the following purposes of school science

	1 (Not important)	2	3	4 (Very important)
a. To provide a foundational education for future scientists and engineers				
b. To develop socially and environmentally aware and responsible citizens				
c. To enrich the understanding and interaction with phenomena in nature and technology				
d. To develop more innovative thinkers				
e. To develop positive attitudes to science				
f. To develop important attitudes and dispositions as a foundation for future learning				

2. Now focusing on the AGE GROUP(s) YOU TEACH, please indicate how often you foster the development of the following science learning outcomes.

	Never - 1	Rarely - 2	Quite often - 3	Very often - 4	N/A
a. To know and understand the important scientific ideas (facts, concepts, laws and theories).					
b. To understand that scientists describe the investigations in ways that enable others to repeat the investigations.					
c. To be able to ask a question about objects, organisms, and events in the environment.					
d. To be able to employ simple equipment and tools, such as magnifiers, thermometers, and rulers, to gather data and extend to the senses.					
e. To know and understand important scientific processes.					
f. To be able to communicate investigations and explanations.					
g. To understand that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.					

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h. To have positive attitudes to science learning.					
i. To be interested in science.					
j. To be able to plan and conduct a simple investigation.					
k. To have positive attitudes to learning.					
l. To understand that scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).					
m. To be able to collaborate with other children					

3. How often do you use the following learning/teaching contexts and approaches in your Science teaching?

	Never - 1	Rarely - 2	Quite often - 3	Very often - 4
a. Open/unstructured play				
b. Role/Pretend play				
c. Drama				
d. Teaching science from stories				
e. Using history to teach science (e.g. transport, the work of scientists)				
f. Working in small groups				
g. Physical exploration of materials				
h. Using outdoor learning activities				
i. Taking children on field trips and/or visits to science museums and industry				
j. Integrating science with other curricular areas				
k. Building on children's prior experiences				
l. Fostering collaboration				
m. Encouraging different ways of recording and expressing ideas – oral, visual, digital, practical				
n. Encouraging problem finding – e.g. children asking questions				
o. Encouraging problem solving – e.g. children solving practical tasks				
p. Encouraging children to try out their own ideas in investigations				
q. Fostering classroom discussion and evaluation of alternative ideas				
r. Fostering imagination				
s. Relating science to everyday life				
t. Using questioning as a tool in science teaching				
u. Using digital technologies with children for science teaching and learning				
v. Fostering autonomous learning				

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4. Which of the contexts mentioned in question 3 do you consider as MOST LIKELY to contribute to the development of children’s CREATIVITY?

	Choose up to 3 answers
a. Open/unstructured play	
b. Role/Pretend play	
c. Drama	
d. Teaching science from stories	
e. Using history to teach science (e.g. transport, the work of scientists)	
f. Working in small groups	
g. Physical exploration of materials	
h. Using outdoor learning activities	
i. Taking children on field trips and/or visits to science museums and industry	
j. Integrating science with other curricular areas	
k. Please mention any other context you think as contributing significantly to the development of children’s creativity and justify your selection(s):	

5. Which of the teaching approaches mentioned in question 3 do you consider as MOST LIKELY to contribute to the development of children’s CREATIVITY?

	Choose up to 3 answers
a. Building on children’s prior experiences	
b. Fostering collaboration	
c. Encouraging different ways of recording and expressing ideas – oral, visual, digital, practical	
d. Encouraging problem finding – e.g. children asking questions	
e. Encouraging problem solving – e.g. children solving practical tasks	
f. Encouraging children to try out their own ideas in investigations	
g. Fostering classroom discussion and evaluation of alternative ideas	
h. Fostering imagination	
i. Relating science to everyday life	
j. Using questioning as a tool in science teaching	
k. Using digital technologies with children for science teaching and learning	
l. Fostering autonomous learning	
m. Please mention any other teaching approach you think as contributing significantly to the development of children’s creativity and justify your selection(s):	

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6. How often do you encourage children to undertake the following activities in Science?

		Never - 1	Rarely - 2	Quite often - 3	Very often - 4
a.	Observe natural phenomena such as the weather or a plant growing and describe what they see.				
b.	Ask questions about objects, organisms, and events in the environment.				
c.	Design or plan simple investigations or projects.				
d.	Conduct simple investigations or projects				
e.	Employ simple equipment and tools to gather data and extend to the senses.				
f.	Use data to construct reasonable explanations				
g.	Communicate the results of their investigations and explanations.				

7. Which of the science activities mentioned in question 6 do you consider as MOST LIKELY to contribute to the development of children's CREATIVITY?

		Choose up to 3 answers
a.	Observe natural phenomena such as the weather or a plant growing and describe what they see.	
b.	Ask questions about objects, organisms, and events in the environment.	
c.	Design or plan simple investigations or projects.	
d.	Conduct simple investigations or projects	
e.	Employ simple equipment and tools to gather data and extend to the senses.	
f.	Use data to construct reasonable explanations.	
g.	Communicate the results of their investigations and explanations.	
h.	Please mention any other activity you think as contributing significantly to the development of children's creativity and justify your selection(s):	

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8. How strongly do you agree or disagree with each of the following statements about the role of teacher in fostering INQUIRY skills?

	1 (Strongly Disagree)	2	3	4 (Strongly Agree)
a. Teachers should demonstrate first the correct way to solve a problem				
b. Teachers should give children ample time to work out their own solutions to problems before showing them how they are solved				
c. Teachers should facilitate children's own inquiry				
d. Teachers should allow children to find solutions to problems on their own				

9. Focusing on the AGE GROUP YOU TEACH, please indicate your views about the importance of the following priorities of children's ASSESSMENT in Science education. To assess the development of children's:

	1 (Not important)	2	3	4 (Very important)
a. Knowledge and understanding of scientific ideas (facts, concepts, laws and theories)				
b. Knowledge and understanding of scientific processes				
c. Competencies necessary to carry out scientific inquiry				
d. Understandings about scientific inquiry (e.g. how science and scientists work)				
e. Positive attitudes and increase of interest in science				
f. Positive attitudes and increase of interest in learning science				

10. How often do you assess your pupils in science in the following ways?

	Never - 1	Rarely - 2	Quite often - 3	Very often - 4
a. Using checklists to record observations of children				
b. During classroom interaction				
c. Evaluating children's pictures, graphs etc which show their scientific reasoning				
d. Evaluating children's relevant gestures or physical activity				
e. Marking their homework				
f. Using authentic problem-based tasks				
g. Asking each child to reflect on their own learning and progress				

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h. Using closed question tests				
i. Using open question tests				
j. Using questions in context				
k. Using portfolios (collection of evidence of children's work and progress)				
l. Children correcting each other's work and giving each other feedback				

11. How often do you reward/praise the following characteristics in your pupils in Science?

	Never - 1	Rarely - 2	Quite often - 3	Very often - 4
a. Sense of initiative				
b. Motivation				
c. Ability to come up with something new				
d. Ability to connect what they have learnt during your lessons with topics in other subjects				
e. Imagination				
f. Curiosity				
g. Ability to work together				
h. Thinking skills				

Appendix C: Reflection on professional learning

During each workshop you will be asked to reflect on any changes in your own approaches to teaching/developing young scientists and in particular the focus children.

Name: ……………………….. School:………………………. Date:………………….

Actions: What changes have you made to your practice when developing creativity in science in relation to the spider web curriculum dimensions? Please see accompanying prompt sheet (Appendix E)

Impact: What impact is evident in the children's strategies, creative engagement and attitudes to science (please see Appendix E for prompts regarding creative dispositions, scientific attitudes and attitudes to science, skills and strategies and knowledge and understanding) ?

Evidence: How do you know the work has impacted on the children? What is your evidence? Do refer to the accompanying materials which focus on observation and seek to help you make formative assessments. Please label any evidence and place this next in your file.

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Professional reflection: In what ways is your thinking about science and creativity changing?

Professional reflection: What challenges have you and the children faced and in what ways have you overcome these?

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Appendix D: Termly Observations of Case Study Children

Please complete one of these sheets on a termly basis for each child. The accompanying notes give you some prompts/ideas for observations.

Child's Name:……………………………Age………Year Group………..……..

Teacher's name ………………………… School……………………………………...

Science: Samples/detailed observations (working in English and/or other community languages) to include observations of children spontaneous investigations and exploratory play

Dates and areas of science		
Context and background information about the activity: • Kind of science (investigations, fair test, problem solving…) • How the activity arose • Whether the child was working alone or in collaboration with others • Shorts or sustained activity • Link with other curriculum areas		
Child's approach to the activity: including: *affective factors of science* learning, such as: • attitudes to science • attitudes to science learning • attitudes to learning *social factors of science learning*, such as: • collaborative and communal engagement • communication		
Strategies the child used to carry out inquiry / problem-based activities, such as: • questioning • gathering evidence • interpreting evidence		

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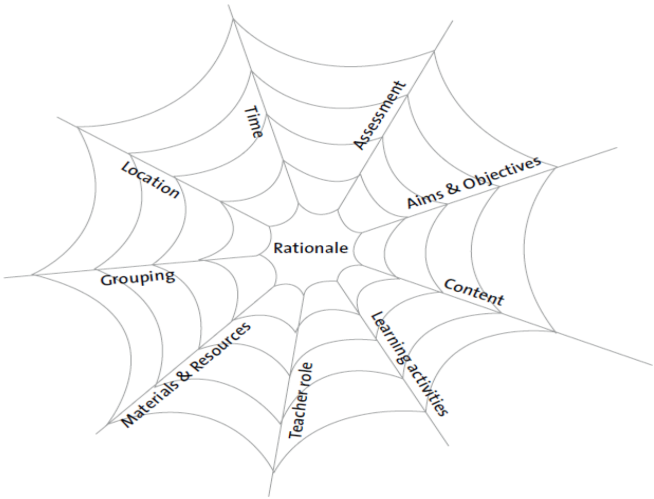
communicating findings Science process skills, such as: • predicting • observing • measuring • describing • classifying		
Knowledge and understanding the child shows: such as • science content (ideas/concepts and processes) • scientific inquiry (how scientists develop knowledge and understanding of the surrounding world)		
Creative dispositions, such as: • sense of initiative • motivation • innovative thinking • connections making • imagination • curiosity creative thinking skills • problem solving skills • reasoning skills		
Child's own response to the activity: • pleasure and interest • relating to previous experience • reflecting on own learning		
What this sample shows about new experiences/support needed to further development		

Developed from CLPE: the Primary Language Record (2005) and in the light of the CLS research

If appropriate please attach any other evidence of the child's work (e.g. diagram, photo, writing, print-out…)

Appendix E: Support for reflection: the spider web of curriculum dimensions and List of Factors from CLS

The *curriculum dimensions* associated with the 'vulnerable spider web' are offered as support for reflection as they identify key aspects of learning in schools (van den Akker, 2007). The rationale in the middle of the spider web refers to the central mission of the curriculum. It is the major orientation point for curriculum design, and the nine other components are ideally linked to the rationale and preferably consistent with each other. The spider web illustrates the many interactions and interdependence of the parts but also the vulnerability. If you pull or pay too much attention to one of the components, the spider web breaks (van den Akker, 2007, p41).



Curricular Spider Web (van den Akker, 2007, p. 41)

In CLS, the review of research findings related to creativity in learning and teaching was used to develop a List of Factors (see below) linked to these different dimensions that had been found to be associated with creativity in early science and mathematics. The curriculum dimensions and associated List of Factors provide a common framework for reflection upon your conceptualisations, practices and outcomes related to opportunities for creativity in early science.

These are offered as support to extend your reflections and to enable you to sue and become familiar with and use the insights gained from CLS. It is not expected you will comment on each(!), but it is hoped you will consider them as you plan and later reflect upon your own and the children's learning.

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	Dimensions Sub questions	Factors important to nurturing creativity in early years science and mathematics
Aims/purpose/priorities	**Rationale or Vision** *Why are they learning?*	• science economic imperative • creativity economic imperative • scientific literacy and numeracy for society and individual • technological imperative • science and mathematics education as context for development of general skills and dispositions for learning
	Aims and Objectives *Toward which goals are the children learning?*	• Knowledge/understanding of science content • Understanding about scientific inquiry • Science process skills; IBSE specifically planned • Capabilities to carry out scientific inquiry or problem-based activities; use of IBSE • Social factors of science learning; collaboration between children valued • Affective factors of science learning; efforts to enhance children's attitudes in science and mathematics • Creative dispositions; creativity specifically planned
Teaching, learning and assessment	**Learning Activities** *How are children learning?*	*Focus on cognitive dimension incl. nature of science* • Questioning • Designing or planning investigations • Gathering evidence (observing) • Gathering evidence (using equipment) • Making connections *Focus on social dimension* • Explaining evidence • Communicating explanations
	Pedagogy *How is teacher facilitating learning?*	• Role of play and exploration; role of play valued • Role of motivation and affect ; Efforts made to enhance children's attitudes in science and mathematics • Role of dialogue and collaboration; *collab. between children valued* • Role of problem solving and agency ; use of IBE/PBL, Children's agency encouraged • Fostering questioning and curiosity - Children's questions encouraged • Diverse forms of expression valued • Fostering reflection and reasoning; children's metacognition encouraged • Teacher scaffolding, involvement, Sensitivity to when to guide/stand back
	Assessment *How is the teacher assessing how far children's learning has progressed, and how does this information inform planning and develop practice?*	*Assessment function/purpose* • Formative • Summative • Recipient of assessment results *Assessment way/process* • Strategy • Forms of evidence ; excellent assessment of process +product, Diverse forms of assessment valued • Locus of assessment judgment – involvement of children in peer/self assessment

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	Dimensions Sub questions	Factors important to nurturing creativity in early years science and mathematics
Contextual factors (Curriculum)	**Materials and Resources** *With what are children learning?*	• Rich physical environment for exploration; Use of physical resources thoughtful; Valuing potential of physical materials; • Environment fosters creativity in sci/math • Sufficient space • Outdoor resources; recognition of out of school learning • Informal learning resources • ICT and digital technologies; confident use of digital technology • Variety of resources • Sufficient human resources • NO reliance on textbooks or published schemes
	Location *Where are they learning?*	• Outdoors/indoors/both - recognition of out of school learning • Formal/non-formal/informal learning settings/ • Small group settings
	Grouping *With whom are they learning?*	• Multigrade teaching • Ability grouping • Small group settings • Number of children in class
	Time *When are children learning?*	• Number of children in class • Sufficient time for learning science and mathematics
	Content *What are children learning?*	• Sci/ma as separate areas of knowledge or in broader grouping • Level of detail of curriculum content • Links with other subject areas / cross-curriculum approach; evidence of science and maths integration (planned or incidental) • Subject-specific requirements vs. broad core curriculum • Content across key areas of knowledge

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Appendix F: Proforma for adaptation for ethical purposes

Creativity in Early Years Science Education

Creativity in Early Years Science Education

PARENT/CARER PARTICIPATION CONSENT FORM

Title of project: ……………………………………………………………….

Name of CEYS teacher……………………………………………………………

Please initial each statement

I agree that my child can take part in the above project…………………..

I confirm that I understand the information about the above project…………..

I understand that participation is voluntary and I am free to withdraw my child at any time without giving any reason…………………………………………………….

I understand that my child's responses will be anonymised before analysis………..

I agree that photos of my child engaged in learning activities can be shared with others for educational purposes……………….

……………………………	………………..	………………………………..
Name of parent/carer	date	signature
……………………………	………………..	………………………………..
Researcher	date	signature

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IKY

Appendix G: Capturing classroom teaching and learning activities

Context

Name:

School:

Age of children:

Core focus of the activity/ies:

The planned activity/ies:

The resources used:

The opportunities for inquiry-based science learning:

The opportunities for creativity:

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Appendix H: Planning staff development

Guskey (2002) connects high-quality professional development to nearly every attempt at improving education. Most high-quality professional development programmes aim to “alter the professional practices, beliefs, and understanding of school staff toward an articulated end” (Griffin, 1983, p.2). Both Guskey and Griffin believe that its essential purpose is thus to improve student learning and hence professional development programmes can be defined as systematic efforts to bring about change in:

a) the classroom practices of teachers,

b) in their attitudes and beliefs, and

c) in the learning outcomes of the students.

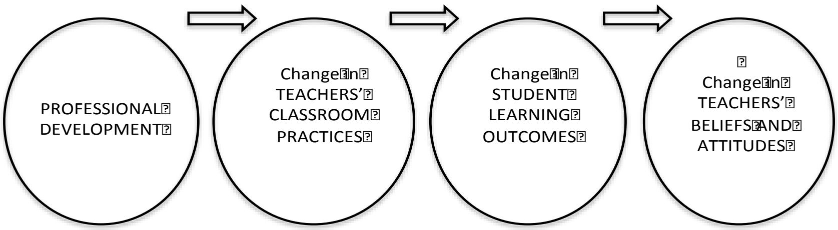

Figure *A Model of teacher change (Guskey, 2002)*

The curriculum development process, particularly if carried out through action research, could provide a platform for collaborative learning and development of the participating teachers as co-designers, pedagogy development through reflection on and in practice (Schon, 1983) and whole school staff development through peer observations, coaching and cascading approach (Guskey, 2002). In order to achieve staff and whole school development process in the CEYS project the following template for its planning is provided:

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Name:

School:

Potential activities for cascading approach to staff and whole school development

Activity	When (When did do you do it? Date, hour etc.)	Where (Where did you do it? In your classroom, staff room, in your colleague's classroom, outside of your school, at National conference etc.)	How (How did you do it? What exactly did you do?)	Who (With whom, who was involved, invited etc.)
Sharing of the knowledge, skills, ideas and competencies acquired at the CEYS workshops (e.g. sharing quality indicators for classroom materials at staff meeting or with 1 or 2 colleagues etc.)				
Distributing/sharing a survey of teachers' attitudes, experience and beliefs about creativity and science in Early Years (e.g. among early primary teachers or late primary teachers)				

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Support 1 colleague in introducing creativity and inquiry-based approach to teaching science or another subject				
Invite 1 colleague to do peer observation of your lesson				

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Appendix I: Reflection and Planning sheet

Name:

School:

Workshops (My first thoughts about what I find useful, about what I have heard, discussed and explored at workshops)	**Main Focus** (What I want to plan, what I want to focus on)
Summer 2015: Workshop 1	**Phase 1: Getting Started and Planning** Between workshop 1 and workshop 2 I would like to: a) test the following b) change c) experiment with d) think about the 3 following questions to work on

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Workshops (My first thoughts about what I find useful, about what I have heard, discussed and explored at workshops)	**Main Focus** (What I want to plan, what I want to focus on)
Autumn 2015: **Workshop 2 (early autumn)**	**Phase 2: Developing the first action research cycle and exploring quality indicators** Between workshop 2 and workshop 3 I plan to: a) collect the following data b) introduce the following change/s c) focus on the following children

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Workshops (My first thoughts about what I find useful, about what I have heard, discussed and explored at workshops)	**Main Focus** (What I want to plan, what I want to focus on)
Autumn 2015: **Workshop 3 (later autumn term**	Between workshop 3 and workshop 4 I plan to: a) document the introduced changes in the following way/s b) adjust the introduced changes in the following way/s c) document any evidence of impact of the introduced changes on the children's behaviours, attitudes and learning and reflect upon their own learning in the following way/s

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Workshops (My first thoughts about what I find useful, about what I have heard, discussed and explored at workshops)	**Main Focus** (What I want to plan, what I want to focus on)
Spring 2016: Workshop 4	**Phase 3: Action research cycle two and staff development in school** Between workshop 4 and workshop 5 I plan to: a) collect the following data b) introduce the following change/s c) document the introduced changes in the following way/s d) adjust the introduced changes in the following way/s

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	e) document any evidence of impact of the introduced changes on the children's behaviours, attitudes and learning and reflect upon their own learning in the following way/s f) contribute to staff development in the following way/s

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Workshops (My first thoughts about what I find useful, about what I have heard, discussed and explored at workshops)	**Main Focus** (What I want to plan, what I want to focus on)
Summer 2016: Workshop 5	**Phase 4: Synthesising and presenting findings across both AR cycles** Between workshop 5 and Summer School 2016 I plan to: a) prepare for Summer School 2016 in the following way/s b) disseminate my findings in the following way/s <u>Questions to consider:</u> ○ *What key issues has my work raised?* ○ *What are the implications for further development?*

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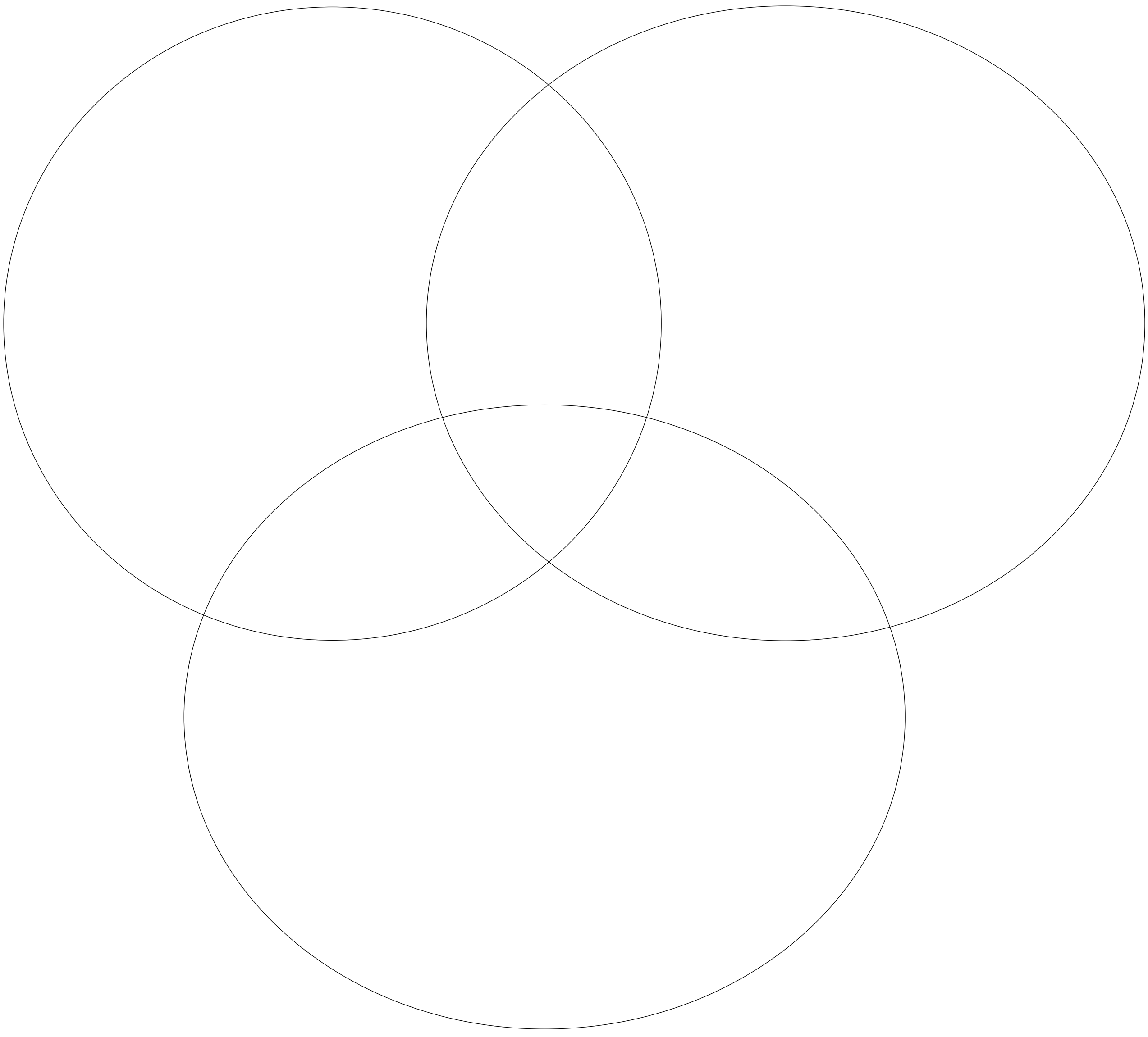
Appendix J: Enabling Creativity though Science in Early Years Education

What do we mean by creativity in early science? How do these concepts overlap**?**

Creativity **Science Education**



Preschool and First Years of Primary

Materials prepared by Ashley Compton Bishop Grosseteste University College for CLS first project Meeting October 2011

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What does creativity look like in science in preschool and first years of primary?

The examples below are lessons that were taught by undergraduate teacher training students, which they believed were creative. Do you think they are creative? In what ways? What examples of creative lessons can you provide?

Making moving vehicles. The children designed their own cars with no set format or guidance. The children had individual and fantastic ideas. They then made the vehicles from a cardboard box and decorated them. The children were extremely passionate and were more talkative as it was their own ideas and their own personal work. (4&5 year olds)

Went on a 'habitats walk' outside. Saw the effect of changing the learning environment on motivating learning. The children were allowed to ask any questions they wanted to find out about. They tried to answer these through observation and investigation. (5&6 year olds)

Exploring what light travels through. They were able to explore their own choices of items and make it their own decisions. They were excited and motivated to find out more. They were also eager to create their own investigations. (6&7 year olds)

The children had to do an experiment individually where they had to test what material soaked up the most water. They had to make it a fair test by using the same amount of material. They measured the water then tested cotton wool paper towels, kitchen roll, plastic bags and sponge. Giving each a mark out of 3 on effectiveness. They were all involved and it helped to get them interested in science. (6&7 year olds)

In a nursery class I taught Maths and Science by tasting Ice Cream and producing a graph to show the class's favourite ice cream. It was creative because the children tasted the ice cream and then chose a picture which they then put on the graph. (3&4 year olds)

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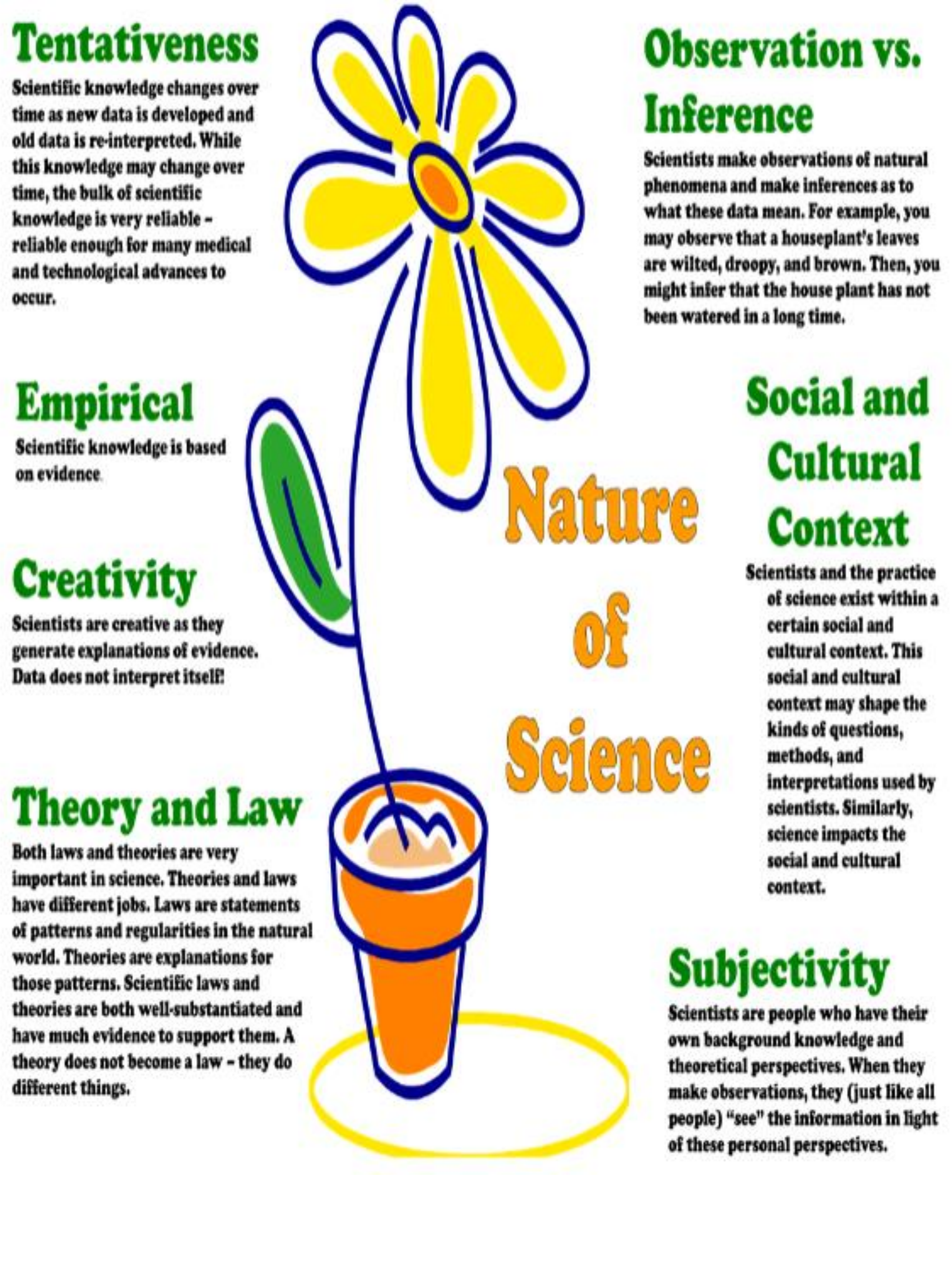
Appendix K: Nature of Science



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