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Fostering creativity in learning through digital games

C²Learn creative learning

Creative Emotional Reasoning Computational Tools Fostering Co-Creativity in Learning Processes

www.c2learn.eu

C²LEARN LEARNING DESIGN FOR CER

C²LEARN PROJECT DELIVERABLE NO. D2.2.2

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2.0	Early April	OU	Completed draft developed by OU in consultation with EA and having taken on comments from consortium on ToC, circulated to whole consortium

2.1	Mid April	OU	Revised draft with feedback from consortium. Revisions made on basis of feedback.
3.0	22 April	OU	Final draft of D2.2.2, feedback received from consortium and report delivered to EA.
4.0	23 April	EA	Final draft of D2.2.2 delivered to consortium

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Abbreviations used

A) Abbreviated names of the project consortium partners

Abbreviation	Explanation
EA	Ellinogermaniki Agogi, Greece (coordinator)
UEDIN	The University Of Edinburgh, UK
OU	The Open University, UK
NCSR-D	National Center For Scientific Research "Demokritos", Greece
UoM	Universita ta Malta, Malta
SGI	Serious Games Interactive, Denmark
BMUKK	Bundesministerium Für Unterricht, Kunst Und Kultur, Austria

B) Other abbreviations in alphabetical order

Abbreviation	Explanation
C²Learn	Acronym of the project (full title: Creative Emotional Reasoning Computational Tools Fostering Co-Creativity in Learning Processes)
CER	Creative Emotional Reasoning
DLT	Diagrammatic Lateral Thinking
DoW	Description of Work (Annex I of the Grant agreement no. 318480)
EC	European Commission
ELT	Emotive Lateral Thinking
FP7	The Seventh Framework Programme for Research and Technological Development (2007-2013)

Abbreviation	Explanation
ICT	Information and Communications Technologies
LDS	Living Dialogic Space
LT	Lateral Thinking
M#	#th month of the project (M1=November 2012)
PT	Possibility Thinking
SLT	Semantic Lateral Thinking
TEL	Technology-Enhanced Learning
WHC	Wise Humanising Creativity

Executive summary

C²Learn at a glance

C²Learn (www.c2learn.eu) is a three-year research project supported by the European Commission through the Seventh Framework Programme (FP7), in the theme of Information and Communications Technologies (ICT) and particularly in the area of Technology-Enhanced Learning (TEL) (FP7 grant agreement no 318480). The project started on 1st November 2012 with the aim to shed new light on, and propose and test concrete ways in which our current understanding of creativity in education and creative thinking, on the one hand, and technology-enhanced learning tools and digital games, on the other hand, can be fruitfully combined to provide young learners and their teachers with innovative opportunities for creative learning. The project designs a learning context with game elements which includes an innovative C²Space incorporating diverse computational tools, the use of which can foster co-creativity in learning processes in the context of both formal and informal educational settings. The C²Learn environment is envisioned as an open-world 'sandbox' (non-linear) virtual space enabling learners to freely explore ideas, concepts, and the shared knowledge available on the semantic web and the communities that they are part of. This innovation is co-designed, implemented and tested in systematic interaction and exchange with stakeholders following participatory design and participative evaluation principles. This happens in and around school communities covering a learner age spectrum from 10 to 18+ years.

About this document

Deliverable 2.2.2 is the second of the two public versions of the document; the first was delivered in Month 9 and this one in Month 18 of the three-year project. Similarly to D2.2.1, and D2.1.1 Interim, this document explicates the key concepts and principles relating to ***C²Learn's Learning Design***. Developed by the OU team working closely with feedback from other consortium members, it sets out the over-arching theoretical frame of the project which encompasses Creative Emotional Reasoning (Deliverable 2.1.2) and its practical application in relation to the project's learning approach. Deliverable 2.2.2 is structured in three parts. The first considers the overall goals of the ***C²Learn*** gameful design encompassing a 'playful' digital gaming and social networking environment or "Co-creativity space" (**C²Space**). The C²Space exemplifies students' and teachers 'playful' experiences or what they do:

- free exploration of ideas, concepts, and 'shared' knowledge
- opportunities to engage in creative problem-finding and problem-solving
- opportunities to be assisted by the system (Creativity Assistants)

The second part addresses what the **C²Space** looks like in practice utilising the affordances of currently available examples of game prototypes and digital tools. The third part documents what will occur next in how the consortium is progressing in designing the **C²Space** encompassing a digital gaming and social networking environment, with the learning goals in mind. Inevitably as the parts of ***C²Learn*** are developing in planned parallel development, the Learning Design will in reality remain a living document throughout the second half of the project, with terminology and processes being refined. This official version though sets down markers as to our expectation of the direction of such evolution.

1 INTRODUCTION

Deliverable 2.2.2 seeks to set out the overall **Learning Design for C²Learn**. This introductory note aims to remind readers that C²Learn aims to design a playful learning system and/or experience that provides innovative opportunities for co-creativity. To do this C²Learn integrates 'playful' elements of gameful design, or the transposition of game mechanisms and affordances in non-gaming contexts, to intrinsically motivate desired user behaviours and increase the pleasure of use and/or experiences in the **C²Space**. C²Learn also achieves this by combining a range of educational contexts and orchestrations, with specialist tools enacted through core micro-activities through gameful design in the project's C²Space. In these spaces learners will engage 'playfully' with co-creative, non-linear thinking triggered through embedded challenges. This introduction sets out the elements of the deliverable which combines goals and associated tools, gameplay and then the strategic future evolution of these by the consortium.

1.1 AN INTEGRATED GAMEFUL DESIGN

C²Learn is conceptualised as an integrated gameful design encompassing a **digital gaming and social networking environment** which we refer to as the **C²Space** where classroom-based **educational scenarios** provide a framework in which affordances possible in digital games are used to help deepen students' relationships with real-life contexts through action and play. The C²Space allows students to draw on their gaming literacy to interact creatively and collaboratively with each other. The **C²Space** is designed to leverage games' deeply satisfying properties (e.g. agency, emotion, and immediate feedback) by providing students with 'playful experiences', or **C²Experiences** where they autonomously and collaboratively: explore; face and overcome challenges; play games to assist them in reaching their goals; connect with others by engaging in fun and meaningful activities: and evidence *compassion and shared values* or put *forth new ideas* that required other students to imagine new ideas*; to shift from 'what is' to new possibilities of 'what might be'*. In this journey they are assisted by each other and artificial intelligence or **Co-Creativity Assistants** that interact with the students (and/or teachers) to:

- enable them to use mechanisms of creative thinking
- use their imagination (embodied through a wide range of activities including the arts, technology, sports, etc) to break with ordinary classifications and to perceive openings in the taken-for-granted;
- propose them resources, routes, strategies;
- inform/alert them; and
- expedite tasks and processes and facilitate concentration on collaborative creative thinking.

Engaging game affordances including feedback, agency, emotion and relevant challenges, *over* gamified elements such as points, levels, and rewards or badges drawn upon in a non-game framework, are better suited for C²Learn because they motivate students and increase their intrinsic motivation and capacity for active learning in a way which is more sympathetic to the wider goal of WHC. This is achieved through playful **C²Experiences**—as opposed to game—orientated strategies. This intentional stance addresses the widely theorised critique of gamification within game studies which argues such game oriented strategies provide primarily extrinsic reward motivators (Nicholson, 2012a[1]) that rely on operant conditioning (rewards, points, limited meaning). Extrinsic motivators lower the potential for fostering creativity (Amabile, 1998a, 1998b) and co-creativity. By employing gameful design, C²Learn's Learning Design aims to increase intrinsic motivation by paying careful

[1] See Nicholson, S. 2012a.

attention to the match between task and learner and the careful construction of learning groups (Amabile, 1988a, 1988b). Although undertaken in business contexts, Amabile's studies reveal the importance of diversity of perspectives in any effective co-creative teamwork and are frequently applied in other contexts including the classroom. Forming groups or teams with diverse talents and ways of working, is an important aspect of the teacher's role. As well as diversity, teams must share excitement over their (shared) goal/s. They must show collaborative willingness to support and help one another through difficulties and they must acknowledge unique perspectives brought by others in the team. In addition to this, leaders of a creative process (which in C²Learn might include students as well as teachers), must be ready to acknowledge new and useful ideas, as a culture of negative evaluation, and one where high quality individual and group contributions are not actively and consistently valued, seriously undermines motivation toward creativity and thus kills creativity. Amabile shows through her work that modelling creativity through behaviours that encourage collaboration and communication and which acknowledge the value of perseverance also, is an important aspect of leadership of co-creativity. The intention in C²Learn is to capitalise on gameful design to encourage the features of co-creativity. This is because C²Learn understands people enjoy playing games because they are having fun, in control and can potentially affect the gameworld through their meaningful choices and decisions. They play games because they are challenging and filled with clear goals and they are so enjoyable that winning is irrelevant, what is relevant are the pleasurable and playful experiences.

Engagement in C²Learn, then, attends to intrinsic motivation by providing elements of game design in the C²Space through 'playful' activities that spark deep attention, motivation and curiosity. Our intention is to harness students' motivation and engagement through enjoyable learning and a goal-oriented approach that is enhanced by Wise Humanising Creativity (WHC) outcomes discussed further in Section 2 of this document. The analogue and digital aspects of gameful design in the context of C²Learn will be informed by educational scenarios, appropriate for a range of contexts and learners, and addressing specific learning objectives, and further contextualise this project's careful and creative criticality in relation to the act of game design.

The core educational scenarios of C²Learn are in development through collaboration with the school communities involved in the project and provide a content framework in which the innovative technologies and practices of the project are deployed. Through the scenarios, which reflect user expectations and requirements, the learning design and game design elements are applied in concrete activities in educational settings. They also provide a range of example contexts which may inspire others to develop future scenarios for use of the project's resources beyond the life of the project, reflecting learning goals in other educational contexts. As the Additional Deliverable, produced April 2014, entitled 'Overview of the C²Learn approach: cohesion and consistency in the project puts it, "In the long term, educational scenarios are provided to teachers and learners as open-ended tools encouraging them to develop their own designs of C²Learn activity, outside the pilots and beyond the end of the project" (p12).

Thus these educational scenarios encompass a context (e.g. the classroom) and its orchestration, in which there are micro-activities informed by analogue and gameful design and social networking. Critically, they draw on specific C²Learn analogue tools for fostering co-creativity. The classroom micro-activities co-exist alongside and in relationship with, an open world digital space or ARG platform which contains its own micro-activities and further C²Learn tools, as illustrated in Figure 1.

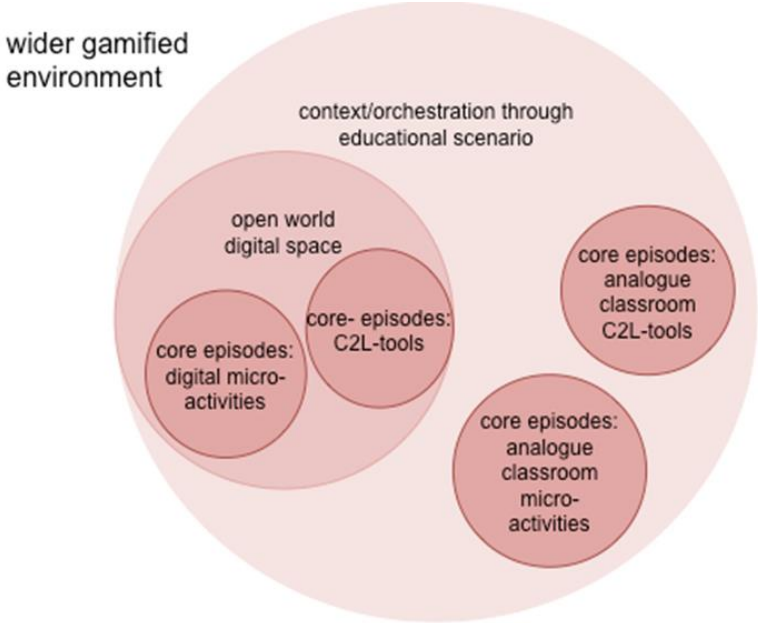

Figure 1: The architecture of the playful experiences or C²Experiences in C²Learn

At this point of the project, the gameful design of the C²Space is in parallel development, as the game design and game and tool development teams work alongside those involved in piloting material and pedagogical approaches with students and teachers. Figure 2 shows how the elements of the overall gameful design of C²Space are intended to relate to one another through an overall playful space which offers playful challenges, explorations, games and other 'fun stuff', supported by creativity assistants (AI agents).

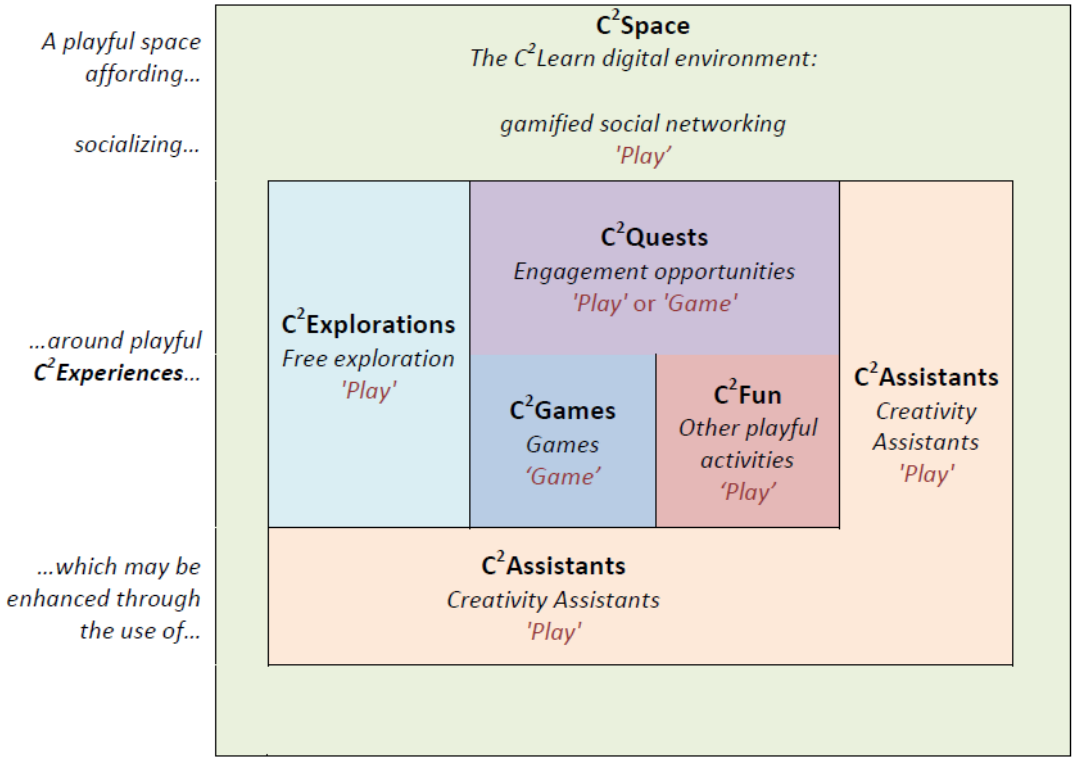

Figure 2: How the gameful design of C²Space fits together (reproduced from the 'additional deliverable')

Through development activities in the first stage of the project, a range of possible scenarios have been developed iteratively with core user communities in Austria, England and Greece with D 5.3.1 having recently reported the most up-to-date developments in this area and D5.3.2 due to update on the latest progress. The current pilots each use one or more existing scenarios in which to embed the game affordances both analogue and digital. The pilots will allow the further development of these scenarios. However, ultimately the project outcomes may need to leave open the potential for new users to develop their own appropriate scenarios, perhaps driven by localised curriculum needs in which to use the project resources and it is hoped that the piloting will offer insight into how C²Learn might support end users in doing this.

The computational tools for CER (non-linear thinking techniques that foster co-creativity) are in development by NCSR-D, and the educational contexts for the scenarios being explored. CER is divided into three distinct, yet interrelated, kinds: [1] ***Semantic*** [2] ***Diagrammatic*** and [3] ***Emotive***. The possibilities of the C²Learn game prototype are under close discussion between all partners with University of Malta (UoM) and Serious Games Interactive (SGI) taking a lead with D 4.4.1 recently reporting the latest developments. As a result of on-going discussions, the C²Learn Environment's relevant game paradigms have been presented in D4.4.1, with a detailed analysis of workflow within an educational scenario, and a description of how and when the use of a game 'intervention' makes sense. This workflow is further elaborated using two game design examples: (1) a hypothetical example, 'creativity dominoes'; and (2) 'creative cards'. This learning design document, reflects and builds on the second of these game design examples.

1.2 BRIEF OVERVIEW OF CONTENTS

Deliverable 2.2.2 is divided into three parts.

The first part of D2.2.2 considers the overall goals of the ***C²Space*** encompassing a digital gaming and social networking environment, in other words addressing what it will enable students and teachers to do. It presents the integrated perspectives of OU (WHC) and UEdin (CER) explicating how the theoretical map translates into the analogue and digital environment.

The second part addresses what ***C²Learn*** practice (C²Experiences) could look like in the ***C²Space***. This section provides greater insight into how creative thinking, social engagement, ethics and impact and wider change might manifest in C²Learn, as an *active process of change* guided by compassion (i.e. close and active awareness of the needs and hopes of others[2]) and reference to shared values derived from users' collaborative thinking, shared action and gameplay within a Living Dialogic Space to foster Wise Humanising Creativity (WHC) through CER's set of core creative learning tools that will support the manifestation of WHC. This information is paramount in order to inform the future ***C²Learn*** learning experiences and the affordances it will need to foster co-creativity.

The third part documents how the consortium is progressing in designing the ***C²Space*** with the learning goals in mind through two parallel sets of activity: the **C²Learn Co-Development Teams** comprising teachers and pupils working to generate and critically evaluate the educational scenarios, computational tools, pedagogical approach and assessment strategy within the piloting activity; and the **C²Learn Consortium Partners** working to develop and refine the analogue and digital **C²Space**, the gameful design and **C²Experiences**, the computational tools, pedagogical approach and assessment strategy.

[2] A precursor, as Amabile, 1998a and 1998b showed, and as discussed further in Part 1, to co-creativity

2 Overall goals of C²Learn

What the **C²Space** and experience will enable students and teachers to do.

2.1 C²LEARN CO-CREATIVITY CONCEPTUAL FRAMEWORK

The goal of C²Learn is to foster co-creativity through Creative Emotional Reasoning (CER, theorised by UEDIN) and generating Wise, Humanising Creativity (WHC, theorised by OU). The intention is that the tools and strategies of CER are harnessed to generate WHC activity between participants in the C²Space with its elements of game design, CER has been explained in deliverable D2.1.1 with sub-elements more fully developed in D2.1.2; in this deliverable we add to this a brief explanation of WHC. OU and UEDIN teams have conceptualised how WHC[3] and CER[4] might best be theoretically inter-related in order to represent conceptually what the C²Learn experience will enable students and teachers to do in terms of fostering their co-creativity. The clearest way to show this was felt to be through a diagrammatic representation illustrated in Figure 3 below. The explanatory text[5] leads the viewer through the key enabling features of the co-creativity conceptual framework from the edge of the figure to the centre. It culminates in a clear explanation of the 'what' of co-creativity defined in terms of the interrelationship between WHC and CER which emerges at the centre of the figure.

In the text, which follows Figure 3, a brief summary of the key components of WHC is given. These are further explained using concrete educational examples, in the second part of the document.

[3] See Chappell K., Craft A., Rolfe L. & Jobbins, V. 2012, ; Chappell K. 2008; and Craft A. 2008.

[4] For a definition and analysis of CER, as well as an exposition of tis theoretical foundations, see Deliverable 2.1.1: *Creative Emotional Reasoning*.

[5] Figure 2 and text were developed in collaboration between Open University (OU) and partners University of Edinburgh (UEdin)

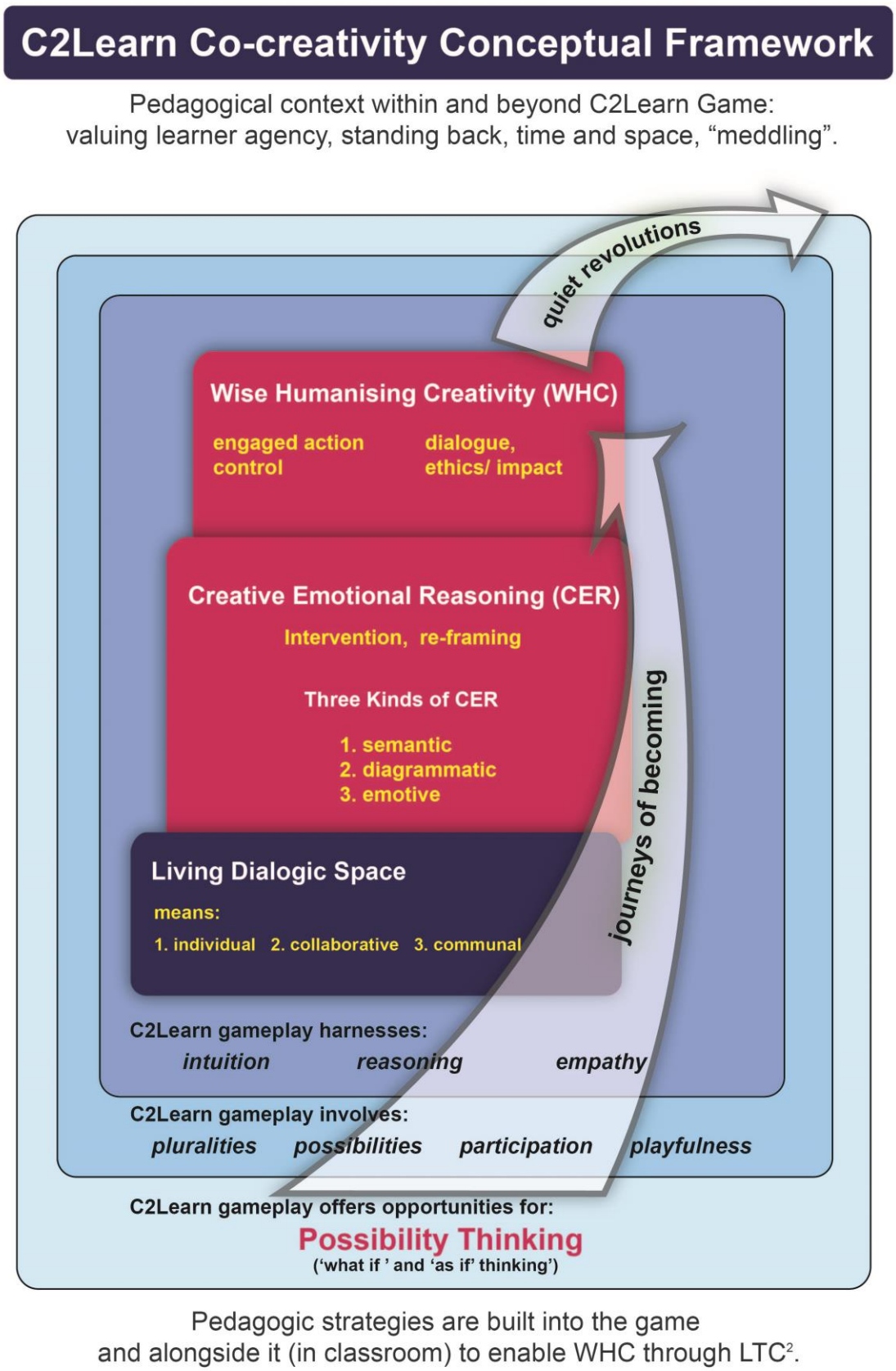

Figure 3: C²Learn Co-creativity Conceptual Framework

This figure illustrates 'how' co-creativity is fostered within C²Learn and 'what' that co-creativity is. Co-creativity within C²Learn is **novelty which has emerged through shared ideas and actions and which involves participants taking into account the impact of that novelty**. Co-creativity will be fostered in C²Learn by:

- **Possibility Thinking (PT)[6].** PT is 'what if' and 'as if' thinking and will be inherent in multiple elements of the C²Learn framework hence its representation around or underneath the other elements.
- **The 4P's[7].** The presence within and outside the **C²Space** of *pluralities* (opportunities for learners to experiment with multiple pluralities of places, activities, personal identities, and people), *possibilities* (opportunities for possibility thinking, transitioning from what is to what might be, co- constructing with others through the C²Learn experience, designing, editing, extending and exploring content), *participation* (opportunities for learners to take action, make themselves visible on their own terms, and act as agents of change) and *playfulness* (opportunities for users to learn, create and self-create as active and connected users in their emotionally rich, virtual and actual play-worlds).
- The **C²Space's** capacity to harness **intuition, reasoning** and **empathy** within and outside the gameworld.
- **Living Dialogic Spaces[8]** (LDS) being embedded in the C²Space and also present in the game affordances to offer users high participation and shared control, individually, in collaboration and/or as part of a communal endeavour. Within and outside the C²Space interactions will therefore offer a new 'space' for debate and difference, openness to action, working 'bottom up', and different modes of idea exchange. This will happen through creative learning conversations. The purpose of these is to flatten hierarchies, reposition users in different roles and allow spaces that promote a sense of equality through 'listening' to other users and even allow users to change their mind by identifying with the space of dialogue. The creative potentials offered by such a dynamic dialogic environment will be fully exploited by brainstorming activities, which propel and structure CER's non-linear thinking techniques.

Alongside and within these enabling features of the **C²Space,** teacher, facilitator (potentially including students in this role) and the game's Creativity Assistant will pedagogically value learner agency, stand back, offer time and space and where appropriate 'meddle in the middle'[9]. These pedagogies are implicit across the enablers and are therefore indicated at the top of the figure as the context within which the C²Learn activity takes place.

All of the above will enable **C²Learn co-creativity**, shown as emerging from the centre of the figure. This has two related components:

- **Wise Humanising Creativity** (WHC)
- **Creative Emotional Reasoning** (CER)

WHC will occur in C²Learn as an active process of change guided by compassion (i.e. close and active awareness of the needs and hopes of others[10]) and reference to shared values derived from users' collaborative thinking, shared action, gameplay and social interaction. WHC will manifest in four intertwined ways shown in the highlighted box within the WHC section of the graphic. Users will:

[6] See Craft, A., 2010
[7] See Craft, A. 2011
[8] See Chappell, K., & Craft, A. 2011.
[9] See Craft, A., Chappell, K., Rolfe, L., & Jobbins, V. 2012.
[10] Enacted by students i.e. gameplayers and supported and encouraged by teachers

- Generate, explore and enact new ideas with a valuable impact on the community, discarding other ideas that lack such potential (**ethics and impact**);
- Pose questions, debate between new ideas, find ways to negotiate conflict or to go in a different direction to others if conflict is not resolved (**dialogue**);
- Take charge of different parts of the creative process, understanding the rules of the system[11] and how decisions have consequences, making decisions around new ideas and taking action(s)[12] through various scenarios and/or quests (**control**); &
- Be immersed in the game and its environment, and possibly addicted to gameplay and/or the interactive drama played out in the gameworld and in real-world spaces. Such immersion will sometimes lead to taking risks and generating surprising individual or collaborative ideas (**engaged action**).

Such activity is co-creative because it is about **new ideas** which are captured or selected because they are **valuable to the community**, and are generated with shared control in an immersed dialogic learning context which encompasses the C²Space, fostering **ethical awareness** arising from the experience and action.

Over time, noticeable changes in users' dispositions, even small incremental personal changes, will result from their WHC. This is because there is a core reciprocal relationship within WHC between creativity and identity in which as creators make, they are also being made. And so users undertake **journeys of becoming[13]**. This is represented on the figure as an embedded on-going process from the 'how' of the enablers of co-creativity to the 'what' of the co-creativity.

It should be noted that, whilst WHC and its journeys of becoming, as a highly applied concept, may appear to share principles in common with pedagogic approaches such as problem-based learning (PBL), challenge-based learning or discovery learning, which foreground learner-initiated activity as well as collaboration, it is distinct as a concept. Originally developed in McMaster University Medical School in Canada, Problem-Based Learning (PBL) encompasses a "collaborative, constructivist, contextualised learning and teaching approach" (Ribeiro, 2011: 2) founded on the belief learning involves forging *new* knowledge. The goal of PBL is for students to gain increased understanding of: ''flexible knowledge, effective problem-solving skills, self-directed learning (SDL) skills, effective collaboration skills, and intrinsic motivation" (Hmelo-Silver, 2004: 235). PBL requires students to take responsibility for their own learning; this in turn encourages students to gain the skills necessary for them to become *lifelong* learners (*ibid*.).

Whilst not actually directly focused on creativity, PBL is oriented toward creative activity as Margetson (in Boud and Feletti, 1991: 45) details, in that it:

- encourages open-minded, reflective, critical and active learning;
- pays due respect to both student and teacher as persons with knowledge, understanding, feelings, and interests in a shared educational process;
- acknowledges that knowledge is complex and changes as a result of responses by communities of persons to problems they perceive in their worlds.

WHC by contrast is directly focused on creativity, i.e. the generating of original and valuable outcomes through individual, collaborative and communal activity, with close attention to the ethical and social benefits of such creativity. And although some writing in the PBL field (eg Engel, in Boud &

[11] See Walsh, C.S. 2010.
[12] See Apperley, T., and Walsh, C.S. 2012.
[13] See Chappell K., Craft A., Rolfe L. & Jobbins, V. 2012.

Feletti, 1991) do emphasise the way that it reframes learning, it nevertheless is often discussed as a pedagogic approach. WHC is focused on learning rather than on pedagogy. A further distinction between PBL and WHC is that when PBL addresses creativity it does so in the goal-focused way that is inherent in approaches defined by specific 'problems'. WHC takes a less problem-focused approach. As such it has more space inherent within it for emergent creative ideas and possibilities.

CER can be best understood as a core manifestation of the more comprehensive creativity framework of WHC. It is an umbrella term and refers to:

- a principled, unifying theory of non-linear thinking techniques that foster co-creativity
- and the theory's implementation within C²Learn's computational tools.

Premised on a notion of creativity as an **intervention resulting in reframing**, CER's set of core creative learning tools support the manifestation of WHC. They do this by providing methods for the disruption of established routines and patterns. Hence CER's positioning in the box emerging from the centre of the WHC box.

By embedding CER's creativity enablers (i.e. the different techniques implemented in C²Learn's computational tools) within WHC we seek an organic fusion that will provide

- WHC with additional structured techniques taking advantage of and further enabling WHC's creativity opportunities: and
- CER with much needed ethical and cultural dimensions and the most appropriate conditions for fulfilling its potential.

As CER heavily relies on brainstorming activities structuring the core parts of the CER techniques, there is a particular relation with LDS. LDS' flattened hierarchies and open space of dialogue are an ideal environment within which to embed and evolve these brainstorming techniques, providing the opportunity to experiment with dynamic group management methods.

Ultimately, WHC, with CER's set of core creative learning tools support the manifestation of WHC making this the 'what' of C²Learn's co-creativity. This fuels the potential for **quiet revolutions**[14]. Hence the quiet revolutions arrow emerging from the top right hand corner of the figure. Such revolutions aim to be critical, yet ethically grounded and align personal with wider values. A quiet revolution has the potential to be a form of collaborative and collective endeavour that assumes commitment to excellence and engaged involvement by adults and children alike.

***C²Learn* co-creativity**, then, which seeks to foster quiet revolutions, will be fostered in a an environment designed with game elements using analogue and digital techniques including challenges, feedback, points, levels, rewards integrated within classroom practice informed by a scenario based context with close attention to the delicate balance between intrinsic and extrinsic motivation. We aim to harness students' motivation to challenge 'what is' and to generate, by working with others, 'what might be'.

[14] See Chappell, K., Craft, A., with Rolfe, L., & Jobbins, V. 2011.

3 C²Learn practice

In Section 2, we presented ideas on how WHC and CER are theoretically inter-related in order to represent conceptually what the C²Learn experience will enable students and teachers to do in terms of fostering their co-creativity. The diagram and accompanying explanatory text helps the viewer understand how 'journeys of becoming' can lead to 'quiet revolutions' through the 4Ps: *pluralities*; *possibilities*; *participation* and *playfulness*.

This section of the document provides greater pedagogical insight into what types of activities need to occur in C²Learn, as an *active process of change* guided by compassion (i.e. close and active awareness of the needs and hopes of others) and reference to shared values. This is derived from users' collaborative thinking, shared action, gameplay and social interaction (within a LDS) to foster WHC through CER's set of core creative learning tools support the manifestation of WHC.

Ultimately, C²Learn is about fostering co-creativity in learning. Learners, individually as well as mainly collaboratively and also communally, come up with novelty, new ideas. These new ideas:

- Have emerged through asking 'what if' and 'as if' questions and through the use of disruptive techniques resulting in re-framing;
- Have emerged from shared ideas and actions in an immersed dialogic rather than hierarchical environment; and
- Are captured or selected because they matter to the community and have a valuable impact on it.

Learners take into account the impact of that novelty on the individual, collaborative and communal dimensions of their community.

From an educator's point of view, C²Learn co-creativity is mainly about collaborative and communal creative processes in analogue and digital learning contexts designed with game elements, and about creative outcomes generated and shared with others; learners are collaborators and co-creators within their groups and their wider communities, without though forgetting their own wishes, interests, and needs. In some instances co-creativity will also manifest through the users interaction with artificial intelligence embedded within the C²Space.

Learners are motivated to be creative not just for the sake of creativity in isolation (*'I am being creative on my own and don't care if the others value this or not'*); rather, they are motivated co-creators because they recognize the value of their creativity for themselves and the others. They also have an interest in getting others to recognize and appreciate their creative activity, since the real value of this creativity materializes mainly in the group and the community through dialogue, action, immersion and being in control and not merely within the creator.

C²Learn co-creativity is not bound to any specific subject area in the curriculum. What is more, fostering this co-creativity does not involve the teaching of factual knowledge. Co-creativity is rather a learner disposition within school and within the digital game environment, cutting across the curriculum and other learner competences and conditions.

C²Learn co-creativity, after all, is about changing pedagogy and learning, unleashing learners' and teachers' creative potential, revolutionising education. This has been illustrated very clearly in the 'Impact' section of Part B of the DoW (B3.1.2.2 Scientific Impact from the Pedagogical Perspective).

A *C²Learner* moves away from learning about unquestionable facts, to thinking differently and questioning the obvious and widely believed, toward generating new ideas, proposing new solutions

and implementing changes, feeling, understanding and responsibly managing the usefulness and impact of novelty on themselves and the others - being intrinsically motivated to do these things through gameplay and interacting with other users and the machine.

In addition, a *C²Learner* actively helps to make all this a playful experience in which everyone is having a good time, relaxing and letting themselves 'immerse' in an activity which is more of a game and less of a lesson, considering it fun but at the same time important to them and the others. This playful experience, which has digital gameplay inherent within it, will involve challenges, quests, consequences and, we anticipate, a trajectory.

Finally, reflection on their co-creativity is important to *C²Learners*. They reflect on the value and impact of their creativity, as well as on how they and the others may be changing little by little during this adventure, what this change looks like, what has enabled it and where it is taking them next.

The C²Learn teacher intervenes as little as possible in learners' co-creative process, standing back, observing, enabling and facilitating as well as getting alongside students to share ideas as a co-learner or 'meddler' when appropriate, rather than instructing.

Clearly, then, learning for C²Learn co-creativity in some of its aspects is intrinsically different from what might in some classrooms be 'conventional' learning aimed at the transmission of knowledge rather than 'construction' of knowledge which is what C²Learn co-creativity assumes (although many classrooms in Europe as well as around the world foreground a transmission approach). The view of learning seen in terms of construction, informed by learners' own and social dialogic engagement draws on Piagetian and Vygotskian theory that has influenced pedagogy worldwide in the last fifty years. With a social constructivist foundation, the learning model in C²Learn is aimed at affording unlimited, self-sustained discovery of new possibilities and one's own and others' creative potential. It emphasizes personal and shared meaning-construction and is skeptical of models that are primarily or solely reward based (and hence are not tied to a solely 'gamified' approach that implies a behaviourist learning model, operated as it is on reward-based behaviours which whilst playful are focused on winning through reward).

It is important to acknowledge that C²Learn co-creativity may well draw not only on the C²Space elements designed specifically for the project but also may encompass existing co-creative games such as Minecraft and SecondLife (and many more). What will be needed for these are scenarios teachers can use that also require students to engage in co-creative activities. It is important to remember that many teachers already use games for teaching and might want to share gameplay practices and experiences that have the potential to foster co-creativity, even WHC. This is dependent on the teachers own interest and skill, but for teacher who enjoys playing, for example, Civilization, they may find it worthwhile to give their students the task of designing a mod (modification) for playing a historical conflict. We believe the C²Space will allow teachers to playfully author scenarios they can use with commonly available games. It will also be important, as detailed above, that teachers' other existing interests and skill sets, (e.g. ways to provoke the imagination such as the arts, ways to inspire such as interests in sports) are actively afforded space within C²Learn in order that the environment fully integrates within teachers' existing practice and passions rather than being seen as an 'add-on'.

3.1 WHAT C²LEARN PRACTICE COULD LOOK LIKE

C²Learn practice can be seen as an ensemble of four interwoven elements:

A. **The co-creativity element** driven by **Possibility Thinking** involving 'what if' and 'as if' questions, which enables users to imagine new ideas and to shift from 'what is' to new

possibilities of 'what might be', provides a foundation of opportunities for the intervention and reframing involved in **creative emotional reasoning** and the ethical impacts, dialogue, control and engaged action of **wise humanizing creativity**. Together this generates shared change. In C²Learn co-creativity, possibility thinking is integrated with **Creative Emotional Reasoning** in which learners generate new ideas together through the use of disruptive techniques for semantic, diagrammatic and emotive lateral thinking which results in reframing.

which involves:

B. The **social engagement element** via a 'Living Dialogic Space' defined by flattened hierarchies enabling dialogue, and the use of brainstorming activities which together enable individual, collaborative and communal thinking. This occurs through **immersion** in the C²Space and **collaboration** with fellow users, both the inside and outside.

which fosters:

C. The element of **Ethics and Impact Awareness:** in other words generating novel and valuable ideas evaluated by students for their ethical impact, and selecting and enacting ideas because they matter to the community and have a valuable impact on it. Involvement in this ethical dimension has the effect of both forming and being formed through dialogue ie co-creative outcomes via Wise Humanizing Creativity

which all occurs in the context of:

❖ D. The element of the **wider picture of change** ('Journeys of Becoming' and 'Quiet Revolutions' via cyclical developments between creativity and identity) through gameplay and social engagement in the C²Space over time where users make their decisions about consequences and impact wisely. Thus over time, cyclical developments between creativity and identity occur. Learners enable change and reflect on change in longer periods of co-creative activity.

The characteristics of student behaviours in C²Learn co-creativity and identified by the project team as the co-creativity evaluation criteria, are evident as students foster new, valuable ideas through:

- Accepting and generating intervention and reframing
- Attending to the ethics and impact of ideas
- Involvement in dialogue
- Being in control
- Engaged action – being immersed in the experience

Examples are presented below of what learners and teachers typically do in each of the elements of co-creativity, and of how game affordances and social networking technologies can help to facilitate and further empower them to engage in C²Learn's co-creativity.

C²Learn action and engagement can be seen as taking place within a wider face-to-face and virtual pedagogical environment of co-creativity, which includes several core episodes of co-creativity and creative thinking. At large, these two levels of activity (wider environment and core episodes) correspond to the digital environment and the core games/playful/social networking activities respectively. Students' digital and face-to-face involvement inherently involves what the project calls the four P's of participation, possibilities, pluralities and playfulness. The following table (Table 1) shows how the elements A.-D. above are mainly evident at these two levels:

Table 1: Four interwoven elements of C²Learn practice

	Wider environment of co-creativity *(corresponding to the C²Space)*	**Core episodes of co-creativity** *(corresponding to the core games and 'playful' activities)*
A1. Creative thinking (driven by 'Possibility Thinking' provides a foundation of opportunities for the intervention and reframing involved in creative emotional reasoning and the ethical impacts, dialogue, control and engaged action of wise humanizing creativity*)* **A2. Creative thinking formalized** *('Creative Emotional Reasoning')*	• Creative thinking that has taken place within core episodes **leaves its traces** in the wider environment. • In the wider environment, co-creators can **reflect** on the creative thinking that has taken place within the core episodes.	• Creative thinking lies **in the heart** of each core episode; core episodes are formed around tasks or initiatives of creative thinking. • Part of the creative thinking in a core episode may be formalized, applying CER techniques.
B. Social engagement *(*via a 'Living Dialogic Space' defined by flattened hierarchies, involving individual, collaborative and communal thinking, through immersion in the C²Space t and via collaboration*)*	• Social engagement that has taken place within core episodes **leaves its traces** in the wider environment. • In the wider environment co-creators can **reflect** on social engagement that has taken place within the core episodes.	• Co-creators are involved in social engagement of various kinds within each core episode.
C. Ethics and Impact Awareness Element: novel and valuable ideas evaluated by students for their ethical impact (both forming and being formed through dialogue ie co-creative outcomes via Wise Humanizing Creativity)	• Ethics and impact considerations that have taken place in relation to new ideas within core episodes **leave their traces** in the wider environment. • In the wider environment, co-creators can **reflect** on the ethics and impact considerations that have taken place within the core episodes.	• Co-creators consider ethics and impact within each core episode.
D. Wider picture of change Element ('Journeys of Becoming' and 'Quiet Revolutions' through gameplay and social engagement in the C²Space over time where gameusers make their decisions about consequences and impact wisely*)*	• In the wider environment, co-creators may make **wider plans** for change, setting relevant goals. • **Traces** from the core episodes may provide evidence of wider change. • Co-creators **reflect** on these and more generally on the C²Learn experience.	• Each core episode contributes to the wider change, but the wider change is not (necessarily) an explicit focus in each core episode.

Overall, the core episodes of co-creativity are typically characterized by 'playful' activity and a faster pace, while the wider co-creativity experiences (C²Experiences) affords a slower pace of taking stock of the activity that has occurred in the core episodes and of the overall experience. This is likely to involve classroom based reflection on the outcomes of the analogue and digital gameplay, which Nicholson (2012b[15]) argues is vital in designing environments with game affordances. He notes that debriefing can occur within the roles assumed during the learning or outside of these entirely but that there needs to be some form of recording of the debriefing. He emphasizes the need for debriefing to enable the expression of feelings as well as enabling engagement with experience and what was learned (each student relating their own perspectives to those of others), consideration of how to apply what was learned in new contexts, and planning next steps. As he puts it, 'one of the powerful aspects of debriefing is that it allows each participant to take what he or she internalized from the activity, share it with others, and learn from others… while challenging it can be …valuable to bring in other viewpoints and to let the learner know that his or her thoughts will be shared with others' (ibid p5). Such reflective and collective debriefing is in keeping with the learning design of C²Learn and might be led by students themselves considering the extent to which they have achieved co-creativity.

Notes to teachers will need to include suggestions on how such reflective activity has been and might be further integrated within the C²Space and reviews of learning. Notes to teachers will also of course need to contain strategies for using C²Learn's core elements to help student people feel more in control of their lives and futures and capable of changing them (agency). The C²Space does not set goals for students and teachers. Rather, it lets them choose goals that challenge them and are important to the community.

[15] See Nicholson, S. 2012b.

3.2 HOW C²LEARN PRACTICE MANIFESTS IN THE C²SPACE

This section details how C²Learn practice manifests in the C²Space. It is divided into four tabulated sub-sections which correspond to the four different elements of C²Learn practice identified above in 3.1:

- The Creative Thinking Element (1 + 2)
- The Social Engagement Element
- The Ethics and Impact Awareness Element
- The Wider Picture Element

In each table the element of C²Learn practice is approached from four perspectives which represent the integration inherent in the project's gameful design i.e. how learners, teachers, technological environment and C²Space nurture each element of the C²Experiences. These tables are written with other elements of the project, in parallel development, in mind. This means that they should be seen as developmental and informative tools for the project's own development as well as describing the project's goals to external readers.

3.2.1 THE CREATIVE THINKING ELEMENT

A1 'Possibility Thinking' (PT)

Provides a foundation of opportunities for the intervention and reframing involved in creative emotional reasoning and the ethical impacts, dialogue, control and engaged action of wise humanizing creativity

Table 2: The Creative Thinking Element

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Think about ***possibilities*** rather than approach learning as solely acquisition of knowledge ('what is') • Find and solve problems – being not only 'consumers' but also 'instigators' of problem-solving • Aim to 'think differently' and generate new ideas by exploring possibilities and perspectives: ▪ engaging in inquiry, asking 'what if' questions ○ experimenting with pluralities of places, activities, people ▪ imagining, engaging in 'as if' situations ○ experimenting with pluralities of personal identities eg repositioning roles ▪ exploring, co- constructing (designing, editing, extending) content ▪ applying CER non-linear thinking techniques (see below).	• Provides challenges provoking learners to engage in possibility thinking • Encourages and facilitates learners to pose and solve problems posed by teacher and others • May ask learners 'what if' questions, and provide opportunities for students to engage in 'as if' activity, predominately encourages and facilitates learners to ask their own 'what if' questions and to engage in 'as if' activity • Ideally, devises learner activities that can only be satisfactorily completed if learners actively experiment with pluralities of places, activities, people, and personal identities, and/or exploring and co- constructing (designing, editing, extending) content • Integrates into the activity the use of CER non-linear thinking techniques.	• Providing the learner with a digital space which intuitively affords problem-finding and problem-solving and foregrounds exploration of possibilities and perspectives: ▪ Navigating through challenges ▪ Addressing and posing challenges ▪ Providing instant feedback ▪ Encouraging/motivating learners to keep thinking differently and address challenges creatively (e.g. through game affordances) • Keeping track of the possibility thinking activities so that learners can reflect on them both in their efforts to address the challenges, as well as in their evaluation of the experience afterwards.	• Facilitate to learners to get involved in playful exploration of a given possibility space, or co-construct a new possibility space, e.g. by: ▪ Presenting them with 'what if' questions and 'as if' environments ▪ Requiring them to pose their own 'what if' questions and to engage in 'as if' environments ▪ Requiring them to explore and co- construct (designing, editing, extending) content ▪ Provide peer feedback ▪ Enabling/enhancing the application of CER non-linear thinking techniques (see below).

A2. Creative thinking formalized: 'Creative Emotional Reasoning' (CER)

Application of non-linear thinking techniques which consist in interventions resulting in reframing

Table 3: The Creative Thinking Element formalized

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Address given challenges (problems, dilemmas, difficult issues) • Reframe these problems, dilemmas, issues and come up with new responses to given situations: ▪ Engage in activities aiming to disrupt established routines and patterns of thought and action ▪ Create new analogies as building blocks of creativity ▪ Actively experiment recombining elements of creative challenge ▪ Actively facilitate a shift of perspective, by uncovering aspects of creative challenge, going beyond material provided by description (elements) of challenge, re-casting challenge in new light (as whole/re-formulating elements) • Generally, uses CER lateral thinking techniques and engages in brainstorming tasks	[as in 1 above] and • Intervenes (directly or indirectly) to trigger learners' new responses by disrupting students' established routines and patterns • Assigns and facilitates brainstorming tasks	[as in 1 above] and: • The design of more innovative/interesting 'disruptors' (elements that disrupt learner's established routines and patterns), as well as experiment with their introduction and use within the activities, by taking advantage of what digital technologies have to offer.	[as in 1 above] and • Creativity assistants (AI) disrupt learners' established routines and patterns: ▪ without teacher's intervention/trigger ('automatically') AND/OR ▪ facilitating teacher's intervention • Playfully realise brainstorming tasks

3.2.2 THE SOCIAL ENGAGEMENT ELEMENT

Via a 'Living Dialogic Space' defined by flattened hierarchies, involving individual, collaborative and communal thinking, through immersion in gameplay and social networking via collaboration in the C²Space.

Table 4: The Social Engagement Element

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• ***Co-create***, that is: ▪ Create individually AND ▪ Co-create by collaborating with others within their group AND ▪ Do the above by consciously placing themselves, their groups and their creative activity in the wider frame of the community (whole class, school, local community, society at large, the world) – in other words co-create communally	• Divides the class into groups, aiming at 'balanced' group composition (e.g. mixing 'more' and 'less' creative or active learners but also possibly mixing groups to enable different ages and capabilities, interests etc to work together) ▪ May keep the groups stable over time, or may change grouping patterns • Assigns/facilitates: ▪ individual learner work ▪ collaborative learner work ▪ whole class work • Agrees the rules with learners, and acts as facilitator, 'meddler' as appropriate and rule-keeper.	• Teacher's management of individual, group, whole class learner activity • Opportunities for individual, collaborative and communal activity • Teacher's decisions on learner grouping (e.g. through information on learners' activity and co-creativity profile) • Providing access to, organization, and overview of the creative activities to the learner, the group, the community • Rewarded participants by making their progress visible in an immediate, tangible way,	• Provide opportunities for individual creativity BUT PREDOMINANTLY • Afford collaborative and communal activity realized within the group and placed within the wider community: '*I am playing here within my group, but I know there is more at stake out there, in the wider picture (e.g. in the whole class)*'. • Allow students to choose goals that challenge them, and use C²Learn's tools to spark positive emotions in their lives and communities while identifying and gaining control over barriers that hold them back. •

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Engage in ***dialogue*** and ***negotiation***: ▪ Pose questions ▪ Debate between ideas ▪ Promote dialogue and respect of different viewpoints within their group, encouraging their peers to voice their ideas ▪ Actively negotiate conflict and seek alternate paths, going in a different direction if conflict is not resolved although accepting sometimes conflict is not commensurable ▪ Are generally prepared to change their mind in the space of dialogue.	• Enables and facilitates learner dialogue and debate, by assigning relevant tasks: ▪ E.g. sets challenges, poses questions and dilemmas to learners which afford different viewpoints and debate. • Encourages all learners to express their opinion and critique in a variety of forms. • When conflict occurs, allows it to be openly expressed and negotiated by the learners: ▪ Encourages learners to seek alternative paths and be prepared to change their mind.	• Keeping track of the dialogue and negotiation activities (e.g. of their timing and subject, and of their results) so that learners can reflect on them both in their efforts to discuss and negotiate, as well as in their evaluation of the experience afterwards. • Although dialogue and negotiation will expectedly take place predominantly face-to-face in the classroom, hosting such activities online (e.g. asynchronously and at a distance) is an option too.	• Use the motivational power of posing debatable challenges and dilemmas • Encourage the expression and consideration of different viewpoints • Enable the expression and management of conflict in a 'contained' /safe manner, e.g. through opening up ways to explore alternate paths, but also allowing conflict to be unresolved where appropriate.

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Are in ***control***: ▪ Take charge and leading roles during different phases of the creative process ▪ Share control/leadership with others, in a context of equality and flattened hierarchies ▪ Understand the rules of the system underlying the challenges facing them and their group ▪ Understand how decisions around new ideas have consequences ▪ Make decisions around new ideas ▪ Instigate action.	• Designs ways to manage leadership within learner groups, aiming to avert domination by one or more individuals (including themselves s teacher) while encouraging individual initiative ▪ Agrees the rules with the learners ▪ May set learners the task to decide about leadership in their group ▪ May design a mandatory rotation of leadership into the tasks, or may allow for (individual or joint) leadership to emerge from the interaction ▪ Seeks to live out a flattened hierarchy where they engage with students as their equals; this means both standing back to observe carefully how students are responding and also stepping forward alongside students to 'meddle in the middle' as a collaborator as appropriate • Encourages and facilitates each learner group to explore the challenges and systemic relations underlying their immediate task, and the possible consequence of decisions that the group will make • Ensures decision making and subsequent action is an integral part of the learner task.	• Expecting learners to take and lead initiatives (rather than just exposing them to teacher-instigated activity) • Reflecting/representing social relations in the environment so as to make leadership and flattened hierarchies transparent to the learners; this includes the teacher's role • Keeping trace of leadership, decision making and action activities so that learners can reflect on them both in their efforts to address the challenges, as well as in their evaluation of the experience afterwards.	• Involve (changing) leadership roles, or leadership negotiation quests • Emphasize equality of opportunities within the group • Involve exploration of what is lying behind a given challenge or situation, including hidden consequences • Include moments of decision making and of translating decisions into action.

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Make themselves ***visible on their own terms***: ▪ Have control of their own identity and image to others ▪ Have an interest in getting their creative activity and/or creative outcomes appreciated and valued by the others	• Facilitates the learners to become aware of being in charge of their own image to others • Designs peer/group/community evaluation into the activities, so that learners can 'promote' their creative solutions to others and peers can co-evaluate their creativity	• Enabling control of personal identity representation, and peer/group/community evaluation, in a social-network-style fashion	• Offers students opportunities to be visible through avatar and expression of this • Enabling students to engage/disagree/challenge with one another/each other to gain feedback during the digital element of the game (gameplay)
• Engage in playful ***action***, alone and together with the others: ▪ Immerse themselves in the experience of the creative process ▪ Facilitate immersion in the experience of the creative process for the rest of the group ▪ Are willing to take risks and/or leave their 'comfort zone' (thus possibly generating surprising individual or collaborative ideas) ▪ Learn, co-create and self-create as active and connected users in emotionally rich, virtual and actual play-worlds.	• Emphasises the playful nature of the activity (as opposed to the formality of a 'lesson') • Withdraws from the stage as much as possible, becoming an observer and facilitator of the play (possibly also a co-player or 'meddler' at times at the same time as retaining the teaching agenda) • Allows space for learners to take risks outside 'comfort zones', by encouraging the generation of surprising ideas and avoiding criticism of unconventional thought	• Enacting a playful, game-like experience of the wider activity (i.e. beyond, between, around the core games and playful activities) • Helping learners feel as users engaged in a longer-term challenge and not just within the core games and playful activities • Providing game-like triggers and information, such as gauges, scores, etc. • Foregrounding solutions/ creations that the groups and community evaluate as interestingly surprising (rewarding those taking the risk to leave 'comfort zones') • Keeping trace of the activities so that learners can reflect on them in their evaluation of the experience afterwards.	• Allowing safe experimentation with pluralities

3.2.3 THE ETHICS AND IMPACT AWARENESS ELEMENT

Novel and valuable ideas evaluated by students for their ethical impact (both forming and being formed through dialogue ie co-creative outcomes via Wise Humanizing Creativity)

Table 5: The Ethics and Impact Awareness Element

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Consciously and systematically position themselves, their generated new ideas and their decisions about how to use these new ideas, in relation to the values of their own, of their group, and of the community, through dialogue • Explore through dialogue the good and bad consequences of the novelty on them, their peers, their group, the community • Select through dialogue ideas driven by values, and actively promote those which are deemed valuable by the group • Generally, make and evaluate through dialogue decisions which are ethically grounded and act responsibly.	• Enables and facilitates learners to: ▪ Clearly define and express their shared values ▪ Explore the impact of the new ideas and of the overall creative activity ▪ Define and express their decisions in relation to this impact.	• Learners expressing and sharing their values • Learners expressing and sharing their evaluations and decisions in relation to the impact of their novelty • Keeping track of activities so that learners can reflect on them in their evaluation of ethics and impact both during the activities and afterwards.	• Provide ethically challenging situations/choices/dilemmas/problems which allow students to develop, position and evaluate new ideas in relation to their own values, those of the group and of the community and which help them to act responsibly. • This would also allow them to collaborate with each other in new ways as they will bring diverse skills and experiences to their gameworld identity.

3.2.4 THE WIDER PICTURE ELEMENT (THE PICTURE OF CHANGE)

'Journeys of Becoming' and 'Quiet Revolutions' via cyclical developments between creativity and identity, through digital gameplay and engagement in the social networking environment over time where gameusers make their decisions about consequences and impact wisely

Table 6: The Wider Picture Element

The learners:	The teacher:	The tech environment may help in:	Games and playful activities may:
• Set goals for themselves, their group, their community, aiming at creative change of for example rules and behaviours and thus may become 'quiet revolutions'. • Act as agents enabling change in longer periods of co-creative activity (although shorter periods or one off experiences are also possible) • Reflect on their, their group's and community's activity and achievements: the 'journeys of becoming' and eventually the 'quiet revolutions'.	• Facilitates the learners to set goals aspiring and enacting creative change, thus to act as change agents, and to reflect on their activity and achievements.	• Enabling shared goal setting • Keeping track of activities so that learners can reflect on them in their evaluation of wider change.	• Offer scope for students to set goals for themselves and their community which aim at creative change of eg rules and behavior, and which thus may become 'quiet revolutions'

3.3 HOW C²LEARN PRACTICE MANIFESTS VIA CURRENTLY AVAILABLE GAME PROTOTYPES/TOOLS

In order to fully foster co-creativity, and prevent C²Learn becoming 'locked down' in tight scenario-based activities, games and tools will need to be embedded within a wider 'learning design unit' which allows for the space and flexibility necessary for LDS, co-creativity and ultimately journeys of becoming, within the classroom and beyond it. Whilst we are still working as a consortium on what exactly the C²Space will be like that will structure this 'learning design unit', we can, in the meantime, offer insight into how C²Learn practice might manifest via C²Experiences . This is presented using the four elements table from section 3.1, adapted to give examples for this game prototype.

This builds on the Interim Deliverable 2.2.1, which stated learning goals and indicators simply in terms of the five categories of co-creativity. Having further articulated C²Learn practice in this new version of the deliverable in terms of the four elements of Creative Thinking, Social Engagement, Ethics and Impact Awareness and the Wider Picture (which incorporate the previous five categories of co-creativity), we can state the learning goals and indicators more fully. Using the same tabulated format as in Section 3.1 we articulate below how C²Learn practice manifests in the four elements via one example (4Scribes) of the available game prototypes and tools, and what indicators of co-creativity might be apparent. The format of the Table in 3.1 has been adapted so as to include the C²Space and teacher activity in the wider environment of co-creativity column; this is because these two are the main contributors to fostering co-creativity. The games and playful activities and learner activity have been included in the core episodes of co-creativity column because these are the two main places where co-creativity will manifest.

The 4Scribes example which follows, is situated within 'Rescue' - one of the Scenarios which is in development. In this scenario, students are presented with the dilemma that following a crash of some kind (e.g. aeroplane, space mission, boat), there is a lifeboat/ escape pod available that can take a certain number of people (e.g.10) and there are more people than that (e.g.11 or 12) who need to rescue themselves or be saved. Through the 4Scribes narrative game the students need to create the story of who is saved and how.

3.3.1 C²LEARN PRACTICE IN 4SCRIBES

Table 7: C²Learn Practice in the 4Scribes prototype

	Wider environment of co-creativity *(corresponding to C²Space and teacher activity)*	**Core episodes of co-creativity** *(corresponding to core games and playful activities and learner activity)*

A1. Creative thinking
(driven by 'Possibility Thinking' provides a foundation of opportunities for the intervention and reframing involved in creative emotional reasoning and the ethical impacts, dialogue, control and engaged action of wise humanizing creativity*)*
	digital environment
	The digital environment around the 4Scribes game will be structured to:
	• Provide a private working space in which the player can create possible 'card' combinations, experiment with posing problems and solving problems within the ongoing narrative using their set of 'cards'.
	• Provide learners with a reflective space or tool to look back over ideas and decisions and reflect and comment on them
	• Offer users space within which they can experiment with identities for card characters and their look
	• Link these to the shared narrative space within which the story is collaboratively created and 'told' using words, images, drawings and film clips
	• Provoke users to overcome challenges in developing their narrative at timely intervals by allowing the Creativity Assistant access to the 4Scribes play
		games and playful activities
		The 4Scribes game will:
		• Involve users in exploration of eg the Rescue scenario possibility space, or their own newly constructed version of that scenario by:
		  ▪ Presenting them with 'what if' questions via eg the Creativity Assistant and 'as if' environments via creation tools in which they can create backgrounds and characters for the 'cards'
		  ▪ Requiring them to pose their own 'what if' questions in their private space as well as the public story-telling space
		  ▪ Requiring them to explore and co- construct (designing, editing, extending) character's features, narrative and environment characteristics

	teacher activity Once the rules of 4Scribes gameplay are established the teacher will mainly 'step back' to allow the flow of play to occur. However if users become demotivated or struggle to develop narrative teachers will step in to: • Pose a range of open-ended 'what if' questions to re-provoke learners to get involved in possibility thinking • Request particular learners pose problems to others and/or pose additional problems to learners themselves • Use the 'card' format to provide character-based opportunities for students to engage in 'as if' activity of plural kinds re identity • If they are not doing so already, encourage them to experiment with other pluralities within the narrative such as place • Trigger the integration into the activity of intervention and reframing tools or use the Creativity Assistant to intervene in provocative ways in gameplay	*learner activity* When playing 4Scribes users will have to • Think about multiple possibilities of narrative direction by working with their existing knowledge and figuring out how to develop that creatively to develop the narrative (rather than approach the task as knowledge acquisition exercise) • Not only solve but also find problems that will help their part of the narrative develop in an innovative way (eg how can my character create an issue for another character which means they can no longer get into the rescue boat) • 'Think differently' and generate new ideas about their characters and the narrative by exploring rescue and personality possibilities and the perspectives of different characters, by: ▪ asking 'what if' and 'as if' questions about card character identity, the place of the crash, the rescue environment, repositioning selves in different roles to understand perspective • Exploring and co- constructing (designing, editing, extending) content within the environment of the public narrative space.

A2. Creative thinking formalized *('Creative Emotional Reasoning')*	*digital environment* [as above] and: The C²Space around the 4Scribes game will offer a selection of C²Learn 'disruptors' (e.g. Random Word Generator) to disrupt learner's establishing narratives. Inclusion of disruptors can be set as voluntary or involuntary within 4Scribes.	*games and playful activities* [as above] and • Incorporate 4Scribes specific intervention and reframing tasks as interjection in the flow of the story (either voluntary or involuntary) to keep learners thinking differently e.g. introduction of rogue character cards or new dimensions to the scenario above and beyond hands dealt to users
	teacher activity [as above] and the teacher: • Intervenes either directly within the flow of the narrative to trigger new responses or indirectly (perhaps in students' private work spaces) if they see users getting set within particular narrative pathways • Inserts (and if necessary) facilitates brainstorming tasks when narrative reaches a dead end	*learner activity* When playing 4Scribes users will have to: • Address given challenges that arise through the combination of the Rescue scenario, and the premise and theme setting at the beginning of the 4Scribes game • Reframe these challenges and come up with solutions to how to e.g. rescue 11 people stranded on the moon when the evacuation pod only has enough air for 10: ▪ Engage with disruption tools and the creativity assistant activities aiming to change obvious patterns of thought eg Random word 'imminence' may prompt them to think about changing their tactic to one of signaling to be rescued which may be more imminent than they previously thought, therefore negating the need for the narrative to find a way not to save all 11 people ▪ Create new analogies as building blocks of the creative process eg thinking about what you do when you have too many items in your basket in the '10 items only queue' in the supermarket ▪ Actively experiment with re-combining elements of the creative challenge e.g. find a way to look on the moon for other crashed spacecraft which may contain air supplies ▪ Actively facilitate a shift of perspective, by uncovering hidden aspects of creative challenge, going beyond the material provided by description (elements) of the challenge, recasting challenge in a new light (as a whole or re-formulating elements of it) e.g.s above also cover these activities

B. Social engagement *(*via a 'Living Dialogic Space' defined by flattened hierarchies, involving individual, collaborative and communal thinking, through immersion in gameplay and social networking in the C²Space and via collaboration*)*	*digital environment* The environment around 4Scribes will: • Assist the teacher's management of individual and group activity as the narrative develops • Assist with teacher's decisions on effective learner grouping for playing 4Srcibes (e.g. through information on learners' activity and co-creativity profile) • Via the public space, provide access to, and overview of the developing narrative to the group • Encourage control of personal identity representation via avatars and the way characters are played in the game, in a social-network-style fashion	*games and playful activities* The 4Scribes game will: • Especially allow for collaborative and communal activity within the shared narrative space as well as some individualized creative activity within the personal private space • Enable the expression and management of conflict within the narrative in a 'contained' /safe manner, e.g. through opening up ways to explore alternate paths in the developing story. In this situation conflict will need to be resolved or skilful ways found to circumvent unresolved conflict, in order to move the narrative on • Involve shifting leadership roles, as different users take charge of the narrative at different times; this will also emphasize equality of opportunity within the narrative groups
	teacher activity The teacher manages the social side of the narrative development by • Taking careful decisions on learner grouping (e.g. through information on learners' activity and co-creativity profile) in order to bring together the most conducive groups for WHC narrative development • Focusing where necessary on individual and within group activity, to keep driving the narrative. This may mean paying particular attention to the atmosphere of group discussion. • Helping learners to keep track of the dialogue and negotiation activities within private and public spaces • Helping more reluctant learners to take the initiatives e.g. perhaps in taking a risk regarding changing the direction of the story. • Monitoring emotional impact of storyline developments in relation to the Rescue scenario Doing all of the above in a way which honours flattened hierarchies and the pedagogies of standing back, so e.g. suggesting rather than telling, using tools to insert ideas 'bottom up' rather than ruling from 'top down'	*learner activity* In 4scribes learners will consciously collaborate and engage socially by: • Engaging in dialogue and negotiation in order to develop the narrative around who is rescued or how 11 rather than 10 people are saved: • Taking control of the narrative guided by their 4scribes cards: • Making themselves visible on their own terms using the personal reflective space and public areas as they like in order to achieve this • Engaging in playful narrative development, together with the others but with an ethically driven purpose to their narrative and a concern for its final impact on the characters

C. Ethics and Impact Awareness Element: novel and valuable ideas evaluated by students for their ethical impact (both forming and being formed through dialogue ie co-creative outcomes via Wise Humanizing Creativity)	*digital environment* The digital environment around the 4Scribes game will be structured to: • Allow learners to think about their values regarding who is more worthy of saving in the Rescue scenario in their private space including the reflective facility and to share these values via the characters and narrative they contribute to within the 4Scribes public space • Allow learners to comment and reflect upon the values that they see others expressing about 'worthiness' of characters both within 4Scribes and forum/blog facilities etc in the environment. • As well as comment and reflect upon the ethical implications of the outcome of decisions to 'save' characters within the narrative via the forums/blogs around 4Scribes • Keep track of ideas and narratives within both the private and public spaces so that learners can reflect on them in their evaluation of worthiness of rescue	*games and playful activities* The 4Scribes game will: • Provide ethically challenging choices /dilemmas /problems such as the Rescue scenario involving characters not usually within their experience which allow students to step out of their everyday 'narrative' and 'values' and challenge them to see situations from new ethical perspectives
	teacher activity Once the rules of 4Scribes gameplay are established the teacher will mainly 'step back' to allow the flow of play to occur. However if users become demotivated or struggle to develop narrative teachers will step in to help learners to: ▪ Clearly define and express their shared values through using private and public spaces and reflection tools effectively to consider the impact of saving characters ▪ Explore the impact of the innovative solutions such as signaling for rescue rather than trying to use the rescue pod to escape, via discussion in online forums/blogs and of the overall creative activity, and/or with the teacher	*learner activity* When playing 4Scribes users will have to • Consciously and systematically position themselves, their avatars (plural identities) and their generated solutions to the Rescue dilemma, in relation to their values, those of their imaginary group (astronauts awaiting rescue), and of the community (space mission), through dialogue • Explore through dialogue the good and bad consequences of deciding who to save, or of waiting to be rescued, and other solutions with their peers, their group, the community • Select through dialogue the solution driven by the values of their imaginary group (space mission), and actively promote those which are deemed valuable by the group

D. Wider picture of change Element ('Journeys of Becoming' and 'Quiet Revolutions' through gameplay and social networking in the C²Space over time where gameusers make their decisions about consequences and impact wisely)	*digital environment* The C²Space around 4Scribes will offer means to • Integrate learning from the 4Scribes game into previous and future shared goal setting • Keep track of collected ongoing narratives so that learners can reflect on them in their evaluation of wider change	*games and playful activities* The 4Scribes game will: • Offer students opportunities to change the rules and assumptions of the game so as to create new and possibly unexpected possible to their own narrative
	teacher activity Within 4Scribes the teacher will • Facilitate the learners to reflect on their changing thinking across a number of different narratives and to connect these to the wider picture of change across the C²Learn experience	*learner activity* Within 4Scribes learners will • Be able to reflect on how they and their thinking has changed within different versions of the narrative • Set goals for themselves and their group aiming at creative change through the narrative; this is important in other words that this game affordance allows engagement with real-world as well as fictional contexts

4 How the consortium is moving toward designing the C²Space with the learning goals in mind

The consortium continues to develop the C²Space through two parallel sets of activity:

- **C²Learn Co-Development Teams** comprising teachers and pupils, are working within the ongoing piloting in Austria (BMUKK), Greece (EA) and England (OU) with the educational scenarios, computational tools, paper prototypes and pedagogical approach, monitored via the assessment strategy developed within D2.3.1.
- **C²Learn Consortium Partners** are all working with the theoretical foundations of the project (articulated above in 2.1) and are continuing to work in an integrated way with the Learning Design to develop and refine the nature of the C²Learn's gameful design itself and within this the game design. This development and refinement is being undertaken through paper prototypes, the computational tools, pedagogical approach and assessment strategy. To do this the consortium partners are collaborating with one another, and will continue to do so working with the translations of theory into practice articulated in section 3 above. They continue to also draw on co-creativity and gameplay theory, including research and development on the assessment of creativity and game design, educational literature on pedagogy and learning along with the use of serious games, and of course feedback from the Co-Development teams via the three remaining phases of piloting (detailed below).

The learning design informs both sets of activity but is also informed by these due to iterative nature of the project design as discussed below.

4.1 NEXT STEPS FOR C²LEARN LEARNING DESIGN

The iterative development (through the co-development teams and the consortium) has worked through and will continue on a cyclical basis as follows:

- First pilot cycle completed with a pilot report end October 2013
- Second pilot cycle due to complete with a pilot report end July 2014
- Third pilot cycle due to complete with a pilot report end April 2014
- Final pilot cycle due to complete with a report end October 2015.

Through these pilot cycles, the co-development teams will continue to co-develop and pilot material and assess the degree of co-creativity emerging from its use in the C²Space via the Co-creativity Assessment Methodology, whilst alongside them consortium members continue to develop iterative versions of the semantic, diagrammatic and emotive tools, game design and paper and digital versions of the prototypes, and iterative versions of the co-creativity assessment. The nature of the C²Space itself including the detailed language describing it, will of course be refined further as these elements within it are tested and from the final versions guidelines for teachers and student will be developed.

This version of the learning design in D2.2.2 has been developed by the OU team working closely with EA. BMUKK, SGI, UEDIN, UoM and NCSR-D have also offered some comments. The OU/UEDIN collaboration is working consistently to ensure that the theoretical framing of the project is robust, clear and integrated bringing together the CER elements within the WHC goal – and that this is clearly communicable. This has been extended in this deliverable in collaboration with EA to shift the theory into examples of manifestations in practice in Section 3 above. With EA/SGI/OU the collaboration is

working to ensure that partners and others who will use the learning design are able to do so productively, and that the learning design can develop appropriately as part of this process. In addition as indicated above the consortium as a whole continues to explore how to ensure the C²Learn experience provides an appropriate C²Space, is achievable with the resource available to the project, is at the cutting edge of game technology and is open and flexible enough to be used in multiple classroom and curriculum settings.

References

Amabile, T.M. (1998a) How to Kill Creativity. Harvard Business Review, Sept – Oct 1998, NEED PAGE NUMBERS

Amabile, T.M., Burnside, R. and Gryskiewicz, S.S. (1998b) *User's Manual for KEYS: Assessing the Climate for Creativity.* Greensboro, N.C.: Center for Creative Leadership,

Apperley, T., and Walsh, C.S. (2012). What digital games and literacy have in common: A heuristic for understanding pupils' gaming literacy. *Literacy*, Vol 46, pp. 115–122. DOI:10.1111/j.1741-4369.2012.00668.x ISSN: 1741-4369

Boud, D. & Feletti , G. (eds.) (1991). *The challenge of problem based learning.* London: Kogan Page Limited.

C²Learn (2013) Deliverable 2.1.1: *Creative Emotional Reasoning*. June 2013

Chappell K., "Towards Humanising Creativity", *UNESCO Observato*ry, E-Journal Special Issue on *Creativity, policy and practice discourses: productive tensions in the new millenium* Volume 1, Issue 3, 2008, http://www.abp.unimelb.edu.au/unesco/ejournal/vol-one-issue-three.html (20 February 2012).

Chappell, K., & Craft, A. (2011). Creative Learning Conversations. *Educational Research*, 53 (3), 363-385.

Chappell, K., Craft, A., with Rolfe, L., & Jobbins, V. (2011). Not just surviving but thriving. In *Close Encounters: Dance Partners for Creativity* pp143-159 . Stoke on Trent: Trentham Books.

Chappell, K., Rolfe, L., Craft, A. & Jobbins, V. (2011). *Close Encounters: Dance Partners for Creativity* Stoke on Trent: Trentham Books.

Chappell K., Craft A., Rolfe L. & Jobbins, V. "Humanising Creativity: valuing our journeys of becoming", *International Journal of Education and the Arts*, *13(8) 1*-35, 2012, retrieved 11.01.13 from http://www.ijea.org/v13n8/

Chi M. T. H., Bassok M., Lewis M. W., Reimann P., & Glaser R., "Self-explanations: how students study and use examples in learning to solve problems", *Cognitive Science* 15, 1989

Craft A., "Trusteeship, wisdom and the creative future of education?", *UNESCO Observatory*, E-Journal, Volume 1, Issue 3, Special Issue: *Creativity, policy and practice discourses: productive tensions in the new millennium*, 2008.

Craft, A., "Possibility Thinking and Fostering Creativity with Wisdom: opportunities and constraints in an English context", in Bhegetto R. & Kaufman J. (Eds), *Nurturing Creativity in the Classroom*, Cambridge: Cambridge University Press, 2010

Craft, A. (2011). *Creativity and Education Futures: Learning in a Digital Age*. Trentham Books.

Craft, A., Chappell, K., Rolfe, L., & Jobbins, V. (2012) Reflective creative partnerships as 'meddling in the middle': developing practice. *Reflective Practice: International and Multidisciplinary Perspectives.* DOI:10.1080/14623943.2012.670624

De Bono E., *Teach Your Child How to Think*, Penguin books, 1994.

Engel, J. (1991). Not Just a Method But a Way of Learning. In D. Boud & G. Feletti (Eds.), *The Challenge of Problem-Based Learning*. London: Kogan Page.

Hmelo-Silver, C. (2004) 'Problem-Based Learning: What and How Do Students Learn?',*Educational Psychology Review,* vol. 16, no. 3, September 2004, pp. 235- 266.

Kress, G.R. and van Leeuwen, T. (1996) *Reading Images: The Grammar of Visual Design*. Abingdon: Routledge

Margetson D (1991) Why is Problem-based Learning a Challenge? In: D Boud, G Feletti, eds. *The Challenge of Problem Based Learning*. London: Kogan Page

Nicholson, S. (2012a). A User-Centered Theoretical Framework for Meaningful Gamification. Paper Presented at *Games+Learning+Society 8.0*, Madison, WI.

Nicholson, S. (2012b). Completing the Experience: Debriefing in Experiential Educational Games. In the *Proceedings of The 3rd International Conference on Society and Information Technologies*. Winter Garden, Florida: International Institute of Informatics and Systemics. 117-121.

Ribeiro, L.R.C. (2011) 'The Pros and Cons of Problem-Based Learning from the Teacher's Standpoint', *Journal of University Teaching & Learning Practice,* vol. 8, issue 1, pp. 1-17.

Walsh, C.S. (2009) The multi-modal redesign of school texts. *Journal of Research in Reading* 32(1): 126-136

Walsh, C.S. (2010). Systems-based literacy practices: Digital games research, gameplay and design. Australian Journal of Language and Literacy Education. Vol 33, No 1, pp. 24-40.

Williamson, B. (2008). *Games and Learning: Policy Recommendations Report*. Bristol: Futurelab