TECHNOLOGY-ENHANCED PEDAGOGICAL FRAMEWORK FOR COLLABORATIVE CREATIVITY: ANALYSES OF STUDENTS' PERCEPTION

Manoli Pifarré, Laura Martí and Andreea Cujba
Universitat de Lleida, Av. De l'Estudi General, 4, 25001 – Lleida (Spain)

ABSTRACT

This paper explores the effects of a technology-enhanced pedagogical framework on collaborative creativity processes. The pedagogical framework is built on socio-cultural theory which conceptualizes creativity as a social activity based on intersubjectivity and dialogical interactions. Dialogue becomes an instrument for collaborative creativity processes development, and processes as: distributed leadership, mutual engagement, peer assessment or group reflection become triggering processes of collaborative creativity expression. Two cases studies were conducted in which two secondary classrooms followed a creative project. We explored the role of technology in shaping collaborative creativity processes and we unpacked students' perception about the collaborative and creative processes developed during the educative project. Our preliminary findings showed that the technology-enhanced pedagogical framework scaffolded the development of collaborative creativity processes. Students reported key divergent and convergent process to solve the social and group challenge. And students highlighted key learning to learn processes related mostly with group reflection and mutual engagement.

KEYWORDS

Creativity, collaboration, ICT, secondary education.

1. INTRODUCTION

We live in changeable world, a world in motion and these changes can be seen at all levels of our life and our society. Many educational researchers highlight that it is under these changeable circumstances that creativity becomes much more present and more important than before and it is claimed to help us achieve our goals as individuals, as organizations, as societies (Westwood & Low, 2003).

Creativity has been theorized from different theoretical paradigms (recent revisions: Sternberg, 2003; Kaufman y Sternberg, 2010). Our study is based on socio-cultural psychology of creativity, conceiving creativity as a fundamentally relational, intersubjective phenomenon. One of the purposes of this paper is to be a contribution to the social and cultural nature of creative acts and how technology can enhance these creative behaviours.

In this line, our study bases on *We-paradigm* of creativity proposed by Glâveanu (2010). From this paradigm "creativity takes place within, is constituted and influenced by, and has consequences for, a social context" (Westwood & Low, 2003). Therefore, the role of social factors in the creative process is investigated.

Our study falls on this line of research and has as a main objective the design, implementation and analyses of a technology-enhanced pedagogical framework for collaborative creativity in Secondary Education. We are interested to know, on one hand, how the pedagogical framework designed has a positive impact on students' development of key collaborative processes. On the other hand, we want to study what role technology plays in mediating the development of these processes.

2. COLLABORATIVE CREATIVITY FROM SOCIO-CULTURAL PSYCHOLOGY

Socio-cultural psychology stresses the role of the social context in shaping humans brain. Vygotsky (1960/1997) pointed to the importance of cultural mediation through tools and signs for the development of all higher mental functions. What transpires from the cultural-historical perspective is that creators use culturally constructed symbols and tools to produce new cultural artifacts (Moran & John-Steiner, 2003). Furthermore, Vygotsky was primarily interested in the ontogenesis and microgenesis of creativity and in creativity as a process occurring in real-life "collaborations".

As a synthesis, Glâveanu, (2010) highlighted three aspects that have to be considered in the socio-cultural psychology conceptualization of creativity, aspects that are important in designing technology-enhanced pedagogy:

1) It considers creative acts as socio-cultural in nature and origin. Cultural traditions, social practices and social artifacts regulate, express, transform and permute the human mind (Shweder, 1990). There is a strong interdependence between individuals and their socio-cultural context. Therefore, the transactions, interactions and activities between these two "systems" are the origin of collaborative creativity. In Cole's (1996) words the mediated action in context is the sociocultural genesis of mental functions.

2) Socio-cultural psychology conceptualization of creativity stresses the role of intersubjectivity and dialogical interaction in the creative expression. Glâveanu (2010) claims that creativity is located in the space of interrelations. We have to investigate how creativity emerges in relations and how dialogue becomes an instrument for collaborative creativity processes development. The communicative and social dimension of collaborative creativity is highlighted by Sonnenburg (2004) theoretical framework for creating in collaboration. Participants have to be mutually engaged in the process of communication during the collaborative resolution of a task and they have to present a working style distinguished by a serious of dispositions that can favour the emergence of creativity in collaboration. This author highlights an open and free communication in which all collaborators have the same chance to contribute to the course of performance, and the same right that his contributions are taken seriously. Mutual trust and risk-taking are other key dispositions in collaborative creativity. Wegerif et al (2010) in a research in which a dialogic perspective of analysing creative thinking in online dialogues was adopted; claims that the creative process in a collaborative learning situation depends more on a tension between different perspectives rather than a shared framework. Thus, creative thinking emerge when further entails opposing ideas and disagreements being thoroughly discussed, in such a way that differing opinions and conceptions are related to each other. In such a process of collective learning an elaborated understanding of the learning topic can emerge.

3) Socio-cultural psychology conceptualization of creativity looks at how cultural symbolic elements come to form the texture of new and creative products. Creators use culturally constructed symbols and tools to produce new cultural artifacts (Moran & John-Steiner, 2003). Zittoun (2007) developed the notion of symbolic resources; the thesis of this notion is that a group of people when facing a challenge they re-elaborate meaning using symbolic tools and cultural artifacts in a newly way that lead them to externalize a new and creative outcome. In our work, we emphasize the use of technology as cultural and symbolic tools that might help groups to create new artifacts to reach innovative solutions to social challenges.

All these basic premises are at the core of the design of the technology-enhanced pedagogical framework for collaborative creativity presented in the next section.

3. A TECHNOLOGY-ENHANCED PEDAGOGICAL FRAMEWORK FOR COLLABORATIVE CREATIVITY

One important challenge that education has to face is how to develop a pedagogy that could promote the development of creative thinking of young people, and equip them to face the new challenges that the changeable world in which we are living is presenting every day and in the future. Our study is facing this challenge and has developed a pedagogical framework in which technology and collaboration have a central role in the developing of creative thinking.

Our technology-enhanced pedagogical framework is framed on socio-cultural theory presented in the previous section and is based on Sawyer's creative process (Sawyer, 2010) who conceives the creativity "in" and "as" action. Creativity takes place over time, and most of the creativity occurs while doing the work in a joint activity, and is both facilitated by human social relations and improve them.

The technology-enhanced pedagogical framework for collaborative creativity developed for this study involves the next seven axes and depicted in Figure 1.
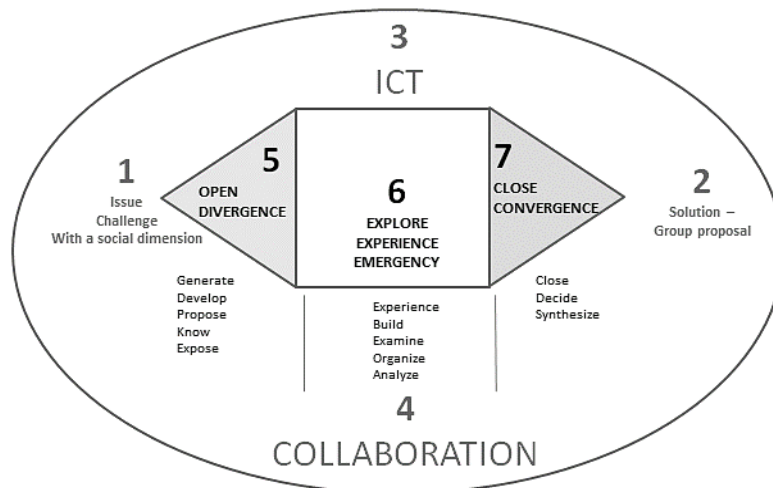
Figure 1. The seven educative variables embedded in the technology-enhanced pedagogical framework.

1. Challenge: The departure is proposing and defining a social challenge to solve collaboratively and creatively. The challenges proposed are: "Creative writing story" and "beautify a patio wall".

2. Solution: Students have to define a solution to the proposed challenge which will have a value for society, with a transformative orientation and students have to define how they are going to communicate to the society their transformative and valuable solution.

3. ICT: Specific use of ICT as mediator of collaborative creativity processes. Our project used 2.0 web tools that allow creative organization of group ideas and enhance the construction and the structure the different phases of the creative process. For example, students used the tool named "Cacoo" to collect information, organize, structure and plan it.

4. Collaboration: Creativity emerges on interaction with other people and with high dialogue quality. Social conception of creativity stands out by: a) the importance of group work: agreement of the rules of team work or "ground rules" (Mercer, 2000); b) the importance of dialogue and language in the creative communication between students. In our project we worked on these aspects as follows:

- Stimulating students into creating their own ground rules in order to promote all group members active participation and work.

- Giving students well-designed scaffolds to improve dialogue and better collaboration.

5. Divergent phase – "Open the mind": Quantitative phase for idea generation. Well-designed activities to promote group idea generation. For example: visualization of images in order to decide the theme of the "beautify the wall" project

6. Exploration phase – "Emergency": The students work together on the ideas that were proposed in the previous phase and on new relevant information.

7. Convergence phase – "Close" the process: It refers to the moment in which the ideas and information are evaluated in a critic and realistic way, in order to converge in one decision and action. This phase should conclude with a tangible and defined product. The methodological strategies that define this phase are: a) the explicit argumentation of the proposed ideas; b) democratic voting and selection of the members. For example: students design book trailers as a way to communicate the creative pieces of writing that they created collaboratively.

4. OBJECTIVES OF THE STUDY

1. To implement the technology-enhanced pedagogical framework for fostering collaborative creativity in Secondary Education.

2. To explore the role of technology in shaping collaborative and creative processes: what technology students used to orchestrate their collaborative and creative project? And how students used this technology?

3. To unpack students' perception about the collaborative and creative processes developed during the educative project.

5. RESEARCH METHODOLOGY

Two case studies were designed in which participated two ordinary secondary classes. In the first study, 2 language teachers and 26 students of year 8th (13-14 years old) participated. Both teachers conducted a project about creative and collaborative writing. The social challenge proposed was: a real editor came to the school and asked for students' collaboration on writing short stories that could be interesting to teenagers. Students should write the stories and explore how to rise teenagers interest on their stories.. The most interesting story would be published on-line in the publisher web and the group of students would have pocket money to spend in a popular bookshop.

In the second study, 3 secondary teachers (one taught technology, the other taught English Language and the last one taught Science) participated. All teachers conducted in an interdisciplinary perspective the project with one group of 25 students of year 7th (12-13 years old). The social challenge proposed was: the environmental school committee asks to the class to think a proposal for decorating one of the walls of the playground. This proposal has to be respectful with the environment and has to include the wall design, materials and budget, and has to be communicated to the school community in English and in Spanish. The proposals and their presentation would be uploaded in the school web side.

In both case-studies students worked together in groups of 4 students.

5.1 Data Collection and Analyses

We collected different kind of qualitative data, however for the purposes of this paper we will base on three types of data: a) the work students did on computer; b) the type of technology they used and for what purposes and c) the responses of a questionnaire that all students answered individually. This questionnaire was formed for seven questions in which students were asked about their perception about what and how they have learnt in relation to the three main axes of our study: creativity, collaboration and technology.

In order to inform about our second research objective - what technology students used to orchestrate their collaborative and creative project? And how students used this technology? - we carried out detailed analyses of the students' products in the different technology they used. We will present the list of technology students used and some examples to illustrate the objectives students had when they used this technology to solve the challenge creatively and collaboratively.

In order to inform about our third research objective -to unpack students' perception about the collaborative and creative processes developed during the educative project- we carried out a detailed content analyses of the students' answers in the questionnaire. A coding scheme was used to characterize students' contributions. The coding scheme is presented in Figure 2.

The coding process consisted of two steps: a) dividing students' responses into meaningful units, and b) assigning a code to each unit. We decided to segment the notes into units of meaning by using semantic features such as ideas, argument chains, and discussion topics, or by regulating activities such as making a plan, asking for an explanation, or explaining unclear information. Validity and reliability aspects were considered in the study.

Our coding scheme has two axes:

a) Creativity axe. In this variable we analysed students' awareness and perception about the two main creative processes: divergent and convergent (see Figure 1).

b) Collaboration axe. In this variable we analysed students' awareness about the learning to learn together processes. We have characterised 4 categories: 1) *distributed leadership:* efficient organization of the team, so that all the members take the same responsibility and by exchanging roles based on that moment necessities; 2) *mutual engagement:* the members attitude based on mutual respect, opinion exchange and helping disposition; 3) *peer assessment*: altogether analysis of the work group; and 4) *group reflection:* students' positive and participative attitude, in order to promote group wellbeing, reflection on the process and being able to regulate.
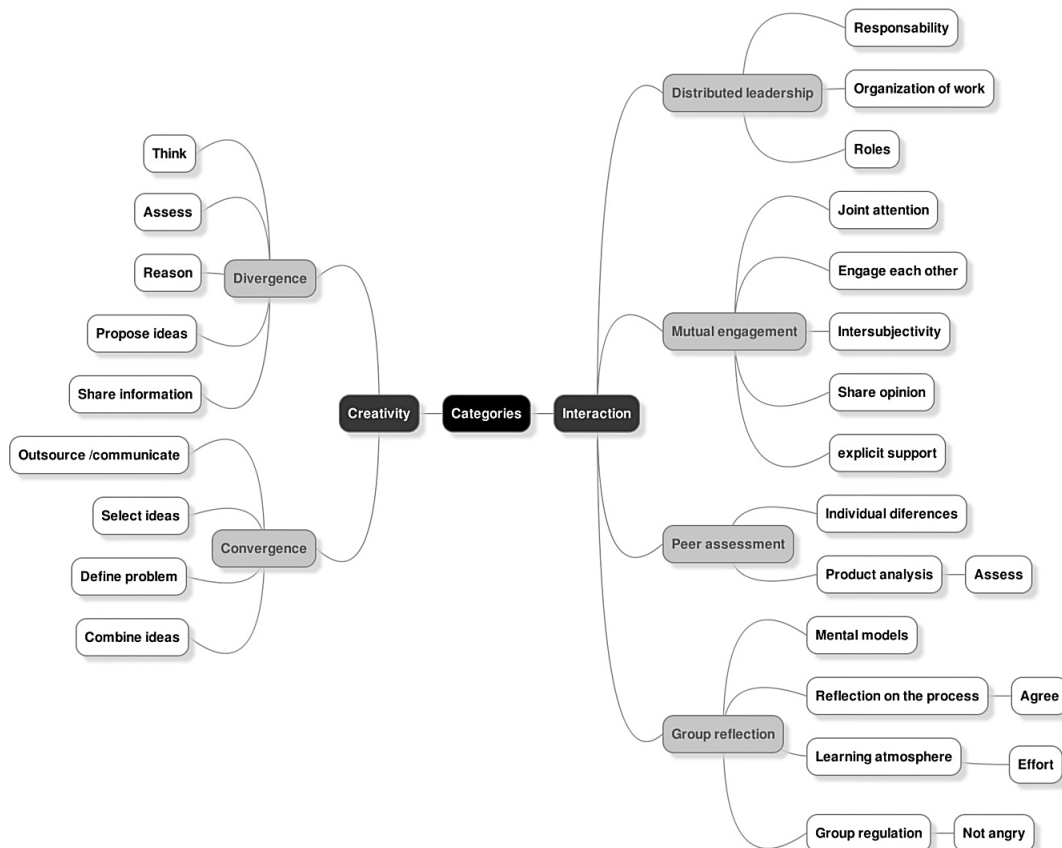
Figure 2. The coding scheme

5.2 Results and Discussion

5.2.1 Technology Students Used to Orchestrate their Collaborative and Creative Project and How Students Used this Technology

Table 1 shows the different technology students used, the cognitive categorization of its use according to the main objective that the students had in order to resolve the challenge in a creative and collaborative way, and a screenshot that exemplifies the use of the technology in our project.

As it can be seen in Table 1, the collaborative use of the technology to solve the challenge triggered a certain way of processing the information and the development of specific cognitive and thinking skills. For example, students used Cacoo to organise and structure the information searched and collected by the different members of the group in order to understand it and make a significant meaning making. And students used Sketchboard tool design the ideas as a proposal for the elaboration of the final product.

Table 1. Technology used, cognitive processes promoted and example.

ICT	Cognitive use	Exemplification
CACOO	Collect information	
	Organize/ structure	
Sketchboard	Design/ Elaborate	
Drive	Build/ Write. Revise/ Modify. Discuss	
Movie Maker	Synthesize. Communicate. Design.	
QR	Communicate/ externalize	

5.2.2 Students' Perception about the Collaborative and Creative Processes Developed During the Educative Project

Figure 3 and 4 shows the results of each of the two cases studies analyzed and in relation to students' perception about the collaborative and creative processes developed during the educative project. As it can be seen students are aware about the development of key creative processes related with convergence and divergence processes.
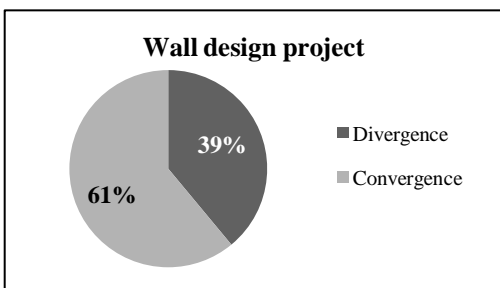

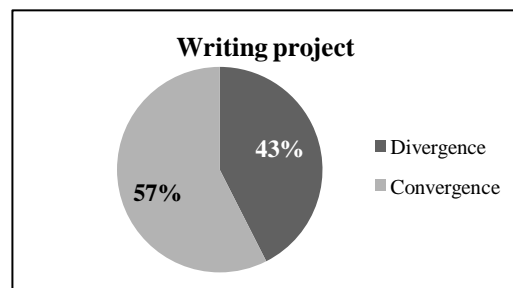Figure 3. Student's perception creativity

Figure 4. Student's perception creativity

230

In relation with creativity, students are more aware of the convergence processes developed during the project; more concretely, students stand by the importance of communication and externalization of the final result. The students were aware that the combination of their common ideas to create the final result and the design of a proper communication of the group ideas were two key processes of their creative work. Our data shows that the fact of communicating their projects to the school community has generated an exceptional leader role on students' engagement in creative processes. Some examples of students' answers are the next ones:

- *"yes, by combining my team mate's new ideas with mine, it resulted in more original ones"*
- *"make a book trailer, that is, do the story visually, and make something likeable"*
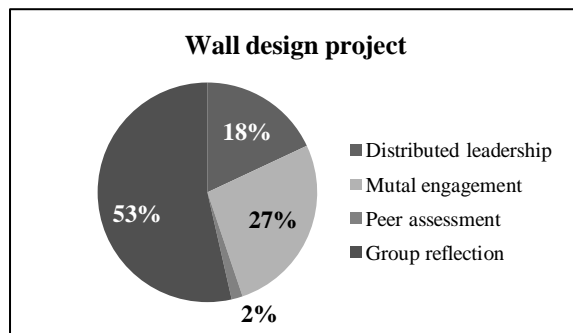
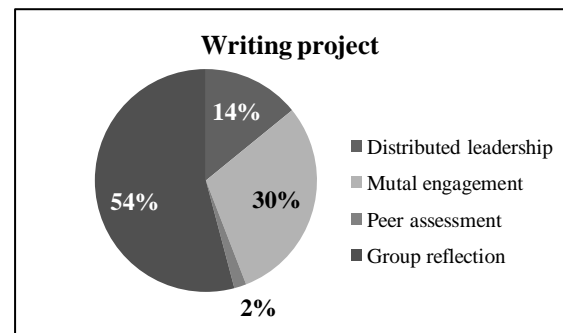

Figure 5. Interaction phases

Figure 6. Interaction phases

In terms of interaction among equals, both case studies show similar results, *Group reflection* is the subcategory that stands out the most, as it can be seen in Figure 5 and in Figure 6. Mutual engagement and Distributed leadership are also key processes highlighted by the students. Besides, if we look at the subcategories of our coding scheme, it can be seen that the subcategory "Learning Atmosphere (Group Reflection)" stands out, followed by Group regulation.

We can argue that "learning atmosphere" is higher because students are aware of the importance of group working, and generating a good environment in order to complete their tasks creatively with a social and transformative value. Student have understood the importance of cresting a good working environment to achieve successful learnings, as opposed to the inappropriate manners that only generate conflicts (not listening to each other, getting angry, fight, yell, etc.) that don't allow achieving the best learning results. Some examples are:

- *"not getting angry" / "not yelling" / "not fighting"*
- *"respect others' opinions"*

Addressing Group regulations as a second stand out subcategory in students' opinion, our results show students awareness about the importance of reaching agreements that took into account different ideas in order to work properly and achieve a quality learning result. Example:

- *"we valued each other and we realized what we did wrong and we had to fix"*

Through the use of collaborative dialogue, we could observe the importance that was given to the organization processes: how they organized, planned, regulated, etc., in order to achieve the group task in the best way possible. Example:

- *"yes, due to the fact that we well behaved, everyone wanted to work and do it in a team. We managed to reach an agreement; none of us was in disagreement with another team mate's idea".*

6. CONCLUSION

Our study designed, implemented and analysed the impact of a technology-enhanced pedagogical framework in the promotion of key collaborative creativity processes in Secondary Education.

Our study showed a positive use of technology to orchestrate students' collaboration and creativity actions. In this line, the educative use of the affordances of some web 2.0 tools as Cacoo or Drive has been shown as powerful tools to support (a) the promotion of all students' ideas, (b) to support the representation and organisation of students' ideas in a significant way and (c) to communicate effectively among the

members of the group. Besides, our technology-enhanced pedagogical framework has been successful in developing key collaborative creativity processes. Students reported key divergent and convergent process to solve the social and group challenge. And students highlighted key learning to learn processes related mostly with Group reflection and Mutual engagement.

Furthermore, our two case studies showed that the technology-enhanced pedagogical model supported students' creation of a collective and creative solution to the challenge. Therefore, our pedagogy engaged students in a creative and collaborative experience in which they create new and shared knowledge, developed Group reflection skills and positive Mutual engagement strategies. From our perspective, our study shows a promising path in the technology-enhanced pedagogy for collaborative creativity. However the limited sample of our study does not let us to make big claims in this area, our intention is to design a more large scale study.

However, students had to use different technology to get the support to develop key collaborative and creativity processes. From our perspective, there is a need to design technology that can support these key creativity processes in a same and shared workspace. Therefore our study can give powerful insights to technologist to design efficient technology to afford key collaborative and creative processes.

ACKNOWLEDGEMENT

REFERENCES

Cole, M. (1996). Cultural psychology: a once and future discipline. Cambridge: Belknap Press.

Glăveanu, V.P. (2010). Principles for a Cultural Psychology of Creativity. Culture & Psychology, 16(2), 147-163.

Kaufman, J. & Sternberg, R. (2010). The Cambridge Handbook of Creativity. Cambridge: Cambridge University Press.

Mercer, N. (2000). Words and minds: How we use language to think together. Psychology Press.

Moran, S. & John-Steiner, V. (2003). Creativity in the making: Vygotsky's contemporary contribution to the dialectic of development and creativity. In R.K. Sawyer et al. (Eds.), Creativity and Development (pp. 61-90). Oxford: Oxford University Press.

Sawyer, K. (2010). Individual and group creativity, in James Kaufman amb Robert Sterberg (eds). The Cambridge Handbook of Creativity, Cambridge: Cambridge University Press, pp.366-380.

Shweder, R. (1990). Cultural psychology – what is it? In J. Stigler, R. Shweder & G. Herdt (Eds.), Cultural Psychology: Essays on comparative human development (pp. 1-43). Cambridge: Cambridge University Press.

Sonnenburg, S. (2004). Creativity in Communication: A Theoretical Framework for Collaborative Product Creation. Creativity and Innovation Management, 13: 254–262.

Sternberg, R. (2003). Wisdom, intelligence and creativity synthesized. Cambridge: Cambridge University Press.

Vygotsky, L.S. (1997). The history of the development of higher mental functions. In R.W. Rieber (Ed.), The collected works of L.S. Vygotsky (vol. IV, pp.1-251). New York: Plenum Press.

Wegerif, R., McLaren, B. M., Chamrada, M., Scheuer, O., Mansour, N., Mikšátko, J., & Williams, M. (2010). Exploring creative thinking in graphically mediated synchronous dialogues. Computers & Education, 54(3), 613-621.

Westwood, R., & Low, D. (2003). The multicultural muse: culture, creativity and innovation. International Management of Cross-Cultural Management, 3(2), 235–259.

Zittoun, T., Baucal, A., Cornish, F. & Gillespie, A. (2007). Collaborative research, knowledge and emergence. Integrative Psychological and Behavioural Science, 41, 208-217.