Chapter

From Individual Creativity to Team-Based Creativity

Margarida Romero

Abstract

Supporting the development of creative competency is important for the actual challenges of the society. However, creativity has been mainly approached in an individual way, without considering the specificities of team-based creativity processes. In this chapter, we establish the differences between creativity as an individual approach and creativity as a collaborative process. Then we discuss creativity from the perspective of the leaners' and teachers' attitudes. Subsequently, we discuss the concept of the *margin of creativity* in different learning activities. We finalize this chapter by discussing digital uses that can support creativity in team-based contexts.

Keywords: creativity, co-creativity, team-based creativity, social creativity, problem-solving

1. Introduction

Creativity is a key competency in addressing the social challenges of postindustrial knowledge societies [1] in which new jobs have an increasing need to be supported by the creative class [2], in which individuals who work in it "engage in complex problem-solving that involves a great deal of independent judgment and requires high levels of education or human capital" (p. 8). In a context of a growing influence of automatization and artificial intelligence, creativity is being widely recognized as an important competency which makes a difference between humans and robotic work [2–4]. For Florida [2], creativity is a factor of socioeconomic differentiation of contemporary societies between "creative classes," who develop occupations where creativity is a determining factor in their complex problem-solving activities, and other social classes in which routine work could be easier to replace through automatization technologies. The noncreative class is in risk to face a growing precariousness within urban environments in which the creative class took the urban space. The importance of creativity as a new imperative of competitiveness is emphasized by Peck [5] as a manifestation of neoliberalism that would tend to increase competition within the active class and demands a higher level of creative problem-solving competency to increase the productivity and innovation to face the optimization of the industrial and service-oriented activities being challenged by automatization and globalization. However, despite the pression for developing creativity to face the twenty-first century challenges [6] and despite the growing differences between "creative classes" and others citizens [2], creativity is still not an educational priority in most of the educational systems of the OECD [7, 8].

2. Creativity is demanding

Creativity is often perceived negatively in educational settings [9]. Teachers and learners sometimes associate creativity with creative processes that have no purpose and no constraints that can lead to worthless solutions. They associate creativity to tasks in which the *margin of creativity* offers an extensive number of solutions, without considering the creative process in some activities with a limited, but important, margin of creativity in the domains such language, physics, or mathematics. Despite the misconception associating creativity to effortless artistic processes [8], creativity is a demanding process resulting from a good analysis of the situation-problem and its context, which must then lead to a solution. Creativity is about creating an innovative, relevant, and valuable solution [10] that is parsimonious and elegant in the face of an initial situation-problem.

3. From creativity as an individual trait to collaborative creativity

Creativity is often seen as an individual trait that can be manifested both in the process and the product or artifact created through the creative process [4]. While everyone has a different level of development of the creativity competency, all subjects can develop their creative potential [10] by developing a better awareness of the creative processes such as divergent thinking [11] and also the creative criteria to self-regulate the quality of the creative solution. Creativity has been mostly studied from an individual point of view in the field of psychology, but there are a growing number of studies in the field of education, not only in individual tasks but also in team-based activities engaging students in different types of creative projects. When learners face complex problems that require collaboration and creativity, then creativity is a social process. If we talk about distributed cognition, we can also talk about distributed creativity [12]. In the educational context, creativity has been mainly analyzed with the help of individual activities [13], which goes against the social character of creativity [14] but also opportunities for collaboration in the context of learning involving tasks of a certain complexity [15]. We see creativity as an iterative process that can develop both individually and collaboratively [16]. Constraints are sometimes a trigger for the initial creative process; creating with limited resources establishes a framework that leads the learner to engage in a creative process to successfully meet these requirements; during the creative process, the learner must explore several new solutions to a problem, to draw inspiration from other realizations to guide one's reasoning and finally to select a solution while considering the context of the situation-problem. This definition of the creative process fostered by a situational problem coincides with Vygotsky's concept of double simulation, according to which learners overcome critical conflicts by making use of cultural artifacts in order to create a solution that emancipates them from the problem situation [17].

4. *Creatitude* as a willingness to engage in creative solutions

This creative attitude or *creatitude* goes beyond the acquisition and understanding of knowledge to give an active role to the learner. Our creativity invites us to invest in creative activities in which we (co) construct cultural products of different types. *Creatitude* refers to the willingness to try new approaches and solutions and also to the ability to make critical and benevolent judgments about the process and to make new attempts when creative attempts are not of enough quality. From

the written creation to robot programming, creative attitude is a way to interact in the world and overcome the consumer or passive role of humans not nurturing their creative attitude toward the problem situations they experience in their lives. Creative attitude allows us to develop new approaches and develop various solutions to problems that challenge us in a way that was not initially expected.

Creating is not enough; creative process should propose an efficient solution that is deemed valid by a reference group. Creativity is socioculturally rooted and cannot be only designated by the subject having to create something but by the community or reference group who will evaluate the value and relevance of the solution in a certain context.

Creative solutions should be not only original but also valuable. In instance, making a chocolate salad is perhaps original, but if it does not taste good, it is not a good creative solution. Creativity is part of a design process and involves a reasonable use of resources. It might be thought that equipping automobiles with six wheels is an original invention and that the two extra wheels add stability to the vehicle, but if these new cars use more resources than necessary, they are not a good creative solution. So, there is a difference between originality and creativity. If originality is a potential for creativity, it is not its only component. This originality must therefore be oriented toward an iterative and complex, rational process of reflection that requires the efforts of learners.

Creativity also requires the learner to engage in decision -making about the way he analyzes the situation and decisions on the process to follow to develop a solution. Creativity emerges in a context in which the learner must decide the way he will proceed individually or negotiate the way they will proceed as a team in co-creative learning activities. In creative process we cannot always apply established solutions for which we can follow recipes step by step or copy a certain procedure. This is what we do most often in class. To pick up the example in the culinary world, being a good cook is not about running existing recipes but about being able to match flavors in innovative ways. In this sense, creative attitude or *creatitude* refers to the willingness to try new approaches and solutions and also the ability to make critical and benevolent judgments about the process and to make new attempts when creative attempts are not of enough quality. It is important not to think that *creatitude* is only an innate quality that only eccentric people can possess. How many times have we heard "I'm not creative. I am Cartesian." Being creative is an attitude and a competency that develops by engaging in motivating projects in which we have real power of action and influence over the world around us.

5. The margin of creativity as an educational design tool

Despite the increasing awareness on the need to develop learners' creativity for today's society, it is difficult for teachers to put creativity as a priority in the context of standardized tests that rules the main milestones of the school curriculum. Therefore, we consider the development of creativity as a *margin* when teachers conceptualize their pedagogical sequences. By *margin of creativity*, we refer to the number of creative possibilities offered by elements such as the domain-specific knowledge of the task, the context of the class, and the time offered for the development of creativity among many other factors having the possibility to affect the activity. It is up to the teacher to judge the moment, the subject, and the context to determine how the development of creativity can be effectively integrated into the activities. In addition, it is important to distinguish the margin of creativity in the solution to be created and the margin of creativity in the creation process. Sometimes the pedagogical context offers more flexibility in the production to be

done and sometimes more flexibility in the process of realization. For example, when programming for the first time with software like Scratch, learners can make different productions, but they will have to work with the same blocks of code. Learners can create a story, a game, or a quiz. Conversely, the teacher may decide that learners should all create a story but leave them the choice of the best medium to tell their story supporting learners' agency. Learners can thus do theater with robots, create a book with augmented reality, create an audiovisual journey with virtual reality, or glue electrical components on puppets.

Moreover, although creativity is a crucial competency to develop in learners, it does not mean that learners must always be creative. The balance between conventional thinking and creative thinking is a more realistic goal. Some educational objectives can be better achieved by conventional ways of thinking. When learners want to understand specific French rules such as color adjectives, the teacher must conform to French conventions (even if it is possible to find a creative way to teach them these rules!). Teachers must also follow a prescribed curriculum, even if it can be applied flexibly. It is by considering these aspects that the psychologist of education at the University of Georgia, Mark Runco says that teachers should aim to develop post-conventional thinking [11]. This thinking refers to the ability of learners to understand established conventions while being able to make creative decisions emerging from a personal reflection process. Post-conventional thinking also refers to the learners' ability to understand context that is more supportive to creativity and contexts that are more conducive to conventional thinking. By focusing on the development of creativity while enabling learners to understand the contexts conducive to creativity, we will be able to get learners to understand that creativity is a competency that can develop in everyone and that must be deployed in the context in which we evolve. Context awareness and empathy are important aspects of creativity as a contextual process [18].

6. Creativity in all disciplines

Creativity is more naturally associated to the artistic domains such the visual arts or literature. Despite this misconception, creativity can be developed in disciplines or domains that are not generally associated with creativity such as history, especially through the historical thinking approach [19] or science, through the maker education and STEAM approaches [18]. By considering the concept of creative margin, creativity can be developed through the study of discipline that may seem too rigid or based on immutable laws to let learners be creative and potentially miss important contents. History, for example, may seem too rigid when viewed as a mirror of the past. When viewed as an interpretative discipline where sources and testimonies serve as a breeding ground for fact-finding and development of deep understanding, then the historical inquiry process and the creative process have several points in common.

7. Creative uses of technology-enhanced learning (TEL)

We must distinguish digital uses that support the creativity of learners of digital uses that place the learner in a situation of passive consumption (like viewing educational videos) or interactive consumption (like quizzes). Based on the model of cognitive engagement developed by Chi and Wylie [20], we have developed a model of creative engagement through the use of technology-enhanced learning (TEL): the passive-participatory model [21] (**Figure 1**).

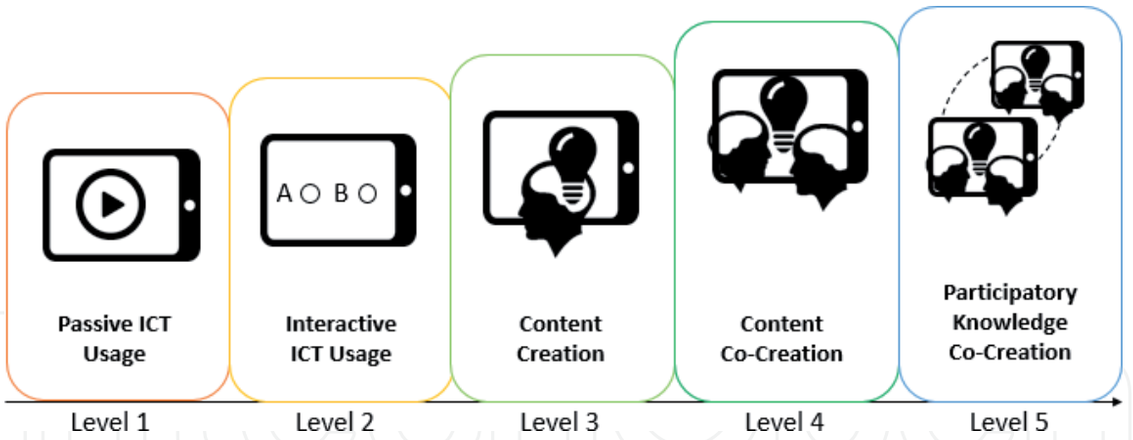

Figure 1.
Levels of creative engagement in the passive-participatory model [21].

In the passive-participatory model [21], we distinguish five types of uses of technology-enhanced learning according to the creative engagement of the learner: passive ICT usage, interactive ICT usage, individual content creation, co-creation of content, and, ultimately, participatory knowledge-based co-creation geared toward understanding or solving problems shared within a learning community. When learners are engaged in co-creative activities (levels 4 and 5), they share their experiences and knowledge, then they negotiate their relevance within the group over the problem they seek to understand and solve. In co-creative activities, learners are required to discuss more explicitly their ideas, decisions and evaluation of the intermediate solutions. By going through a more explicit process, learners can benefit from the creative think-aloud process of their team-mates. This process can lead participants to produce new content based on explanations provided or exposure to peer knowledge designs [22]. Such original productions then become digital media artifacts, such as text-based creations (e.g., when posted to a wiki), audiovisual creations (e.g., interactive video), multimedia (e.g., digital storytelling), or a computer program (e.g., Scratch visual programming).

8. Activities supporting the creative uses of technologies

The uses of digital technologies do not automatically generate an increase in the quality of the learning activities or the performances; neither can we assume the positive effect of technologies in the creative processes and outcomes. The scientific literature offers several principles to consider when it comes to co-creation with digital technologies. The benefits of teamwork must first exceed the transaction costs of coordination and communication actions [23]. In addition, when using technologies collaboratively, it is important that the physical or digital environment [24] is conducive to interaction and that the teacher offers scaffolding to learners while modeling the competencies and attitudes required to correctly collaborate. Teachers should encourage leadership to promote the production and negotiation of meaning in learners [25]. Collaboration among learners should also allow for a mutual and sustained understanding of the object of study [26–28] where there are no restful interactions on a dynamic of domination or idea accumulation without arguments between the members of the team [29]. Moreover, Wegerif [30] emphasizes that it is important to consider the ways in which learners can interact online when the development of competencies is the main pedagogical intent, as is the case in this research. Thus, when collaborating with digital tools, the learner must have a space to step back and actively listen to other members' opinions,

with the aim of creating a dialogue space for reflection [30]. The dialogical space in collaborative tools should be able to support the team-mates' discussion about their different perspectives, opinions, and ideas [31]. Supporting the team-mates' discussion can contribute to their understanding of intersubjectivity [32] during the co-creative process. The mediating tools [33] and the community also participate in structuring collaborative inquiry processes [34] to understand the shared object. As for the composition of the group, Webb and Palincsar [35] argue that heterogeneous groups in terms of expertise can be more productive in collaborative tasks. For effective collaboration, team members must also share responsibility for the learning process and shared purpose [36]. It is also important to pay attention to over-structuring the pedagogical sequence that can create a scripted collaboration [37] that does not have as much pedagogical potential. When properly designed and implemented, the collaborative use of educational technologies would allow learners to experience more achievements, to master more fact-based information, and to be better able to solve problems than when learning for individual use [38–40]. Learners also show a more positive attitude toward the subject and are more motivated to learn when they collaborate with the technologies than when they use them individually [40, 41]. Collaborative idea creation thus enables the advancement and enrichment of the ideas of the learner community and also allows the development of deep understanding [42]. The idea of creating knowledge is thus very important in the design of the collaboration.

9. Conclusion

Developing creative competency for learners and teachers at the same time is an important goal of the educational system and lifelong learning to prepare younger generations to be the creators of knowledge, analysts, leaders, designers, digital citizens, computational thinkers, and the people of tomorrow. It is essential that this aim be reflected in the design of pedagogical sequences built by teachers and lived by learners to train children to the increased complexity of our world. Developing creativity competency is achieved through complex, creative, contextualized, dynamic, digital uses that transform the way we teach and, above all, transform the way learners learn [43]. Within this chapter, we have stressed the importance of moving from an individual way of developing creativity competency to embrace a more collective approach of this competency in order to increase the society capacity to better solve team-level challenges and also increase the citizens' capabilities to deal with societal and global challenges requiring the subject to engage in a creative attitude to overcome current difficulties.

Acknowledgements

This study was supported by the CreaMaker project funded by the Agence Nationale de la Recherche (ANR) in France (ANR-18-CE38-0001).

Conflict of interest

The author declares no conflict of interest.

DOI: http://dx.doi.org/10.5772/intechopen.89126

Author details

Margarida Romero
Laboratoire d'Innovation et Numérique pour l'Education, Université Côte d'Azur, Nice, France

*Address all correspondence to: margarida.romero@univ-cotedazur.fr

References

[1] Garrison DR. E-learning in the 21st Century: A Framework for Research and Practice. [Internet]. 2nd ed. New York, NY, USA: Routledge; 2011 [cited 2019 Aug 30]. Available from: https://www.taylorfrancis.com/books/9780203838761

[2] Florida RL. The rise of the creative class: and how it's transforming work, leisure, community and everyday life. Nachdr. New York, NY: Basic Books; 2006. p. 434

[3] De Bono E. Serious creativity: using the power of lateral thinking to create new ideas. New York, NY, USA: Penguin Random House; 2015

[4] Sternberg RJ, Lubart TI. Defying the Crowd: Cultivating Creativity in a Culture of Conformity. Free Press; 1995

[5] Peck J. Struggling with the creative class. International Journal of Urban and Regional Research. 2005;**29**(4):740-770

[6] Hesse F, Care E, Buder J, Sassenberg K, Griffin P. A framework for teachable collaborative problem solving skills. In: Griffin P, Care E, editors. Assessment and Teaching of 21st Century Skills [Internet]. Dordrecht, Netherlands: Springer; 2015. [cited 2019 Aug 30]. p. 37-56. Available from: http://link.springer.com/10.1007/978-94-017-9395-7_2

[7] Durpaire F, Mabilon-Bonfils B. La fin de l'école: l'ère du savoir-relation. 1re édition. Paris: Presses universitaires de France; 2014. 273 p

[8] Capron Puozzo I. La créativité en éducation et formation: Perspectives théoriques et pratiques. De Boeck. Louvain-la-Neuve, Belgium; 2017

[9] Lytton H. Creativity and Education. [Internet]. London: Routledge; 2012. [cited 2019 Aug 30]. Available from: https://ezproxy.aub.edu.lb/login?url=https://www.taylorfrancis.com/books/9781136669699

[10] Runco MA. Creativity and education. New Horizons in Education. 2008;**56**(1):n1

[11] Runco MA. Divergent thinking and creative potential. Perspectives on Creativity Research. New York, NY: Hampton Press; 2013. 425 p

[12] Sawyer RK, DeZutter S. Distributed creativity: How collective creations emerge from collaboration. Psychology of Aesthetics, Creativity, and the Arts. 2009;**3**(2):81

[13] Romero M, Hyvönen P, Barberà E. Creativity in collaborative learning across the life span. Creative Education. 2012;**3**(4):422-429

[14] Fischer G, Giaccardi E, Eden H, Sugimoto M, Ye Y. Beyond binary choices: Integrating individual and social creativity. International Journal of Human Computer Studies. 2005;**63**(4):482-512

[15] Kirschner F, Paas F, Kirschner PA. A cognitive load approach to collaborative learning: United brains for complex tasks. Educational Psychology Review. 2009;**21**(1):31-42

[16] Mouchiroud C, Lubart T. Social creativity: A cross-sectional study of 6-to 11-year-old children. International Journal of Behavioral Development. 2002;**26**(1):60-69

[17] Vygotsky LS, Rieber R, Carton A. The Collected Works of LS Vygotsky: The History of the Development of Higher Mental Functions. Vol. 4. New York: Plenum Press; 1997

[18] Barma S, Romero M, Deslandes R. Implementing maker spaces to promote cross-generational sharing and learning. In: Romero M, Sawchuk K, Blat J, Sayago S, Ouellet H, editors. Game-based learning across the lifespan:

cross-generational and age-oriented topics. Cham: Springer; 2017. p. 65-78

[19] Lille B, Romero M. Creativity assessment in the context of maker-based projects. Design and Technology Education: An International Journal. 2017;**22**(3):32-47

[20] Chi MTH, Wylie R. The ICAP framework: Linking cognitive engagement to active learning outcomes. Educational Psychologist. 2014;**49**(4):219-243

[21] Romero M, Laferriere T, Power TM. The move is on! From the passive multimedia learner to the engaged co-creator. eLearn. 2016;**2016**(3):1

[22] Nizet I, Laferrière T. Description des modes spontanés de co-construction de connaissances: contributions à un forum électronique axé sur la pratique réflexive. Recherche & Formation. 2005;**48**:151-166

[23] Kirschner P, Kirschner F, Janssen J. The collaboration principle in multimedia learning. The Cambridge Handbook of Multimedia Learning. 2014:547-575

[24] O'Donnell AM. Structuring dyadic interaction through scripted cooperation. Cognitive Perspectives on Peer Learning. 1999:179-196

[25] Pea RD. The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. The Journal of the Learning Sciences. 2004;**13**(3):423-451

[26] Arrighi C, Ferrario R. Abductive reasoning, interpretation and collaborative processes. Foundations of Science. 2008;**13**(1):75-87

[27] Clark HH, Wilkes-Gibbs D. Referring as a collaborative process. Cognition. 1986;**22**(1):1-39

[28] Roschelle J. Learning by collaborating: Convergent conceptual change. The Journal of the Learning Sciences. 1992;**2**(3):235-276

[29] Mercer N. The guided construction of knowledge: talk amongst teachers and learners. Clevedon, Avon, England ; Philadelphia: Multilingual Matters; 1995. 135 p

[30] Wegerif R. A dialogic understanding of the relationship between CSCL and teaching thinking skills. International Journal of Computer-Supported Collaborative Learning. 2006;**1**(1):143-157

[31] Dillenbourg P, Baker MJ, Blaye A, O'Malley C. The Evolution of Research on Collaborative Learning. Oxford: Elsevier; 1995

[32] Koschmann T. Dewey's contribution to the foundations of CSCL research. In: Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCL Community; International Society of the Learning Sciences; 2002. pp. 17-22

[33] Vygotsky LS. Mind and Society: The Development of Higher Mental Processes. Cambridge, MA: Harvard University Press; 1978

[34] Sami P, Kai H. From meaning making to joint construction of knowledge practices and artefacts: A trialogical approach to CSCL. In: Proceedings of the 9th International Conference on Computer Supported Collaborative Learning-Volume 1; International Society of the Learning Sciences; 2009. pp. 83-92

[35] Webb NM, Palincsar AS. Group Processes in the Classroom. In: Handbook of educational psychology. London, England: Prentice Hall International; 1996. p. 841-873

[36] Fransen J, Weinberger A, Kirschner PA. Team effectiveness and

team development in CSCL. Educational Psychologist. 2013;**48**(1):9-24

[37] Dillenbourg P. Over-Scripting CSCL: The Risks of Blending Collaborative Learning with Instructional Design. Heerlen: Open Universiteit Nederland; 2002

[38] Johnson DW, Johnson RT. Cooperation and Competition: Theory and Research. MN, US: Interaction Book Company; 1989;viii:253

[39] Johnson DW, Johnson RT, Smith KA. Cooperative learning returns to college what evidence is there that it works? Change: The Magazine of Higher Learning. 1998;**30**(4):26-35

[40] Resta P, Laferrière T. Technology in support of collaborative learning. Educational Psychology Review. 2007;**19**(1):65-83

[41] Springer L, Stanne ME, Donovan SS. Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. Review of Educational Research. 1999;**69**(1):21-51

[42] Wiske MS, Sick M, Wirsig S. New technologies to support teaching for understanding. International Journal of Educational Research. 2001;**35**(5):483-501

[43] Kamga R, Romero M, Komis V, Mirsili A. Design requirements for educational robotics activities for sustaining collaborative problem solving. In: International Conference EduRobotics 2016; Springer, Cham; 2016. pp. 225-228