Computer-Based Creative Collaboration in Online Learning

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Abstract. Creativity is a key learning objective in higher education, both in face-to-face and online learning contexts. In this study we discuss the concept of creative collaboration and the way this competency could be supported by the use of computer-based environments in online learning. The analysis of the creative process in the context of individual creativity is carried out using McFadzean's [1] creative continuum and the Assessment Scale for Creative Collaboration (ASCC), which has been developed in the context of the CoCreat Lifelong Learning Project. The results of the collaborative creative process show a high relation between the creative process and the social interrelations between the students, but do not show a relation between the collaborative creative process and the time pressure perceived by the students.

1 Creativity in Higher Education

Creativity has been defined as one of the strategic learning objectives in higher education in recent years. The big changes produced in the world in recent years have made it necessary to consider creativity as a strategy for enabling future citizens to succeed in an increasingly complex world. Creativity refers to the generation of ideas that are original, valuable or useful [2]. For years, creativity has been conceived as an individual trait, but also as a process and the product of the process [3;4;5]. In this paper we consider creativity from a socio-cognitive viewpoint as both an individual and shared process. We also define the concept of creativity individually and collectively, before considering the importance of collaboration in the creative process.

Creativity is not merely an original act or idea, it is also an accepted new solution that is collaboratively (co)constructed and shared by a group. Creativity output may result in an act transcending the creativity creator [6] and producing "changes in an existing domain, or transforms an existing domain into a new one. What counts is whether the novelty he or she produces is accepted for inclusion in the domain" [7]. The importance of the usefulness of the ideas or acts that are considered as creative is highlighted by Franken [8]. This author considers "creativity as the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others". In recent years, the increase of collaborative learning and teamwork in the workplace in a context of increasing productivity has underlined the relevance of the collaborative

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creative process in the contexts of group work. Moreover, in recent studies, creativity has been considered as a collaborative and situated process [9] that could not be understood as an individual process. Technology has been seen as an opportunity to support creativity both in individual and collaborative modalities [10] despite there not being an agreement on the impact that technology has on the development of the creative collaboration process.

2 Creativity as a Collaborative Process

The analysis of the creative process in the context of individual creativity is carried out using McFadzean's [1] creative continuum, which considers the different stages of the creative process of collaboration that could be applied both in individual and collective settings. The time factor and the time quality is an important aspect of understanding learning activities [11; 12; 13], and especially in the creative process of collaboration. McFadzean's creativity continuum is a model for analysing the collaborative creativity process by considering a continuum ranging from paradigm preserving to paradigm breaking.

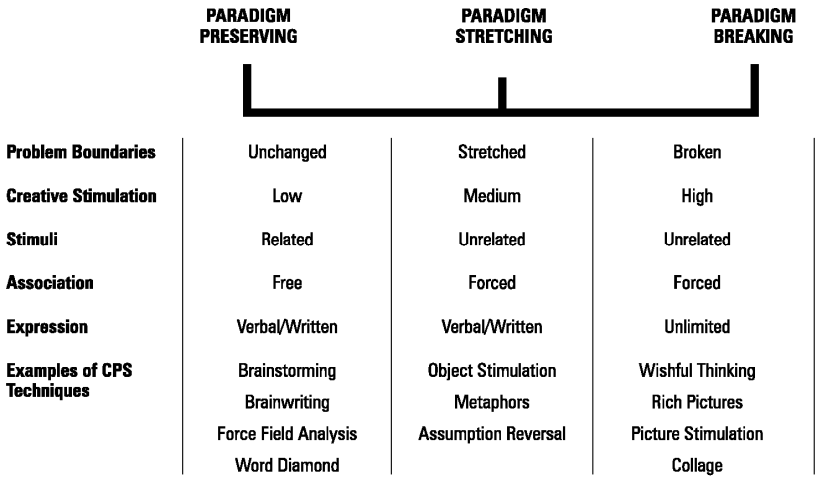

Fig. 1. Creativity continuum adapted from McFadzean [1]

In addition to analysing the creative collaborative learning process using McFadzean's [1] creative continuum model, this study also investigates the students' perception of creative collaboration and the contextual variables of interest. A first element analysed is the degree of perceived co-presence during the teammates' task. The teammates' engagement perception is one of the main factors of students' satisfaction in collaborative tasks [14]. If the teammates' perceived engagement could support the creative collaboration process, the students' perception of an imbalance in their teammates' engagement could make them feel frustrated by the collaborative activity [15]. Tolerance of ambiguity has been analysed as another of the factors related to creativity [16]; the novelty of the creative solution implies a certain playfulness and acceptance of ambiguity in the creative process and outcome definition.

The degree of disagreement or tension between the team members is also considered as one of the factors that could be involved in the teammates' creative collaboration. A certain degree of disagreement and tension could support the creative collaboration [17]. The Assessment Scale for Creative Collaboration (ASCC) [18] has been developed to consider these different factors involved in the creative collaboration process. The ASCC has been created within the context of the CoCreat Lifelong Learning Project. One of the research objectives of this study will also be to analyse the reliability of the ASCC instrument in the analysis of creative collaboration.

3 Time Pressure and Creativity

Within the different factors analysed in the ASCC [18], the time pressure experienced by the students is considered a key factor to understanding the creative collaboration process as a continuum in the context of a flexible long-term task in online learning. Time pressure is defined as a specific kind of stress that is experienced by an individual who perceives that they have less time than required to develop a task. McGrath [19] explains time pressures as the imbalance between individuals' resources and the situational demands. Time pressure is defined as either subjectively perceived time pressure or the imposition of a deadline [20]. In this study, the time pressure is understood as a subjective perception of stress in the context of a long-term task where the students have several weeks to complete the collaborative task.

Prior research on performance effects has demonstrated clearly that time pressure increases the rate of individual and group performance [21; 22]. However, results have been much less consistent on the quality of performance and creativity. Amabile and colleagues [23] and Andrews and Smith [24] observed that time pressure influenced negatively on creativity.

4 Hypothesis

Three hypotheses are analysed in this study. The first hypothesis (H1) proposes that in creative collaboration, a higher level of social interaction will lead to a higher level of creativity. The second hypothesis (H2) states that a low perception of time pressure will lead to higher creativity, in the context of creative collaboration tasks. Finally, the third hypothesis (H3) proposes that in the creative collaboration context, the creative continuum phases of McFadzean's [1] creative continuum will be observed.

5 Methodology

The study involved 64 online learners of the Bachelor's degree in Audio-visual Communication. The students were engaged in the course "Introduction to Creativity in Advertising". The task proposed to the students during the course was carried out in dyads. The students were required to develop a creative advertising project during a period of four weeks. In terms of temporal resources, the task is considered as a long-term task [25] with a high institutional temporal flexibility [26]. The students were invited to answer the ASCC [18] at the end of the creative activity.

5.1 Methodology

The Assessment Scale for Creative Collaboration (ASCC) aims to analyse the students' perception of creative collaboration and the contextual variables of interest, such as the degree of co-presence during the task, the tolerance of ambiguity, the interest in the task, the degree of disagreement or tension between the team members and the time pressure.

The ASCC is based on 16 criteria that have been related to the creative collaboration process of the learners. For each criterion the students should answer one or more specific questions on a scale of 1 to 7 according to (1) how much it was present during their project (presence subscale) and (2) how important it was to their group's success (importance to success subscale) :

1. Shared knowledge and goals
2. An atmosphere of playfulness as well as seriousness
3. Safe atmosphere and trust between participants
4. A degree of disagreement or tension
5. Possibilities for externalizing representations (sketching, writing, modelling)
6. Degree of co-presence during the task
7. Opportunities for divergent thinking
8. Tolerance of ambiguity
9. Engagement/interest in task
10. Level of collaboration itself
11. Opportunities for exploratory talk
12. Adequate knowledge base
13. Problem boundaries stretched or broken
14. Amount of use of imagination
15. Degree of expression enabled
16. Time Management during the creativity task

A rating scale has been chosen so as to shorten the questionnaire, as obtaining the same level of information using Likert scales results in many more statements than shown above. A scale of 1 to 7 has been chosen to enable Spearman's rho correlations between variables to be conducted without challenging the parameters required for the accuracy of the statistic.

6 Results

The preliminary objective of this study is to assess the reliability of the ASCC [18] developed for analysing the factors involved in the creative collaboration process. The analysis of the reliability of the analytical instrument "Assessment Scale for Creative Collaboration" shows a high Cronbach's alpha ($\alpha = .833$) in the presence subscale and in the importance to success subscale ($\alpha = .892$), which leads us to consider this a reliable instrument for the self-assessment of the collaborative creative process.

After assessing the reliability of the ASCC survey, we analysed the results of the creativity level achieved by the students in relation to each of the hypotheses of this

study. The first hypothesis (H1) could be maintained because the results of the collaborative creative process show a high relation between the creative process and the social interrelations between the students. The second hypothesis (H2) should be rejected in this study because the results do not show a relation between the collaborative creative process and the time pressure perceived by the students. The third hypothesis (H3) should be partially rejected because McFadzean's [1] creative continuum phases were only observed in a small number of the dyads. The students did not show a resistance to changing their paradigm.

7 Discussion and Prospective

The creative process in collaborative learning should be analysed by considering the students' experience in their creative process and their collaborative learning, but also by observing the creative process in time. McFadzean's [1] creative continuum is particularly suitable for observing the creative collaborative process in the dyads, allowing the completion of the information provided by the ASCC [18].

As observed by Eteläpelto and Lahti [9], group settings are related to creative collaboration. In this study we observed a higher number of interactions in students showing a higher level of creativity. The interaction process in creative collaboration is observed as one of the important factors in the level of creativity showed by students. In addition to this quantitative observation of the interaction activity between the dyads in the creative collaboration tasks, further studies should consider the specific episodes developed in these interactions to analyse the specific processes that contribute to supporting creative collaboration.

In this study, the perceived time pressure did not affect the creativity levels of the dyads. This could be explained by the high institutional temporal flexibility [26] within a long-term task [25]. In this context, the students developing the task over four weeks perceived a low level of time pressure. In future studies we will increase the time pressure by reducing the number of days devoted to the task.

Finally, in the creative collaboration context of the observed dyads, McFadzean's [1] creative continuum phases were only observed in a small proportion of the dyads. The dyads showed a diversity of different patterns in their creative collaboration. In this sense, each dyad showed a specific temporal pattern in their collaboration [27]. In most of them there were no "paradigm preserving" phases. This could be analysed also in terms of the topic of the course, related to creativity in advertising, where the students did not have an initial paradigm to preserve, and showed a high degree of openness to the creative solutions proposed by their teammates and themselves.

Further research should allow for better characterisation of creative collaboration and control of the time pressure to enable the influence of this temporal factor in the quality of the creative collaboration to be observed. Moreover, future research in the field of creative collaboration could contribute towards consolidating the mixed-method analysis considered in this study and consider not only the specific population of the online campus but also students in face-to-face universities.

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