Co-creativity assessment in the process of game creation

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Abstract. We consider game design as a sociocultural and knowledge modelling activity, engaging the participation in the design of a scenario and a game universe based on a real or imaginary socio-historical context (Jenkins, 2004), where characters can introduce life narratives and interaction that display either known social realities or entirely new ones. In this research, participants of the co-creation activity are Malaysian students who are working in groups to design educational games for rural school children. After the co-creativity activity, learners were invited to answer the adapted version of the Assessment Scale of Creative Collaboration (Romero and Barberà, 2015; Wishart and Eagle, 2014), combining both the co-creativity factors and learners' experiences on their interests, and the difficulties during the co-creativity process. The preliminary results showed a high diversity on the participants' attitudes towards collaboration, especially related to their preferences towards individual or collaborative work.

1. Co-creativity

In education, creative pedagogies encompass approaches that target the development of creative approaches, either from the perspective of teaching practices or from the perspective of the learners' creative skills (Capron-Puozzo, 2014; Kiili et al., 2012). Creativity is described as the ability to develop processes or achievements that are both new, relevant, and valuable, while adjusting to the context in which they occur (Long, 2014; Runco, 2013, p. 201; Runco and Jaeger, 2012). Authors like Osborne (2003) criticize the fact that creativity has become a moral and socio-economic imperative in today's society, while other studies highlight the socio-economic difference that are emerging between the "creative classes" and those who do routine jobs. Creative classes develop occupations where creativity is a determining factor; while routine workers would face growing insecurity in urban environments (Florida, 2014). But creativity is also defended among humanist approaches aiming to develop agency (Engeström & Sannino, 2013) or to engage citizens in co-creative solutions (Barma, Romero, & Deslandes, 2017). Creativity has also been highlighted as one of the key skills for employment expected in 2020 (World Economic Forum, 2016).

1.1 Co-creativity as a person-team-situation interaction

Creativity is considered contextual and judgmental by a reference group (Romero and Barberà, 2014). The contextual nature of creativity is problematic in terms of its conceptual approach and the difficulties encountered when assessing it as a generic skill (Burnard, 2006; Puozzo, 2016). Moreover, the contextual and situation-specific nature of creativity is defended by Woodman and colleagues (1993) within an interactionist model of creative behaviour, "that incorporates elements of personality, cognitive, and social psychology explanations of creativity. In the model, creative behaviour is viewed as a complex person–situation interaction" (Woodman and Schoenfeldt, 1990, p. 279), which engages a complex interaction between the person and the situation. In co-creativity, the interaction is not only developed within the person and the situation, but as a person-team-situation interaction, which requires a multilevel approach to analyse creativity. To identify the multilevel nature of co-creativity within the game design process, we consider co-creativity as an element within the larger creative pedagogy framework (Figure 1).

Creative pedagogy

Learning situation (techno) creative

Creative learning activity (creative margin of the process and the product)

Learning environment that encourages creativity

Learning environment (physical and digital) that encourages creative learning activities

(Creative use of digital technology)

Learner
Individual creativity, *créattitude*
- Engagement
- Divergence
- Use of tools
- Convergence
- Evaluation of creativity (originality, pertinence, efficiency, elegance)
- Control

Team of learners
Co-creativity
- Team diversity
- Coordination
- Serene environment (fun, confiance)

Teacher (creative)
Pro-creative teaching (conception and regulation)

Creative artefact
- Originality
- Pertinence and value in relation to the problem-situation and the context
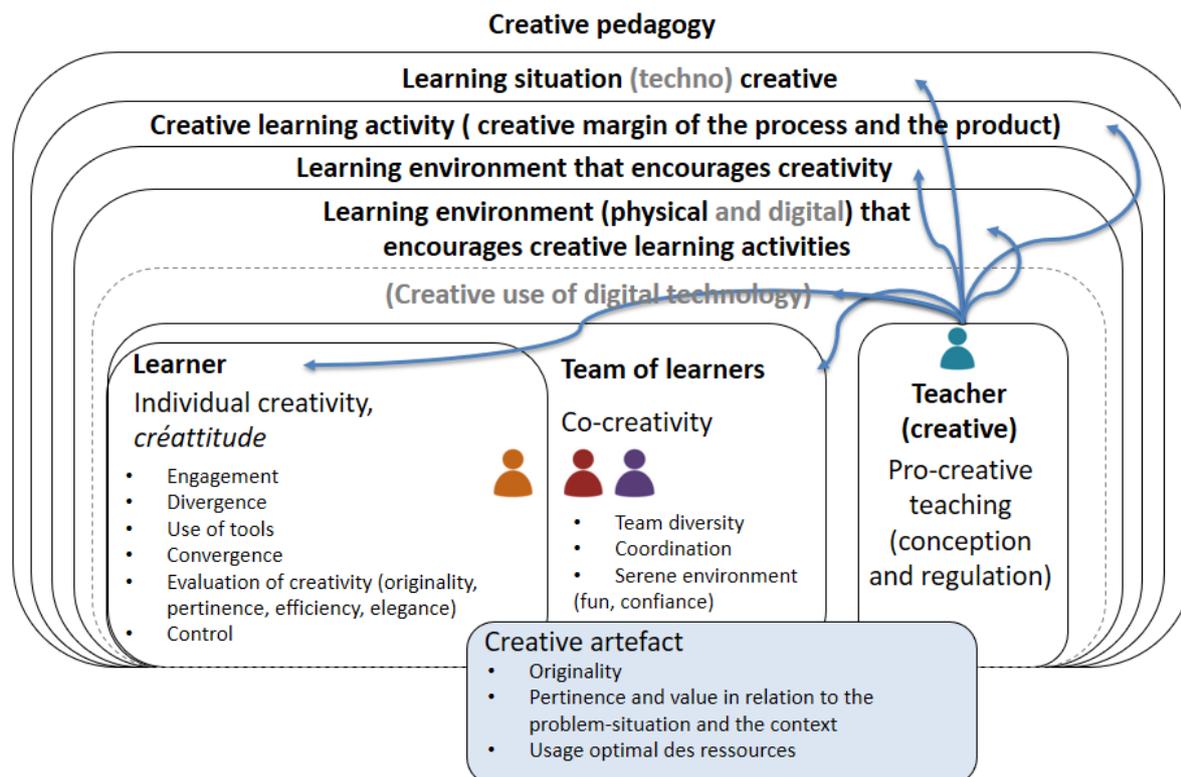- Usage optimal des ressources

Figure 1. Co-creativity within the creative pedagogy framework.

The multiple levels of the pedagogy creativity shown in figure 1 should be taken into account as a whole. For this study, we focus on the teamwork level and the co-creative self-assessment developed by the participants. Within the creative approach of the participants, we consider not only the situation and the way teams overcome their difficulties during the co-design process but also on the attitudes they have towards the creative activity. Within the set of creative attitudes related to creativity, we will focus on tolerance to ambiguity (DeRoma et al., 2003) as "the tendency to perceive ambiguous situations as desirable" (Budner, 1962, p. 28). In creative activities in which the margin of creative solutions is open, the ambiguity is high, which could not be desirable by students preferring more structured and guided tasks.

2. Designing games for learning

Recent research has led to the observation that we can not only learn from playing games, but also from designing games (Arnab et al., 2017; Cucinelli et al., 2016). Given the observed evolution from a consumer approach of digital technologies towards a co-creative approach, we notice two important levers: the technological evolution and the spread of the participatory approach in education. Firstly, the evolution of technologies has popularised game engine platforms, and the emerging of visual programming platforms such as Scratch, leading to the creation of basic arcade-style games, indie-style games or even pattern-based games, in which the participant can customize an existing game pattern (Richard & Kafai, 2015; Woods, 2015). Secondly, within research and media studies, there has been a tendency to consider the participant as a creative agent within a shared collective creation process, rather than as an end-user who will be engaged as an interactive consumer of a professionally-developed product.

3. Malaysian game design workshop

As part of the CreativeCulture project (http://mycapsule.my), a four-day workshop was held at the Learning Sciences Studio, situated at the Faculty of Cognitive Sciences and Human Development UNIMAS, Malaysia. Eighteen Masters students (a majority of them are also teachers) in Learning Sciences, are currently enrolled in a course on Computer-Supported Collaborative Learning (CSCL). The workshop aimed to provide an opportunity to co-create learning materials for teachers and educators who have never used Gamification approach in learning. The Design Thinking program, inspired by playful-and-gameful inspirations developed by

the GameChangers initiative (Arnab et al. 2017) was adopted to think through the process of learning, and to determine how Gamification elements can be integrated into the learning process. The students co-created game-based learning resources which were inspired by existing games, and designed to facilitate in the teaching of STEM subjects, namely Science, Mathematics and English for Primary Schools in Malaysia.

For their project, the schools selected for the actual implementation of the games are situated in rural locations in Sarawak, Malaysia. The assigned schools present a challenge for these Masters students, as a majority are familiar with urban and semi-urban schools, and subcultures of other ethnic groups that exist in Sarawak. In these two schools, the school subculture is dominantly identified by the majority ethnic Malay; the students involved in the gamification workshop mainly have experience in learning and teaching in majority ethnic Chinese, Iban and Bidayuh, where the school subcultures are valued differently.

Contents of the workshop were then expanded into the actual CSCL course that the students are enrolled into. The duration taken for learning about gamification and implementing the products of the students' co-creation activities at the selected rural schools was four months. While developing the games, the students also needed to incorporate the use of technology into the game play, to fulfil the requirements of the CSCL course.
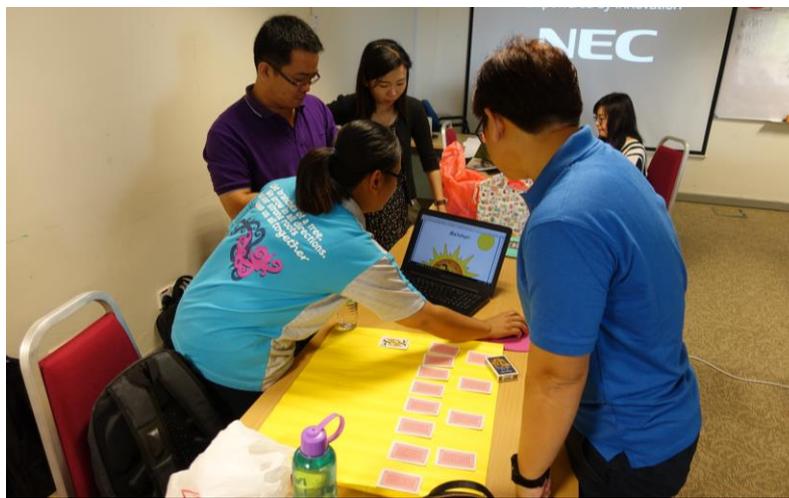

Figure 2. Malaysian students during the co-creation process.

4. Methodology

The students (who are mostly teachers) went through a three-stage process, which includes the co-creation phase, the piloting phase and the reflection phase at the end.

4.1 Stage 1: Co-creation of game-based learning resources via the GameChanger's design thinking process

The design process, based on the GameChanger's approach, aims to make game-based design thinking more accessible to anyone with different literacies in game playing. Inspired by the engaging nature of play and gameplay as a tool for learning, the workshop conducted with the students emphasised on designing playful experiences suited for the target audience (primary STEM education). Teams informed the types game-based resources (digital or analogue) that can be co-created to facilitate engaging learning experiences. At the end of the workshop, the students developed six game-based learning resources. The steps included:

Step 1: Understand the needs, context and audience
What are the key challenges you wish to address? What are the objectives/aims/goals? Who are your stakeholders? And in what context would your solution/intervention be implemented?

Step 2: Get inspired by existing play and gameplay

What play and game activities do you like most? Can you list them out? What are the core mechanics of those activities? Are there any particular game and play strategies that you can think of?
Map the different mechanics and use them as inspirations for the next step.

Step 3: Map the needs and goals to the mechanics and strategy
How would you engage the stakeholders? Will certain strategies promote the aims and objectives you set out?
What play and game activities would develop certain actions, attitudes and/or behaviour?

Step 4: Design your game
Design and develop your strategy/solution/product/experiences that will address the challenges, achieve the goals and engage the stakeholders in the context that you set out in the beginning. Test your game.

Step 5: Pitch your game
Share your gameplan and get feedback from your peers.

4.2 Stage 2: Piloting of the resources developed in schools

For the purpose of the projects, two rural schools have been pre-selected for the training. The pilot activities are also part of the iterative testing process that the students went through. The selected schools share similar demographic characteristics - they are coastal fishing villages, predominantly ethnic Malay, and of a low socio-economic income group. The students involved in the workshop conducted four training sessions at the two schools. In the first session, they introduced Gamification in Learning for the teaching of STEM subjects to the school teachers. The subsequent sessions were conducted with the primary school students who are currently studying at the schools. The children engaged with the games as developed by the teachers through the co-creative process.

4.3 Stage 3: Reflection from the teachers via the co-creativity questionnaires (Data Collection)

The Malaysian students have answered the adapted version of the Assessment Scale of Creative Collaboration (Romero and Barberà, 2015; Wishart and Eagle, 2014) based on a five level scale, combining both the co-creativity factors and learners' experiences on their interests, and the difficulties during the co-creativity process. The learners' experiences were reported through open questions focusing on the positive and negative aspects of the game co-creation process and the main difficulties faced during the project and the strategies developed to overcome them.

5. Results

We analysed the answers of the students focusing on their tolerance of ambiguity declaration, which we linked to their preference to have either very guided instructions or ill-defined tasks. Based on these preferences, we differentiated between students with a low level of tolerance to ambiguity (n=10) including answers from 1 o 3 and students with a higher level of tolerance to ambiguity (n=4), including answers from 4 to 5.

5.1 Co-creativity self-assessment according to the tolerance of ambiguity

Participants with a low level of tolerance to ambiguity tend to assess their game design more favourably in terms of efficiency, originality and value. Those with a high level of tolerance to ambiguity are more critical when judging their co-creative outcome after the co-creation of the game.
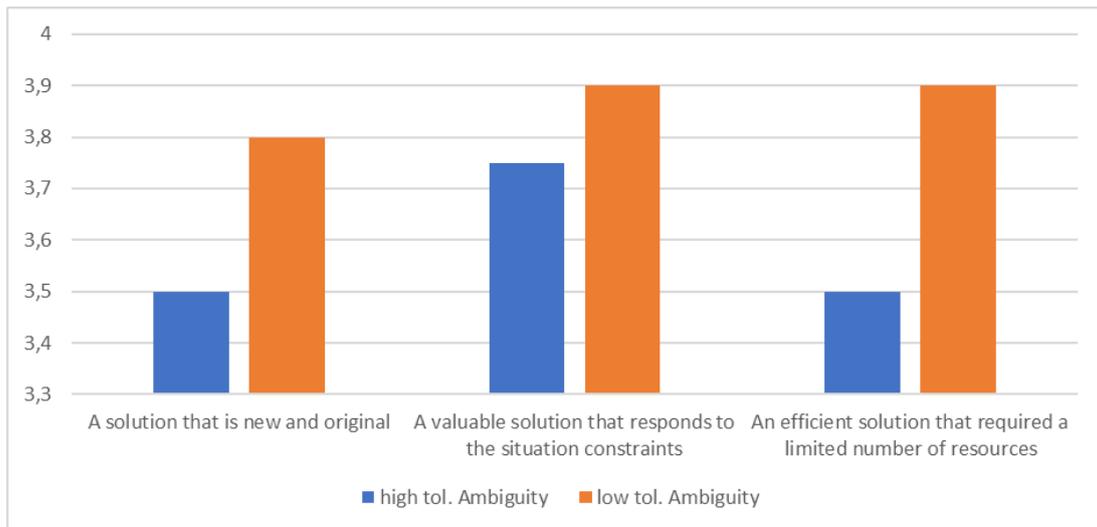
Figure 3. Co-creativity self-assessment according to the tolerance of ambiguity.

5.2 Task preferences according to the tolerance of ambiguity

Participants with low levels of tolerance to ambiguity showed a higher orientation in taking care of detail and work well done and preferred simpler tasks that require little abstraction.
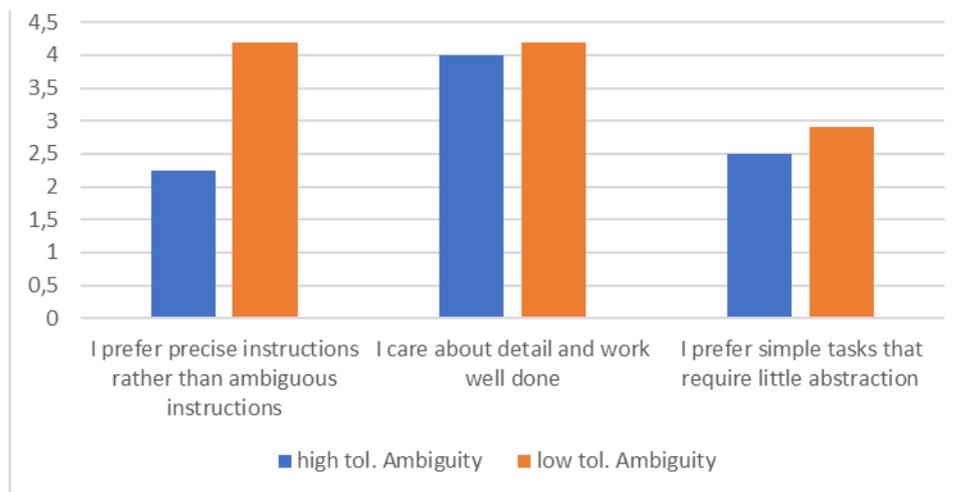

Figure 4. Creative orientation of the CreativeCulture learners.

5.3 Attitudes towards teamwork and errors according to the tolerance of ambiguity

Participants with low tolerance to ambiguity, are more prone to help others, accept their own errors and those of others, but also to prefer individual work above teamwork. When facing difficulties, they are more willing to intervene and to take action.
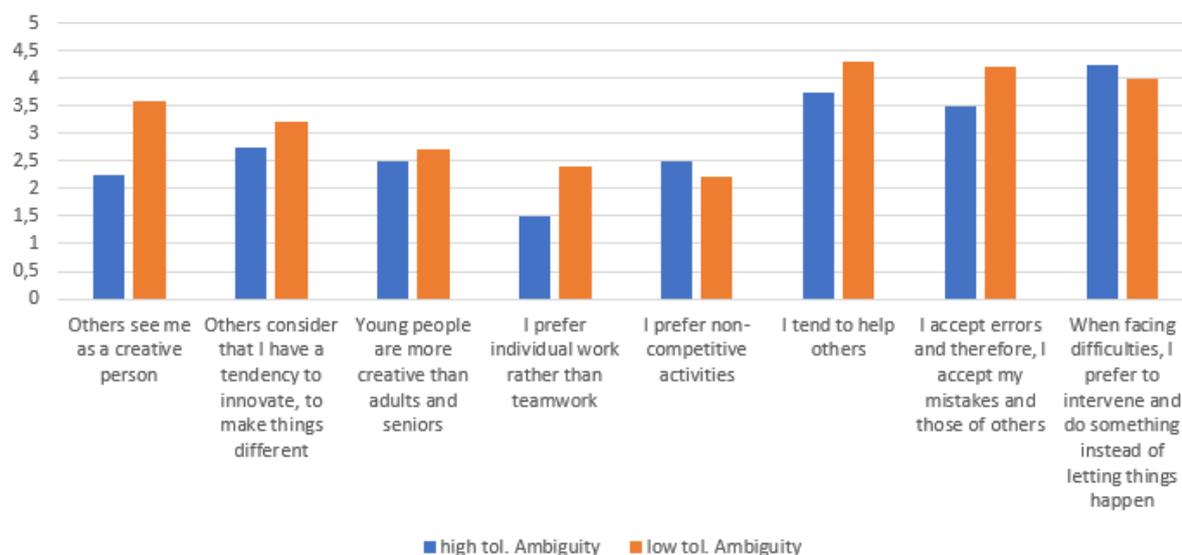
Figure 5. Attitudes towards teamwork and errors according to the tolerance of ambiguity.

5.4 "What were the main positive aspects of the project?"

The main positive aspects of the project as highlighted by Malaysian students, are related to cooperation in teams. One of the student mentions that one of the main positive aspects of the CreativeCulture project is that "they were able to work together towards a common goal that they were invested in", while another mentioned appreciating "to collaborate among themselves despite different backgrounds and ideas". This statement reflects the diversity of ideas during the initial stages of the co-creative process. Another student reflected on the convergence process, after the initial divergent process: "the group itself became closer as they carried [on with] the project. Students were able to understand each other better and therefore conduct the project wonderfully". Students think that "it is possible to obtain new and creative ideas of the team-mate" and agree to value the diversity of ideas shared within the team. During the co-creation process, students are aware "they could collaborate and help the children to learn by gamification". Moreover, they also understand that teamwork produces better outcomes rather than individual work. For them, it is possible "to learn from others' perspective". Students highlights that "the project gave the teachers ideas for designing their teaching approach".

Co-creative attitudes were also important during the co-creation and students highlighted the trust required for team-work and the "creative and fun elements when developing game". Fun, creative and trusty atmosphere were important during the co-creation process.

5.5 What were the main negative aspects of the project?

Negative aspects are mainly focused on the poor organization and a lack of collaboration, and sharing that leads to tensions and imbalance in the work teams. Students find that «the time of preparations for the project was insufficient». Furthermore «some of the members from others team became a little too competitive, even though both teams were supposed to work together». Another problem is raised that «both teams involved in this project faced conflicts due to different opinions about some issues». Then «some people refuse to discuss other ideas». In this case, a teammate highlights that «communication breakdown leads to frustration and disappointment». This leads to «miscommunication, unfair distribution of work between their team and the other team to organize a collaborative activity».

5.6 What were the main difficulties encountered during the creative project?

The main difficulties encountered are based on «limited resources and experts to build products and services» in order «to get an idea that all members agree with». One complication mentioned is how «they could produce a game that is relevant»? It's difficult to «create games suitable for learning especially for primary students», inter alia «the ideas and how to mould the idea into games». Another challenge is «to come to an agreement for the solution used within the project, and to figure out motives of others». Also, «the learners

were «constantly chasing time and communications problems make it harder». Furthermore, during the actual roll-out on site at the rural schools, «unexpected weather conditions blocked the entrance of the project site».

5.7 How did you overcome them or do you plan to overcome them?

To overcome difficulties, students «vote» or «discuss with the team». In other cases, they ask the school teacher for help (in their words, they «interview the teacher") or «confronted the member even though he is older». The participants declare they have the intention «to have more open discussions and to ironing out issues», in their own words: «All members did their best to read through the journal articles related to gamification, and to figure out the proper way to solve the problems». «Learners did their best to overcome by simulate the activity beforehand and plan contingency if certain problems occur. They also presented «the ideas about the games that can be shared with the students because they know what they want to learn while playing games». Other more pessimistic thinking reveals that «nothing can be done» but every problem has its solution, students also took personal initiative to «visit an institution to get an idea» on how to proceed with the gamification process.

6. Discussion

Co-creativity is key to encouraging collective knowledge, experiences, interests and expertise to be exploited towards a more rounded design that could potentially lead to creative solutions impacting real needs in society. Designing and creating games as an activity on the edge of the diverse fields of Art, Design, Science, Computation and Engineering, can be a fertile ground to cultivate such competencies through multi-disciplinary collaboration, and by providing a playful (engaging), creative and innovative space for people to meet and learn how to fruitfully cooperate.

The CreativeCulture project provides a platform for those who are not normally engaging with game design to co-create gameful products for teaching and learning of STEM topics, focusing on the rural schools in Malaysia as the target audience for these game-based learning resources.

What was evident from the co-creation experience with the Masters students was that assumptions about pedagogy and content knowledge are challenged when designing games for schools that practise subcultures unfamiliar to the teams. It is important to situate the learning cultures of schools, to make the learning experience applicable to the local students and their own teachers. Co-creativity enables interaction to happen between the Masters students in this project to create their game-based learning modules; however, much work needs to be considered in understanding existing assumptions, motivation and determination to learn and teach in various school settings.

Further work is required to allow more time for the students and teachers to co-create game-based resources to meet the needs of different schools, which will include repurposing existing traditional games that will be more relatable to the community.

7. Acknowledgement

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