Original Paper

Helping Students to Build Multicultural and Multidisciplinary Competences: A Pilot of Challenge-Based Collaborative Learning on a Digital Gamified Platform

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Abstract

Global issues such as poverty, hunger, and environmental problems are inextricable and cannot be solved comprehensively by homogeneous groups. With the advance of technology, collaborations with peoples at different geographical locations can be achieved effectively. Higher education in the 21st Century must therefore facilitate students to learn how to eclectically connect their creativity and problem-solving skills with technology, and most importantly to work with heterogeneous groups to solve complex global issues.

This paper will elaborate on a pilot study of a project in Hong Kong, titled the CCGame Project, which aims to heighten students' multicultural and multidisciplinary competences by deploying gamified learning and challenge-based learning. Team-based, self-guided learning is the core of the challenge-based learning approach. To preserve students' interest in learning and accomplishing the tasks for the team, cloud-based learning platforms have been deployed. In the pilot, the online learning platform collected data for analysis of individual and team behaviour. The pilot demonstrated that students could work in a diverse team to complete a challenge. Evidence-based results supported with data analytics will be presented and the project's plan of work will also be elucidated in this paper.

Keywords

collaborative learning, challenge-based learning, gamification, multi-cultural, multi-disciplinary

1. Introduction

The 21st century is marked by challenges and opportunities that require, and favour, collaborative, interdisciplinary and often international teams. On one hand, problems have become too broad and significant for individuals; on the other, technology has made collaboration as feasible as never before. While technology has shortened the distances between peoples with the world getting "flatter" by the day, global challenges such as poverty, hunger and environmental problems are becoming more complicated. These well-known "wicked problems" (Conklin, 2001; Ritchey, 2007) are unpredictable, inextricable from their contexts, and observe no national or international laws and boundaries. Hence these global critical issues must be shouldered by multidisciplinary, multicultural teams that combine knowledge and cultural experiences from diverse backgrounds. The pertinent question is, given the critical and pressing complex issues society is facing, "are university graduates prepared to work in effective teams to take on the challenges of the 21st Century?"

To explore the solution, Hong Kong Baptist University (HKBU) has teamed with 3 universities in Hong Kong and a university in Australia to implement a project titled "Developing Multidisciplinary and Multicultural Competences through Gamification and Challenge-Based Collaborative Learning" in Hong Kong, the "CCGame Project" in short.

In this case paper, the goals of the CCGame Project will be explained. The experiment and results of a pilot run will be provided, and the ensuing methodology and plan to carry out an online challenge involving students worldwide studying different subjects will be outlined.

2. Method

2.1 The CCGame Project and Challenge-Based Collaborative Learning

In the context of the CCGame Project, challenge-based learning refers to the teaching model that incorporates the best aspects of problem-based learning, project-based learning, and contextual teaching and learning while focusing on current real-world problems (Johnson, Smith, Smythe, & Varon, 2009; Gibson, 2012). We have an emphasis to deploy digital learning experiences to arouse students' curiosity and desire to learn as self-organising and self-directing international teams to solve real-world problems. To help ensure the acquisition of teamwork skills, the first objective of the CCGame project is to deploy innovative, highly motivating technologies and challenge-based learning pedagogy to emphatically and effectively prepare students to work in multidisciplinary and multicultural work-teams. The second objective of the project is to study the impacts of deploying gamified and challenge-based learning on students' engagement in collaborative and cooperative learning.

2.2 Design of the Pilot

The Project Team implemented a pilot in March 2018 with two main purposes: (1) to explore the chosen challenge-based collaboration platform with students for possible technical and stability issues; (2) to investigate how teams of multidisciplinary and multicultural students collaborate and produce a

product on the chosen platform.

2.2.1 The Challenge-based Collaboration Platform

The "Challenge" platform designed by the Curtin University in Australia was chosen for this pilot run since it was developed specifically for challenge-based collaborative learning with a gamification approach.

One of the most prominent features of the Challenge platform is the ability for teachers/facilitators to create challenge-based "pathways" (series of online activities) for team learning. Team-based pathways allow students to form and organise teams by themselves, choose a topic to work on, discuss, develop and perform the exercises for each subtask, and submit the final collaborative products online. Data collection features such as time spent in various modules and discussion threads by each student are also available on the platform for facilitating learning analytics.

2.2.2 The Theme of the Challenges

To nurture students' competences to solve global challenges collectively in a multidisciplinary and multicultural team, the theme of collaborative tasks/challenges for students must (1) motivate global interest, (2) require knowledge and effort of different disciplines and (3) have a pressing need to engage (Griffin, McGaw, & Care, 2012). The 17 Sustainable Development Goals (SDGs) proposed by the United Nations (2015), aiming at achieving them by 2030, were thus selected as the basis.

The Challenge platform has released a team-based, SDGs-themed pathway called "Balance of the Planet" (BP) in 2018, thus was selected as a main component of the pilot. Under BP, a student team first discuss to work on an SDG. The platform then leads the student teams through exercises of team building and ideas development, cumulating in the final task of producing the work product for submission.

2.2.3 The Tasks to be Accomplished by Students

With the platform, theme and abovementioned components selected, the pilot was operationalised into a series of tasks in four stages as shown in Figure 1.
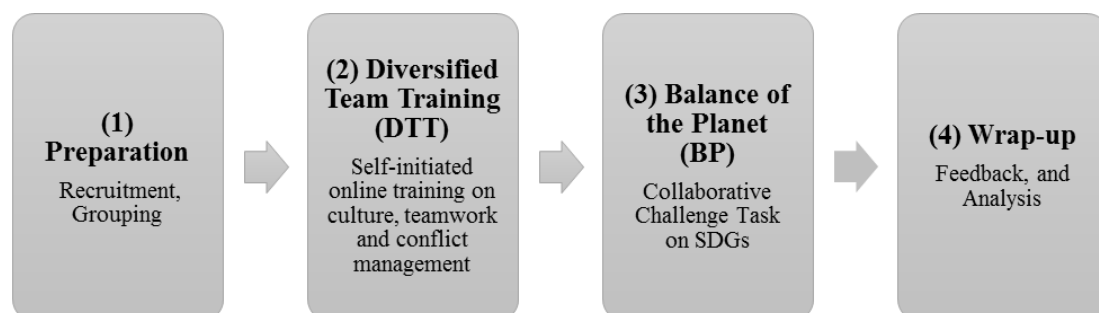
Figure 1. The Design of the Pilot

In this pilot run, the student-teams were not asked to finish the whole pathway. Instead, they had to focus their collaboration to produce a piece of work product, and the challenge for each team was to

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choose an SDG and make a 5-minute video to promote the awareness of their chosen SDG.

2.3 Implementation of the Pilot

The pilot was conducted in March 2018 for six weeks. Invitations were sent to the students who were affiliated with the teaching and learning centre of HKBU. A total of six students, not knowing each other, from different home regions (Hong Kong, Korea, Malaysia and Taiwan) and faculties/schools (science, social sciences, business, and communication) amongst different cohorts were recruited to form two teams (three students each, named "Team 1" and "Team 2" respectively). The diversity of a team was guaranteed that students from the same home regions and disciplines were not assigned to the same team. Two staff members from the teaching and learning centre were respectively assigned to each team as facilitators, to provide technical support concerning the platform and the tasks to be done. The teams were then directed to the Challenge platform and suggested to complete the three modules of "Diversified Team Training" (DTT) in 90 minutes.

Based on the SDGs preferences submitted by the individual students, SDGs "Goal 2: Zero Hunger" and "Goal 12: Responsible Consumption and Production" (United Nations, 2015) were assigned to Team 1 and Team 2 respectively. Guidelines and expectations of the expected deliverable were provided to the team, and they were asked to accomplish the tasks in a month. They were encouraged to use the Challenge platform for all communications on the pilot to ensure maximum capture of their discussions by the platform, while keeping face-to-face and online discussions by other means to a minimum. For this pilot, a token incentive was provided to each participating student.

3. Results

3.1 Time Spent on DTT

The time spent and the completion status on DTT can be an indicator of engagement in the pilot. On average, the time spent on DTT is 71 minutes (SD: 68 minutes, Range: 0-192 minutes). Two participants did not go through DTT while one only completed one module, spending 35 minutes in total. In contrast, one participant used over 100 minutes in module two (teamwork), resulting in its prolonged completion time. A visualisation of the results is shown in Figure 2.
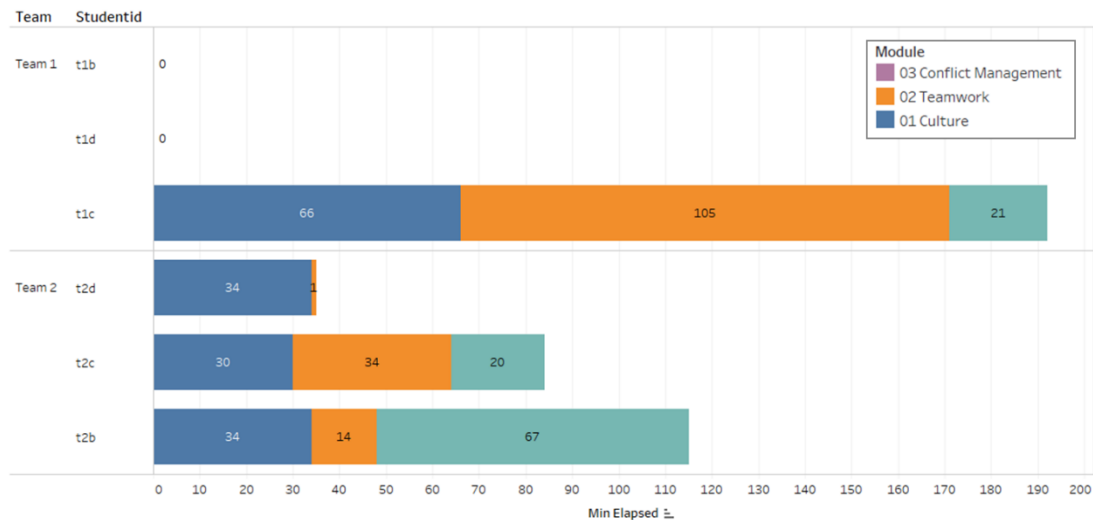
Figure 2. Time Spent on DTT Modules by Individual Team Members

3.2 Contribution by the Students to Balance of the Planet (BP) Exercises

The contribution was expressed in terms of word-count percentage and calculated by the students' word counts in each exercise divided by the total word count of each exercise. The results are shown in Figure 3. The team members "t1a" and "t2a" were the facilitators of Team 1 and Team 2 respectively, so the "contributions" made were for supporting the teams only.
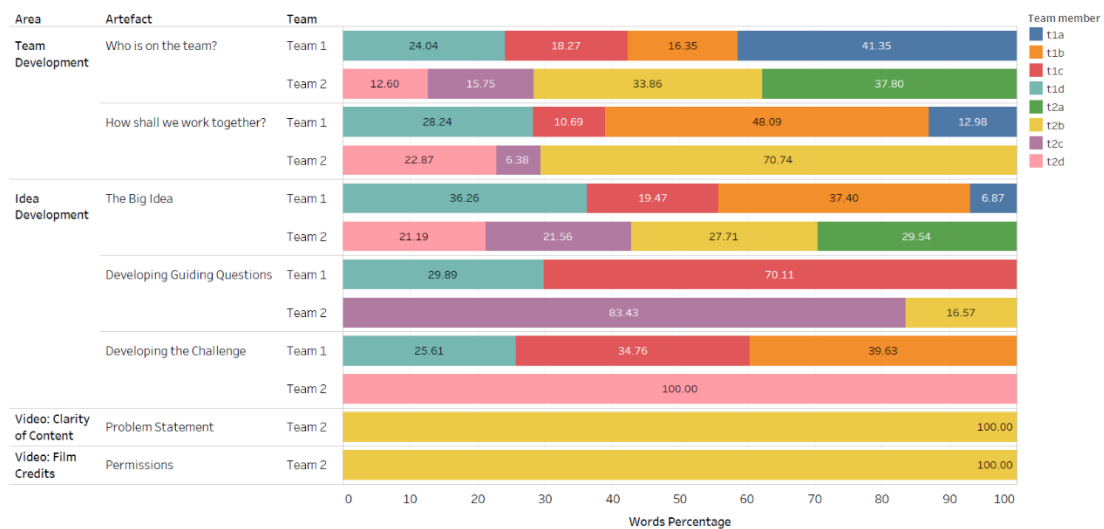

Figure 3. Contribution (word %) on BP by Students (as of Early May 2018)

It is evident from Figure 3 that students in Team 1 contributed more or less evenly to most of the exercises, while those of Team 2 were seemingly dominated by one or two students.

A limitation of this data set is that the students were asked to identify themselves when they contributed to each exercise or contributed on the team's behalf (e.g., as a recorder of a discussion). Otherwise, the text extraction program could not sort contribution accurately. This was the case for the exercises "Idea

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Development: Developing the Challenge", "Video: Quality of Content: Problem Statement" and "Video: Quality of Content: Permissions" for Team 2—while the graph shows that the contributions were from a single student only, close inspection of the inputs showed that one student actually consolidated the team's inputs and entered them into the system.

3.3 Development of on BP

In addition to quantitative aggregation of the students' contributions to exercises, word clouds were generated at two time points—early and late April in order to inspect the teams' development at the beginning and the end of the pilot by looking at the keywords shown in the clouds.

Figure 4 shows the consolidated word clouds of the "Team Development" (team-building exercises) by the 2 teams. At the beginning of the pilot, it appears that the Team 1 students were at the stage of self-introduction and stating their expectations of the pilot (shown by the prominent keywords "majoring" and "fun"), while those on Team 2 had already started discussions on the division of labour (shown by a larger word cloud and prominent keywords "think", "video", "shooting", "responsible", "ideas", etc.). Furthermore, for Team 1, one student did not show up until later in the pilot, hence the keyword "wait" was prominent in the Team 1's word cloud, showing that the team was waiting for that student at that time. When the pilot was about to end, it can be seen that Team 1 had caught up with Team 2 in terms of discussions and focus.
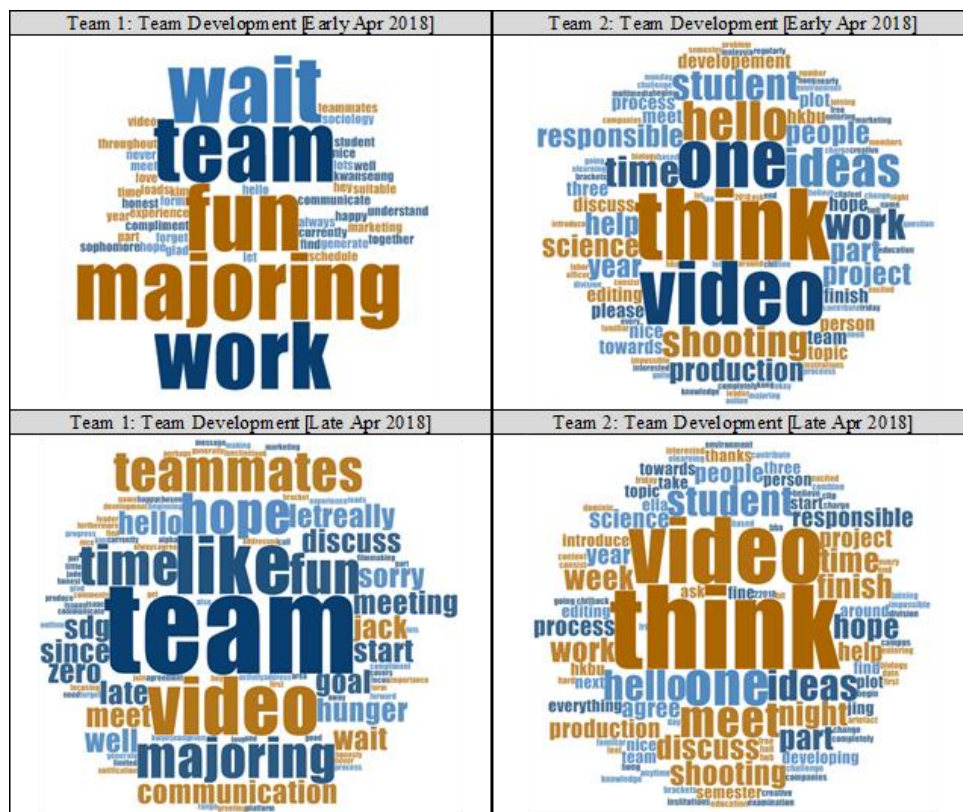

Figure 4. Consolidated Word Clouds Generated from the "Team Development" Exercise by Both Teams

Figure 5 shows the consolidated word clouds of the "Idea Development" by the 2 teams. It can be seen that for Team 1, the discussions grew dramatically from a few keywords about the "Zero Hunger" goal (agriculture, food, nutrition) to useful ideas for the video, in terms of "actor", locations ("restaurant" and "street" in "Kowloon") and type ("documentary"). In fact, the video produced by the team documented the serious food wastage in Hong Kong, for example, the unfinished meals left in restaurants, and the food wastage in supermarkets and food markets.

For Team 2, their Idea Development had grown to a good shape right at the beginning, with their focus aligned with the chosen SDG (Goal 12: Responsible Consumption and Production) with keywords "consumption", "production", "problem", "economy", "environment", etc. In the end, this team interestingly had focused somewhat on "food" as Team 1 did. In Team 2's video, they had shown food wastage at university canteens, and suggested buying food products based on sustainable sources and converting food waste to fertiliser for better utilisation of resources.
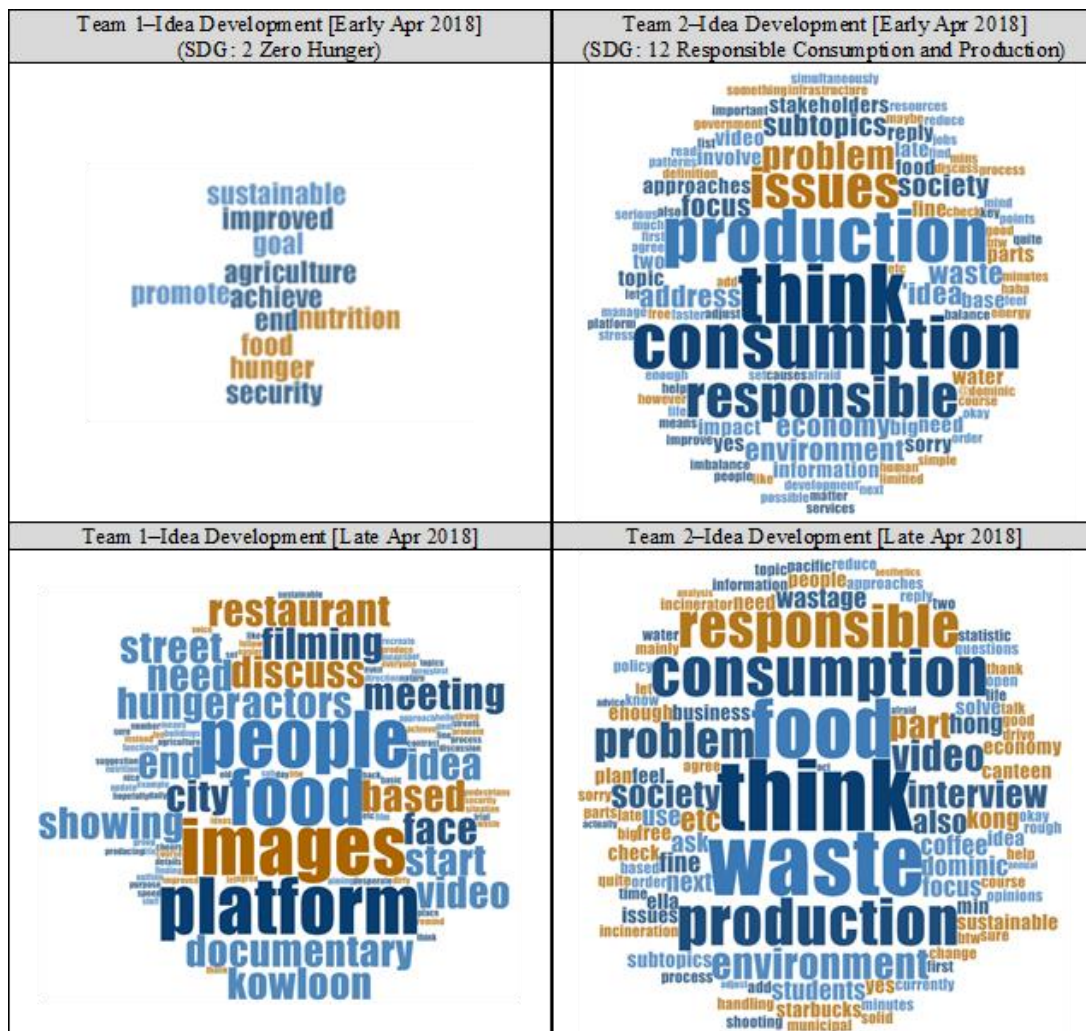

Figure 5. Consolidated Word Clouds Generated from the "Idea Development" Exercise by Both Teams

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3.4 Feedback on the Challenge Platform

Two students gave feedback, mainly related to the lack of a notification system on the platform. One participant stated "We really need a notification system. I keep forgetting that I have to log in and check for updates". He/she indicated the need for "a second measure to communicate within our group". Another participant agreed with the comment, and indicated, "It is already so hard to discuss merely online, and now even without notifications…" and counter-suggested to meet face-to-face.

4. Discussion

In addition to testing the Challenge platform for use by real users—students, another main aim of the pilot was to investigate the effectiveness of the collaborative challenge-based learning in building students' multicultural and multidisciplinary competences. It is likely that all participating students have had little or even no experience on working in a culturally diverse team environment. This pilot offered a novel learning experience for them to work in a virtual, multicultural and multidisciplinary team environment which allowed participants to gain insights on how to work in a culturally diverse team to achieve the same goal.

The students were told to perform their collaboration on the Challenge platform as far as possible. However, there was a participant who preferred "come out and talk" than "working only" digitally. This seems to suggest students' lack of familiarity with working as part of a virtual team. In a virtual context, participants might have encountered challenges in communication as interpersonal processes can be hindered (Maruping & Agarwal, 2004). For instance, there are fewer social cues and non-verbal cues when a virtual tool is used, such that implicit ideas cannot be effectively conveyed (Hambley, O'Neill, & Kline, 2007; Snyder & Stukas, 1999). However, the deliverable to be completed by the teams was a video, the students might have found face-to-face collaboration necessary and more convenient. Another issue on team matter was that DTT was not mandatory for the students to complete, and so some of them missed the chance to acquire essential knowledge deemed important for building multicultural competences. This could have influenced team building, a matter that warranted further investigation in the CCGame Project.

With regards to participants' feedback, a lack of notification system was highlighted as a barrier for their discussion on the system. Their use of the platform is based primarily on their intrinsic motivation (e.g., how engaging and engrossing they are) instead of the extrinsic cues and motivation (e.g., notification system on the phone). The immediacy of responses received from the virtual platform could better facilitate discussion and engagement with a constant update (Rozzell et al., 2014; Tess, 2013). Participants were likely using other platforms like social media more frequently for discussion (Bolton et al., 2013; Crawford, 2009; Hanna, Rohm, & Crittenden, 2011).

5. Limitations

Being a pilot study, with only two small groups of students involved, has rendered any statistical analysis unreliable, hence the lack of quantitative results in this case report. In addition, the learning processes and outcomes of student participants could not be investigated in full. Since there is a lack of notification system on the Challenge platform, some of the communications and work were done offline or on other online platforms for higher convenience and immediacy. Besides, our circumvention of asking each student to identify themselves in each response did not work perfectly, leading to uncertainty in the results as shown. But the Challenge platform has now been improved by automated contribution tracking mechanism.

6. Conclusion and Future Directions

To conclude, the objectives of the pilot are well achieved:

(i)   The students have provided constructive suggestions to improve the Challenge platform;

(ii)   The students could work collaboratively in a diversified team to produce the required video to address their chosen SDGs.

Supported by the pilot findings, the SDG themes seemed to be excellent means for training students' multicultural and multidisciplinary competences, as a synergy of different expertise is required to solve these "wicked problems". With thoughtful design and deployment, in ensuing exercises, students could be encouraged via challenges provided by the SDGs to acquire the competences and be prepared to work in effective teams in the future.

Furthermore, a major focus of the CCGame project is to enhance mutual understanding of students in diverse cultural and academic backgrounds, hence relevant measures for students' cultural proficiency, such as the Global Perspective Inventory (Merrill, Braskamp, & Braskamp, 2012) could be explored to see how the intervention shapes their cultural awareness. To assess the impact of a gamified environment on learning serious topics such as the SDGs, tools such as the EGameFlow (Fu, Su, & Yu, 2009) could also be considered.

Going forward, the Project Team has planned further activities to promote collaborations of multidisciplinary, multicultural teams via gamification. An international online "eTournament" under the SDGs theme would be organised, inviting university students worldwide to participate. The students would be required to form teams with a mechanism in place to ensure each team is a good mix of students from different countries and disciplines. The eTournament would be of 2 stages. In the first stage, team-building would be performed on an online collaborative platform, to let students know more about their teammates, and to formulate the strategies for stage 2. In the second stage, the teams would play on PaGamO (Yeh, 2015), expanding/upgrading their territories' in a virtual world by answering the questions related to the SDGs.

It is obvious that an important element for the eTournament to succeed is a sizable question bank. To achieve this, a memorandum of understanding has been signed between HKBU and UNESCO

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Association of Hong Kong (UNESCO HK); their experts would develop at least 320 SDG questions on selected SDGs. In parallel, an SDG Questions Creation Contest would be organised before the eTournament, inviting university students worldwide to submit up to 10 SDG-related multiple-choice questions each. The submitted questions would be vetted by the UNESCO HK experts in terms of quality and creativity. With the joint effort of students and experts, not only a large number of questions could be created, but would also promote student-generated content and in turn, give students more ownership in the learning process. The processes and findings of the full study would be reported in a longer paper accordingly.

Acknowledgements

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