Guess the Score, Fostering Collective Intelligence in the Class

Josep M. Monguet and Jaime Meza(✉)

Universitat Politècnica de Catalunya, Barcelona, Spain
jm.monguet@gmail.com, jaime.meza@estudiant.upc.edu

Abstract. This paper proposes the use of serious games as a tool to enhance collective intelligence of undergraduate and graduate students. The use of games in teaching, at different levels of education, has been widely discussed by researchers [1]. The development of social skills of individuals in a group is related to the performance of the collective intelligence of the group manifested through the shared and collaborative development of intellectual tasks [2]. Guess the Score GS, is a serious game implemented by means of an online tool, created to foster the development, interaction, collaboration and engagement of students with the educational activity. The game has been designed with the intention of facilitating the development of individual's social skills in a group in order to promote education of collective intelligence. The first part of this article is devoted to the presentation of the fields of knowledge which may be involved in collective intelligence education. The second part presents GS game in the context of a model-based learning to promote collective intelligence. In the final part the results of the implementation are discussed. This paper concludes that the design of learning activities using serious games as a support tool in education, increased social skills and improves student performance groups, therefore the development collective intelligence.

Keywords: Collective intelligence education · Serious games · Learning · ICT tools · Patterns

1 Introduction

Education is a field with continual challenges and educational institutions are constantly searching new models to improve the results of their students. Besides the development of individual competencies and attitudes, are necessary new models and strategies for the development of social and collective capabilities. Furthermore, the use of serious games in education has been explored since the 90's, in order to exploit its various advantages [3]. Under these two assumptions, this paper investigates the design of learning activities based on the application of serious gaming.

A simple analysis of the available literature in the field of education of collective intelligence, its relevance to the innovation and implementation of serious gaming as a means of interaction, shows that academic effort in this area is still scarce [4].

The focus of this work has involved the design, development and operation of "Guess the Score" (GS), an online game developed using services oriented architecture SOA. GS promotes the development of social skills among students through interaction

G. Vincenti et al. (Eds.): eLEOT 2014, LNICST 138, pp. 116–122, 2014.
DOI: 10.1007/978-3-319-13293-8_14

and engagement with members of your group and the class in general. GS is a tool that enables each student individually and as a group see in real time, their results on the detailed monitoring of the activities of the class. The instructional design of the class sessions is such that interventions when students exhibit their practical exercises are used as an input of the game to assess how the students understand the content being studied. In each iteration the system, both the individual and the work group displayed its position on the class, the dispersion of the scores, and can make an immediate self-assessment, to proceed with the next iteration to improve its performance.

The set of iterations executed by students, generate data that allow finding patterns of behaviors of both individuals and the group in the development of the assigned tasks.

2 Collective Intelligence Education

Collective intelligence has always existed between human beings. From the most primitive tribes to the large modern corporations generate collective intelligence [5], so, P. Lévy defines collective intelligence as "recognition and mutual enrichment of people" [6]. Today with the development of ICT [7], exchange information quickly and agile which has generated that to the collective intelligence concept increasing. Diverse studies confirm that the development of collective intelligence with the support of ICT is an important issue. Malone established as a basic question in the collective intelligence center at MIT "How can people and computers be connected so that—collectively—they act more intelligently than any person, group, or computer has ever done before?" [8], furthermore, I. Lykourentzou et al. 2009, define collective intelligence: "an emerging research field which aims at combining human and machine intelligence, to improve community processes usually performed by large groups" [9]. This guidance promotes, among others, the need to educate the collective intelligence. GS was developed considering various strands of thought in the field of social intelligence, design and task management in learning processes and the impact of serious gaming in education.

3 Fostering Collective Intelligence

With the general idea of foresting collective intelligence in educational environment, a prototype of learning model has been designed, developed and tested and it's formally presented in this section and synthetically drawn in Fig. 1. The model allows teacher, students and groups, gradually improve the outcomes obtained from learning activities. So the system facilitates the interaction and engagement of students and groups, along with cyclical improvement of activities design. GS is part of the model, as a facilitator of engagement of participants.

The central hypothesis of this model is that if a group of students learn in a collective intelligence awareness environment, it increases both the outcomes of the groups and the learning level of individual students. Furthermore it increases also the social intelligence of individuals.

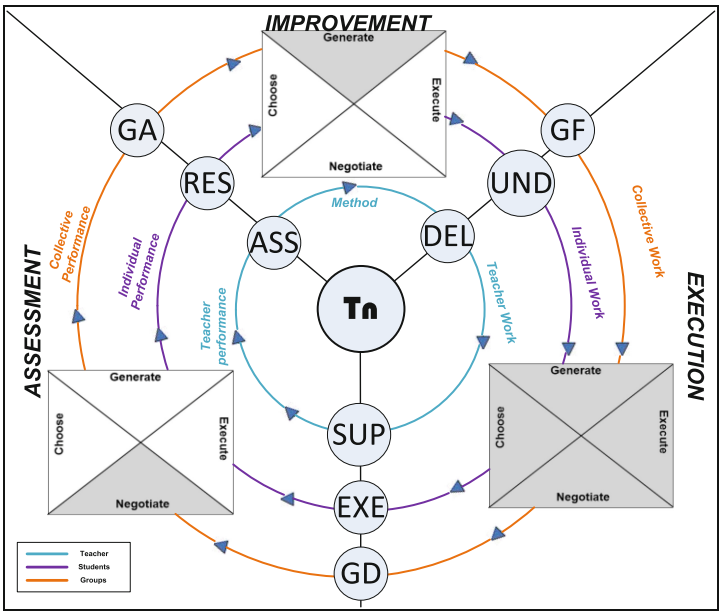

Fig. 1. General view and components of a learning model to promote collective intelligence

The model considers incremental and iterative design in order to improve the activities. This model is based in Deming circle and the Task Circumplex framework of McGrath (Fig. 2). GS into the model responds to the objective of facilitating a way of measuring collective intelligence of the group, together with the assessment of individual students. The data obtained from interaction of students during the realization of activities will use to find patterns of behaviors of groups.

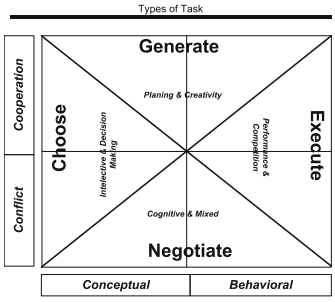

Fig. 2. Task types for learning, adapting from McGrath (1984).

As shown in Fig. 1, the model follows three domains (sectors), circuits (circles) and matrixes which are: execution, assessment and improvement; teacher, students and groups and types for learning respectively. All circuits are concentric with the core

task, it is supported by a serious gaming through a list of milestones summarized in the Table 1.

Table 1. Components of model

Milestone	Description
Delivery (DEL)	Definition of the list of task according to quadrants of Circumplex Model and the challenge of activity. Serious game proposal according to the nature of challenge
Support (SUP)	Support given to students during the development of individual and groups task
Assessment (ASS)	Adjustment of the activity for the next application, using information from massive data
Understanding (UND)	Understanding of contents and strategies for the development of the task. Evaluation of self-benefit of the activity
Execution (EXE)	Interaction with the task development: choose, decision making, creativity, bargaining, and so on
Result (RES)	Real time access to scores, self-assessment and new goals
Formation (GF)	Formation of groups of work. The S.P.A.C.E formula [10], to determine profile for each student
Dynamic (GD)	Visualization of group dynamics, considering individual social skill as well as group behaviors
Assessment (GA)	Real time access to scores, self-assessment and new goals for the groups

4 Generation and Application of Massive Data in Class

GS has been applied in two groups of students of pre and postgraduate (eighty students), in this section have been summarized its application by each milestone.

DL: The learning activity was Capital Innovation IC, and was aimed at facilitating the understanding of concepts and tools for the identification and protection of intellectual assets produced through innovation activities. The learning activities tasks involved: intellective, decision making, generation of ideas and executing performance task of the Circumplex Model. GS was specifically designed to foster participation of students in the assessment of all activities realized during the class. The gaming consisted on trying to guess the value that the teacher will score at works presented in class by students. The students had to qualify the groups presenting their works, according to the parameters of the activity: Inventory of value protection, Threats and risk analysis, cost-benefit of protection and Intellectual capital SWOT. The criteria for the score were: (1) very loose, (2) Pretty lazy, (3) Normal, (4) Good, (5) Pretty good, (6) Very good. The rubrics for the score are: exactly to the teacher plus 1 point, deviation in value of "n" points: Subtract "n−1".

SUP: During the execution of activities the teacher explained to the class the content of the activity, and helped to specific groups to solve details of the different task. In the public presentation of works of groups the teacher discussed about the correctness and mistakes of the tasks. All students of the class where able to follow discussion and participate.

ASS: The data generated by the participation of students in the "guess the score" gaming, during a two hour class were in a rank of between 10 and 20. This data correspond to the assessments made by each student about the level of performance of tasks, presented by any other students, and expressed before the teacher made public his particular assessments. With all this data it was possible: At the individual level measure the deviation between the score of the teacher and each particular student. In each consecutive task assessed, the student was able to improve his or her capacity to apply the concepts related to intellectual capital. At the group level: measure the deviation between the median of score of the group against the teacher and against the other groups. The groups were able to improve its dynamics analyzing their performance as a groups and individually.

UND: Participants had to attend to the session to understand the activity and the tasks for each activity.

EXE: The students working in groups had to solve the list of task of activities.

RES: The students are able to visualize the scores and its ranking individually, as well as in group. Rankings presented included: individual position in relation to the class and group, the student behavior along practices, and position of group in relation to the class (Fig. 3).

GF: The groups were formed freely according to the preferences and affinity of the students.

GD: The group according with the result obtained in each cycle established the goals for the next cycle.

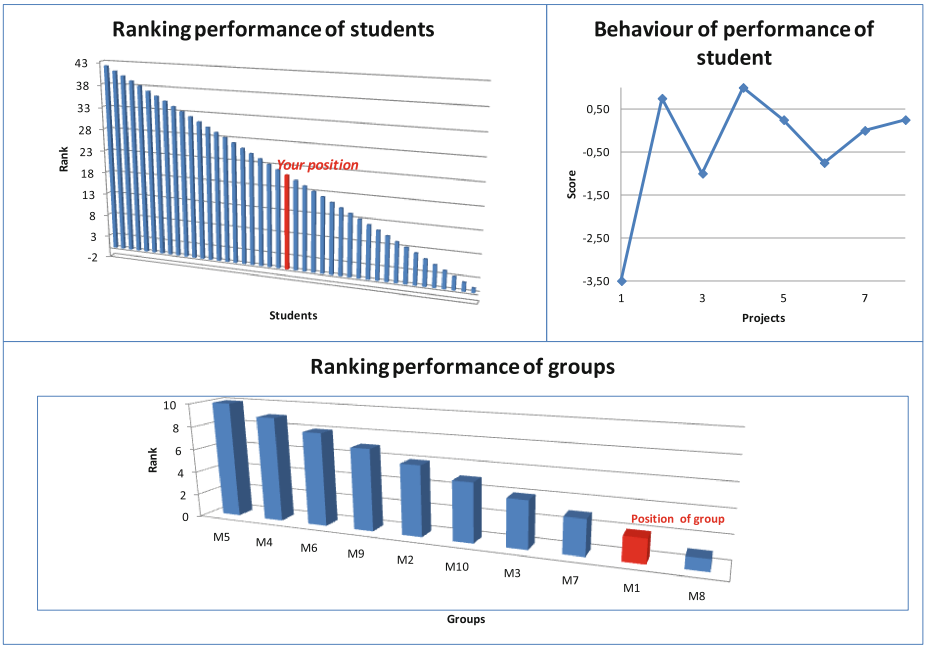

Fig. 3. Rankings of: individual position in relation to the class and group, the student behaviour along practices and position of group in relation to the class.

GA: With the information of each practitioner, the groups, they analyzed their results and how they could improve it in future activities, the resources available are: the S.P.A.C.E formula [10] of group, the average of deviation respect to the experimenter, rate from the minimal to maximal score of groups and so on.

The findings of the test with the first GS prototype are useful to align the next step of research: Some of the results are: As shown in Fig. 4 the gaming strategy is a key element to succeed in student engagement; the process of collecting data from the participation of students has demonstrated efficient and works appropriately; and the S. P.A.C.E [10] application has a limited utility to validate the student social profile.

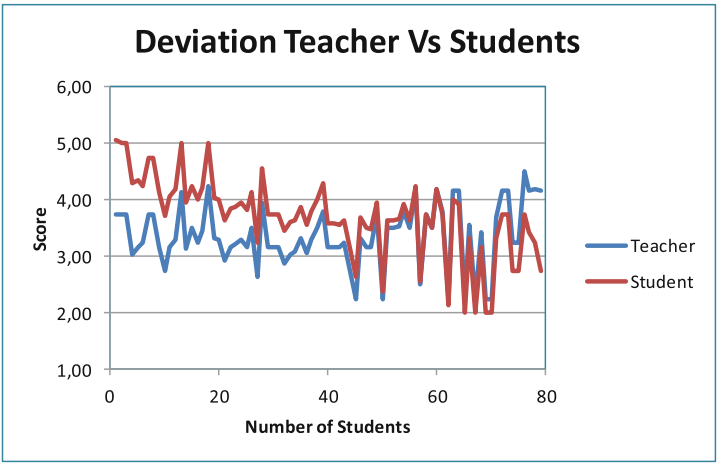

Fig. 4. Deviation between of teacher and students in the application of "guessthescore" game

5 Conclusions

The objective of the work presented here is to share the advances in a research program which intention is to provide a model, strategies, tools and resources to help improve the collective intelligence education. The GS and its theoretical framework is very wide and open and it's necessary much more research to find a consensus about which are the relevant theoretical elements.

The use of GS in the class has allowed obtaining some evidence about student's engagement, the increase of attention during the class and the increasing level of outcomes of exercises and practices. The model proposed, and the corresponding tool, had been the result of a creative combination of theoretical, practical and applied perspectives. From this point, with a consistent model, it will be possible to continue with the development of new functionalities oriented to make recommendations in the improvement continue the knowledge of collective intelligence education.

References

1. Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T., Boyle, J.M.: A systematic literature review of empirical evidence on computer games and serious games. Comput. Educ. **59**(2), 661–686 (2012)
2. Woolley, A.W., Chabris, C.F., Pentland, A., Hashmi, N., Malone, T.W.: Evidence for a collective intelligence factor in the performance of human groups. Science **330**(6004), 686–688 (2010)
3. Susi, T., Johannesson, M., Backlund, P.: Serious games – an overview (2007)
4. Ilon, L.: How collective intelligence redefines education. In: Altmann, J., Baumöl, U., Krämer, B.J. (eds.) Advances in Collective Intelligence 2011. AISC, vol. 113, pp. 91–104. Springer, Heidelberg (2012)
5. MIT Center For Collective Intelligence: Handbook of Collective Intelligence. http://scripts.mit.edu/~cci/HCI/index.php?title=Main_Page#Why_study_collective_intelligence_now.3F
6. Lévy, P.: Inteligencia colectiva por una antropología del ciberespacio. Panamericana de la Salud (Unidad de Promoción y Desarrollo de la Investigación y el Centro Latinoamericano y del Caribe de Información en Ciencias de la Salud), Washington, DC, p. 141. (2004)
7. Lévy, P.: Toward a self-referential collective intelligence some philosophical background of the IEML research program. In: Nguyen, N.T., Kowalczyk, R., Chen, S.-M. (eds.) ICCCI 2009. LNCS, vol. 5796, pp. 22–35. Springer, Heidelberg (2009)
8. MIT Center For Collective Intelligence: MIT Center for Collective Intelligence. http://cci.mit.edu/
9. Lykourentzou, I., Vergados, D.J., Loumos, V.: Collective intelligence system engineering. In: Proceedings of the International Conference on Management of Emergent Digital EcoSystems - MEDES '09, p. 134 (2009)
10. Albrecht, K.: Theory of Social Intelligence. https://www.karlalbrecht.com/siprofile/siprofiletheory.htm