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CONDITIONS AFFECTING LEARNING ON THE COLLECTIVE LEARNING PLATFORM - A STUDY WITH SECONDARY SCHOOL STUDENTS

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Abstract

Technological development is creating new learning environments that take place in the digital space. An example of this is Collective Learning, a digital platform based on a model of collective intelligence that generates a problem-solving context by allowing participants to develop their activity through different phases of interaction within it (Bautista and Valero-Tapia, 2024). Developed by the University Institute of Biocomputing and Physics of Complex Systems (BIFI) of the University of Zaragoza (Spain) in collaboration with Kampal Data Solutions, Collective Learning is designed so that large groups can generate collaborative solutions to the tasks or problems posed in it, also incorporating a consensus mechanism based on the analysis of participants' activity in real time. This collaborative environment can therefore be a learning environment with some conditions that increase the motivation of the participants, such as having learning partners outside the classroom, being able to learn in an environment where many of their daily interactions take place, having activities that have a certain challenging component, or being able to improve critical thinking. However, it is necessary to identify the conditions of these new environments that influence participants' motivation and learning. Therefore, we present data from 234 secondary school students (mean age 14.17 years - SD 1.58) who participated in different work sessions within the Collective Learning platform and who answered a 26-question questionnaire collecting aspects related to satisfaction with the activity and learning, as well as with the conditions that the platform contains to facilitate learning and the behaviours they generated during their interaction. The data were analysed by means of path analysis, in which learning on the platform is mediated by satisfaction with the activity. The results show that the variables included explain 49% of satisfaction and 45% of learning. The facilitating conditions of the platform are the most relevant variable in the model (β=.66 for satisfaction and β=.22 for learning), but equally important are students' behaviour towards the task, orientation towards change as an important factor in learning (β=.20). Finally, satisfaction has a direct effect on learning (β=.38). We conclude by pointing out that an environment such as Collective Learning makes it possible to generate learning experiences and to identify the elements that contribute to learning.

Keywords: *Collective learning, collective intelligence, learning experience, learner behaviour, platform conditions.*

1. Introduction

The construct of collective intelligence (CI) has become popular in recent years due to the possibilities offered by the Internet to create collaborative spaces for large groups. This construct is based on the assumption that groups of people are capable of generating more complex and higher quality solutions to proposed problems than each of them individually. A fundamental idea in this context is that by working together on a task, participants may also be learning (Navajas et al., 2018). In this sense, collaboration in small groups is a common condition in active methodologies such as cooperative learning or project-based learning. However, the possibilities offered by the Internet to move interactions into this space and to create new working conditions for large groups create an environment with new potential to be explored. Specifically, this work is based on an interaction platform based on collective intelligence models used as a learning tool, called Collective Learning.

This platform allows groups of people to work together to solve a proposed task. To this end, it has a system for disseminating information in successive phases, compatible with the gradual creation of more complex answers in a collaborative environment, to finally narrow down the solutions approved by the group by means of a consensus mechanism. It is designed to allow a very large number of people to carry out the same task. Previous work has demonstrated its effectiveness with groups of up to 800 people (Bautista et al., 2022; Cebollero et al., 2024; Orejudo et al., 2022, 2024).

1.1. The collective learning platform as a learning environment

Collective Learning is a digital tool that allows users to respond to activities at different stages (https://www.kampal.com/collective-learning/). In this way, users have the possibility to elaborate their answers successively, to see the answers of the other participants and, with this new information, to modify the answers already elaborated, to copy them directly or simply to ignore them. Participants are not obliged to generate new answers at each stage, but the activity is stimulated by successively receiving new information and encouraging the evaluation of this information, which provides an incentive to generate new answers (Bautista and Valero Tapia, 2024; Orejudo et al., 2022).

As mentioned above, participants go through different phases of activity. Thus, initially (phase 1), the work is carried out individually. Then, in phases 2, 3, 4 and 5, the work is carried out in small groups of 5 participants, with the aim of optimising this learning environment (Navajas et al., 2018), but also to ensure that the answers generated by the participants are disseminated throughout the network by successively exchanging the members of the group. Finally, phases 6 and 7 are aimed at reaching a consensus.

The activity designers or project managers within the platform are responsible for introducing the tasks to be carried out. The format of the activity is extremely flexible, as it can include text format, audio/video, external links, etc., and questions can be posed with different answer options, both open and closed (Orejudo et al., 2022; Orejudo and Denoni, 2024). The type of content to be included is very diverse, but it is well suited to tasks that are close to the format of problem solving, case studies, exercises and concrete tasks.

2. Design

The work presented is based on three elements. The first is the Collective Learning Platform, a virtual environment for collaborative learning that allows large groups of people to interact to complete learning tasks. Its characteristics have already been presented in the previous section. It is also relevant to mention the type of task that is introduced in the platform and that the participants in the platform have to analyse and that has to be designed for learning. In this case, the learning objectives are related to the development of socio-emotional e-skills for acting in digital contexts (Cebollero-Salinas, 2022; 2024). To achieve this objective, and following the methodology of cases in learning contexts (Orejudo et al., 2008), situations related to cyberbullying, hate speech on the Internet, social comparison, viral jokes or phubbing are included in the platform. For this purpose, different learning situations of between 45 and 50 minutes are planned and offered to all schools in the region through the Department of Education of the Government of Aragon (Spain). In this way, between 40 and 50 schools take part in these activities each school year, with each school being responsible for deciding how many students take part in each activity.

Finally, since the aim of this study is to analyse how the participants in the activities value the elements of the Collective Learning platform as a learning environment, the study has a component of evaluation of the activity through a survey format. In turn, the data analysis is based on a theoretical model of the relationship between the variables, in which both the conditions of the platform and the behaviour of the participants during the activity are directly related to the learning achieved and to the general satisfaction with the activity, and a relationship of mediation of these variables through general satisfaction and learning is also proposed. The AMOS 28 software was used for statistical analysis.

3. Objectives

Therefore, the aim of this paper is to present the assessment that students in compulsory and post-compulsory education make of the activities they do on the Collective Learning platform, to describe their own performance on the platform, and to verify that the conditions of the platform and the behaviour of the participants are related to satisfaction and learning.

4. Methods

4.1. Participants

A total of 234 secondary school students from Aragón (Spain) participated in this study (mean 14.17 years - SD 1.58). All of them completed at least one learning activity within the Collective Learning platform during the school year 2023/24. Of them, 49.1% are girls, 48.7% are boys and 2.1% identify with another identity. Most of them are in compulsory secondary education (88%), where they are aged between 12 and 16. The remaining 12% are students in the first year of high school or vocational training, aged between 16 and 22. As a condition for completing the activity evaluation survey, all of them had to have participated in at least one learning situation within the platform.

4.2. Activity evaluation questionnaire

As we have already mentioned, after the last activity of each group and after about one week, the participants had to fill in, in the presence of the teacher who had accompanied them during the activities, an activity evaluation questionnaire via Google Forms with 26 items specifically designed to evaluate the learning environment of Collective Learning. The items were specifically designed for this work and covered the following dimensions:

- Learning (6 items, α=.801). Example of items: "The situation(s) we analysed allowed me to really put myself in the place of the characters presented".
- Strategies followed during the activity aimed at change (5 items, α=.753). Example: 'Throughout the phases of the projects, I changed my initial response to others that seemed to me to be better ideas'.
- Strategies followed during the activity that are not change-oriented (3 items, α=.443). Example: "Throughout the project phases, I did not change my initial answer because I was too lazy to read or because there were too many answers".
- Platform conditions conducive to the activity (4 items, α=.783). Example "I felt comfortable on the platform because I could see what other people were saying".
- Platform conditions inhibiting activity (3 items, α=.635). Example: "I didn't like that the platform could delete responses".
- Platform conditions related to anonymity (2 items, α=.818). Example: "The fact that no one knew who you were allowed me to say what I really thought".
- Satisfaction with the activity (3 items, α.717). Example: "I liked the activity with the collective learning platform".

All items of the scales have a Likert scale format with values from 1 to 6. In order to facilitate the comparison between the scales, the mean for each of them is presented according to the number of items, so that the scores presented have theoretical ranges between 1 and 6.

5. Results

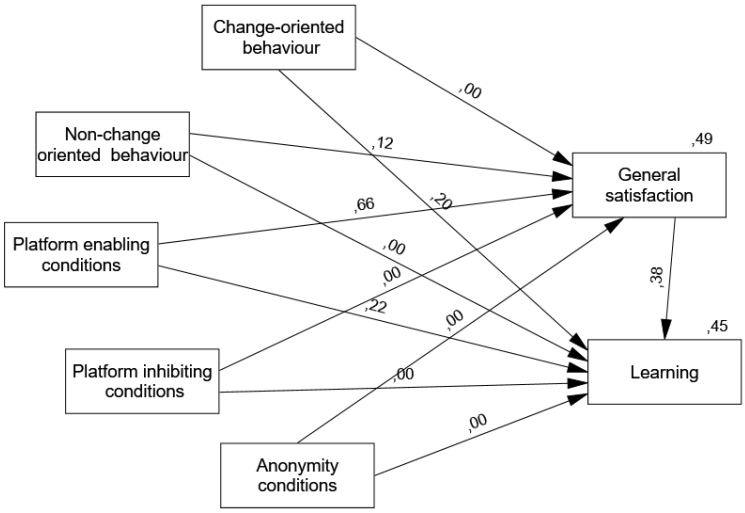
As can be seen in Table 1, students in secondary education give a medium-high rating to the activities carried out on the platform. It is worth noting that the highest scores are given to the general satisfaction and the facilitating conditions of the platform (3.97 and 3.89). Similarly, the assessment of learning is above the theoretical average of the scale (3.5). The condition of anonymity stands out as the least relevant.

Table 1. Descriptive statistics of the evaluation of the activity.

	N	Mean	S.D.
Learning	234	3.77	1.13
Change-oriented behaviours	234	3.39	1.18
Non-change oriented behaviour	234	3.49	1.09
Platform enabling conditions	234	3.89	1.19
Platform inhibiting conditions	234	3.43	1.07
Anonymity conditions	*234*	2.89	1.24
General satisfaction	*234*	3.97	1.21

In terms of the relationships between the variables, the results are shown in Figure 1. The model fit data reflect quite adequate values of the model (χ^2=8.302, df=6, p< .217, CFI=.997, TLI=.991, RMSEA=.041). This figure shows that all variables included in the model have some effect on the endogenous variables. In particular, Overall satisfaction (49%) and Learning (47%) are adequately explained by the exogenous variables and are closely related (β=.38), proving that Overall satisfaction with the activity is a condition for learning. Following this mediation relationship, Platform conditions that facilitate interaction are found to be particularly relevant for predicting satisfaction (β=.66) and direct learning (β=.22), accumulating total effects of β=.469. In turn, the participants' own behaviour is relevant, as their change-oriented behaviour is the main predictor of learning (β=.20). Finally, the relevance of non-change behaviour as a relevant condition for overall satisfaction is noteworthy (β=.12).

Figure 1. Path model.



6. Discussion and conclusions

The aim of this study was to analyse which elements of the learning environment created in the collective learning platform and the students' behaviour that emerges in it have an impact on the learning that takes place in it. To this end, a group of secondary school students in Spain evaluated the most relevant elements of this platform using an ad hoc questionnaire. This platform generates a new learning scenario with different characteristics, as it allows the dynamic interaction of large groups of people, it is based on small group work (Navajas et al., 2018), it encourages the dispersion of information among all participants in the activity and incorporates mechanisms to increase interaction between participants, and finally it generates a consensus mechanism that helps to generate a collective solution.

The results obtained show that the participants in the activity perceive the most relevant conditions of the activity and that they point out that their own action, oriented towards change and learning in this social context, is a key condition for learning and for showing satisfaction with the activity. Furthermore, it emerges as a key factor that the platform's own actions are significantly the most important elements in explaining both satisfaction and learning. These elements highlight the importance of the facilitation of interaction and the activity of participants as fundamental aspects in collaborative learning contexts mediated by technological support (Castellanos et al., 2017; Cesarini et al., 2016; Liu & Lan, 2016; Orejudo et al., 2024).

Likewise, it should be taken into account that these results are not independent of the learning content, the emotional e-competences (Cebollero et al., 2022; 2024), which are essential for adapting to virtual environments, and the way the content is presented within the platform, in which the case methodology (Orejudo et al., 2008) is essential, as it tries to facilitate the participants' involvement in the learning situation and, therefore, their motivation. Finally, it should be noted that the participants are secondary school students and that they have some different characteristics from other groups, such as university students, who give higher ratings to the activities (Valero-Tapia et al., 2023). However, it should be noted that in this group of students, a relevant value is found for non-change behaviour as a basic aspect of satisfaction with the activity, a relationship that could well be explained by the characteristics of this adolescent stage.

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