Understanding students' engagement with a Serious Game to learn English: A sociocultural perspective

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Abstract

Research studies have demonstrated that students' sociocultural background influences their learning and engagement processes in classroom activities. Additionally, research studies have shown inconclusive effects of how Serious Games improve students' engagement. Therefore, this article describes the results of a research study that analyzed, from a sociocultural perspective, the incorporation of the Serious Game (SG) Be (the) 1: Challenge in a classroom setting with forty-seven high school students who live in vulnerable conditions in the Amazonian region of Colombia. A revised version of the Motivation Attitude Knowledge Engagement (MAKE) survey was implemented to inquire students' engagement with the game, including open-ending questions. Moreover, game learning analytics (GLA) from a teachers' dashboard was collected to track students' achievements and progress during gameplay. Data was analyzed, triangulated, and interpreted through the lenses of the Reflective Play Activity Model (RPAM) to have a better understanding of students' interactions with the game in the classroom. The main findings reveal that (1) when students developed intrinsic play, their cognitive, emotional, and behavioral engagement was low, but when they developed extrinsic play, their engagement increased, and (2) GLA serves to predict students' engagement with a SG in marginalized settings. Additionally, this study refines the RPAM by deepening how this model can occur in face-to-face settings with students who, due to their sociocultural background, do not have access to discuss, construct, exchange, and share information about game features in online environments.

Keywords: *Serious games, student engagement, game learning analytics, educational technology, English language learning.*

1 Introduction

[1] remark that the rapid technological changes of our century change the landscape of foreign language (L2) teaching and learning, which suggests the move away from designing Computer Assisted Language Learning (CALL) courses towards the adoption of web 2.0 technologies into teaching and learning since there is a "shift from using the computer as a tutor to using the computer as a facilitator" [2, p. 124]. This implies the move from traditional methods to communicative ones in language teaching and learning processes in which Technology Enhanced Language Learning (TELL) becomes a vital theory to understand such processes.

To the previous regards, [3] expresses that technology must be seen as a means to promote language learning. Yet, as supported by [4], teachers need to understand how to

use and implement games in the language classroom. Hence, it is necessary to develop deep research in this area that has not been sufficiently addressed in Colombia and link language learning and teaching to technology use and its effects and outcomes in diverse backgrounds.

In TELL research, while [5] establish that engagement and enjoyment whilst learning can be increased with the use of media and games technologies, [6] support that students' technology acceptance, the sense of freshness and the students' language proficiency are some of the factors that may influence its effectiveness. Considering that, [7] highlights the necessity of developing more in-depth research on the most effective designs to implement mobile devices to reach students' learning efficiently. Therefore, research needs to focus on the understanding of the impact of TELL and mobile applications in students' learning.

Recently, and thanks to technological advancements, video games started to be part of high schools and universities' teaching and learning processes. In Colombia, research carried out by [8] claim that students enrolled in higher education in this country have a positive attitude towards Mobile Assisted Language Learning (MALL), which is influenced by performance expectancy, social influence and facilitating conditions of students. The authors assert that an improvement of facilitating conditions and an influential role of the educational community is crucial for integrating MALL in education. Nevertheless, little research was found in the use of TELL in state schools in Colombia, being most of the studies carried out in higher education contexts.

As an outcome of the trend of implementing TELL in second language teaching and learning, the use of Serious Games (SGs), defined as customized games that have been purposively designed for educational settings [9], has been incorporated. To this respect, [7] have demonstrated that SGs are effective for language learning, specifically, [10] and [11] have emphasized in the SGs outcomes in terms of vocabulary acquisition. In addition to this, [12] assert that studying games in respect to language learning leads to a deeper understanding of its effects. Additionally, [13] and [14] assert that implementing SGs in the language classroom can increase students' engagement and motivation. More authors such as [15-16] have demonstrated the impact of SGs specifically in vocabulary learning. Consequently, it becomes necessary to understand how SGs influence students' engagement in marginalized settings.

To the previous respect, [15] defines engagement as the "amount (quantity) and type (quality) of learners' active participation and involvement in a language learning task or activity" (p. 2). To this respect, [16] affirms that "in the context of language learning and use, Engagement with Language is a cognitive, affective, and/ or social process in which the learner is the agent and language is the object (and sometimes vehicle)" (p. 244). Additionally, [17] express that "engagement is the active verb between the curriculum and actual learning" (p. 23). The previous assumptions imply that the engaged learner is committed to and involved in language learning, in which action is the fundamental basis.

According to [15], engagement has the following characteristics (1) engagement means action, (2) engagement is highly context-dependent, (3) engagement always has an object, (4) engagement is inherently situated, and (5) engagement is dynamic and malleable. [17] add that "engagement's characteristic effort, exertion, vigor, intensity, vitality, zest, and enthusiasm are markers of energy; its interest, focus, and concentration are outward expressions of purpose or direction; and its absorption, determination, and persistence are signs of durability" (p. 22). Moreover, [18] states that focused attention is critical to engagement. The previous indicates that game playing implies strong engagement [9]. Overall, enhancing students' engagement implies focusing on its characteristics and being aware of its outcomes.

To the previous regard, [19] and [20] assert that a sociocultural perspective is necessary when studying how SGs impact engagement and learning since students from diverse backgrounds may have different learning styles on and around computers, which means that it becomes important to thoroughly understand the features and strengths involved in gameplay in students from such settings. Accordingly, [20] propose the Reflective Play Activity Model (RPAM) to better describe the social processes that occur when students

engage in gameplay. In the RPAM [20] explain that, in reflective play, the object "lies in the process of the intrinsic playing itself. This object triggers the motive that is to reflect on intrinsic play and it results in a pool of shared resources as the outcome" (p.364). The authors add that "these resources can be combined, used, and transformed in novel ways through expansive play" (p.364).

In the RPAM, [20] define two types of gameplay: intrinsic and extrinsic. They state that "intrinsic play refers to the play within the predefined boundary of the game structure, while extrinsic play refers to the play that goes beyond this original game structure" (p. 360). This means that in reflective play "the game software becomes a secondary tool that consists of externalized symbols of how to use the actual tool" (p.366). Therefore, it becomes important to use the RPAM to analyze the social processes that take place when marginalized students interact with games.

Finally, [18] supports that given the fact that the language teaching environments are being transformed using technology, research needs to focus on understanding how different kinds of activities and participation affect students' engagement with learning and why. In such processes, it becomes essential to consider students' sociocultural backgrounds [19]. Considering the information from the previous paragraphs, the objective of my research process was analyzing, from a sociocultural perspective, the incorporation of the SG *Be (the) 1: Challenge* in a classroom setting in a marginalized area of the Amazonian region in Colombia.

2 The Serious Game Be (the) 1: Challenge

[21] relate that the SG *Be (the) 1: Challenge* is a game that was "specifically designed to strengthen English language learning processes" (p.68). This game was designed by the Ministry of Education in Colombia with the support of the British Council. The game designers launched it in March of 2020. This game is available in Apple Store and Play Store for free, so anyone can download it. This game can be played without internet connection, which is suitable for students in Colombia since internet connection is not stable in some areas of this country and there are some regions do not even have access to it. Additionally, [21] share that the SG *Be (the) 1: Challenge* has the following goals:

- to promote meaningful learning environments in which the students feel motivated to develop their learning activities.
- to develop confidence and self-knowledge about their own learning process.
- to develop autonomy and empowerment through the design and monitoring of self-training routes.
- to develop and apply cognitive skills (e.g., problem-solving) in different situations and with different levels of requirements.

Regarding the game, it offers four levels: Pre-A1, A1, A2, and B1 (see Figure 1), following the English levels proposed by the Common European Framework of Reference (CEFR). These levels are called *Missions*. Then, each mission offers *nine* locations (see Figure 2) with different activities to complete, each location is focused on a different aspect of English (interactive use of English, lexical knowledge, communicative knowledge, grammar knowledge, literal reading comprehension, inferential reading comprehension, and lexical and grammar knowledge). The previous means that during the gameplay process students must accomplish different tasks in each one of the locations. To give an example, in the Mission A2, Location 1, students must write a word that matches the definition given by the game (see Figure 3). Other missions require students to see a picture and choose a definition that best describes it (see Figure 4), read a conversation and choose the best option to answer a question made by one of the participants of the conversation (see Figure 5) or ask students to complete a sentence choosing the most suitable grammatical term to the sentence (see Figure 6). Some other locations also include reading comprehension tasks. I chose the game since it offers different and varied tasks and activities that foster students'

engagement and participation in the gameplay process. Moreover, this game does not need internet connection, which made it the perfect one for my region that lacks this stable connection.

Figure 1. *Levels in Be (the) 1: Challenge, Mission B1: The Letter of Margaret Winter.*

Figure 2. *Locations in Be (the) 1: Challenge, Mission Pre A1: A Sweet Quest.*

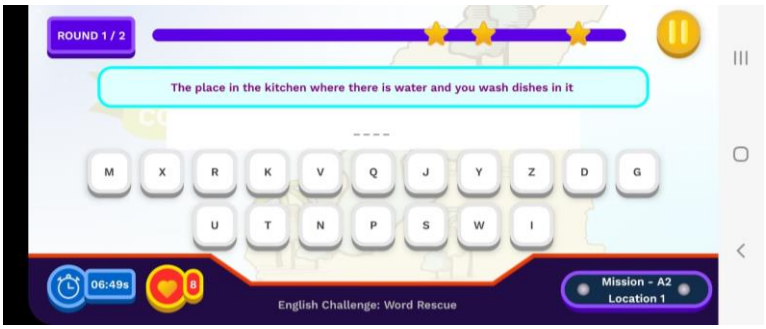

Figure 3. *Example of Location 1 in the Mission A2: The Last Refugee.*

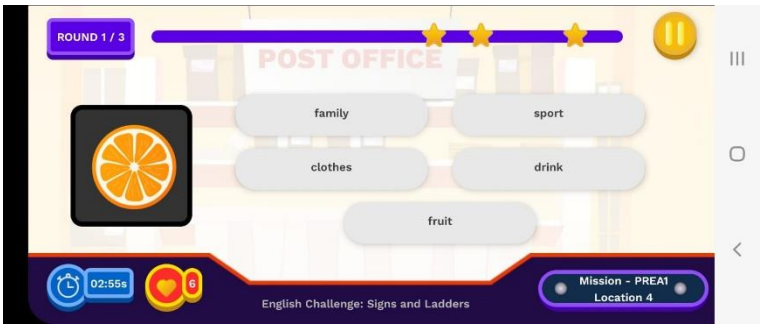

Figure 4. *Example of Location 4 in the Mission Pre A1: A Sweet Quest.*

Figure 5. *Example of Location 5 in the Mission B1: The Letter of Margaret Winter.*

Figure 6. *Example of Location 9 in the Mission A1: Keeping Hope Afloat.*

The dashboard of the SG *Be (the) 1: Challenge* provides full and detailed learning analytics about the following variables: *progress*, *performance*, and *participation* of the students. These variables report the amount of time spent by the students in each mission, the accuracy of students' answers in each one of the missions, and the overall results of the students' interactions with the game. This data demonstrates the degree of interest and commitment from students, which is linked to their engagement. The Game Learning Analytics (GLA) system measures the variable *progress* by analyzing students' percentage of completion of each one of the missions at each level. The data is displayed as it appears in Figure 7.

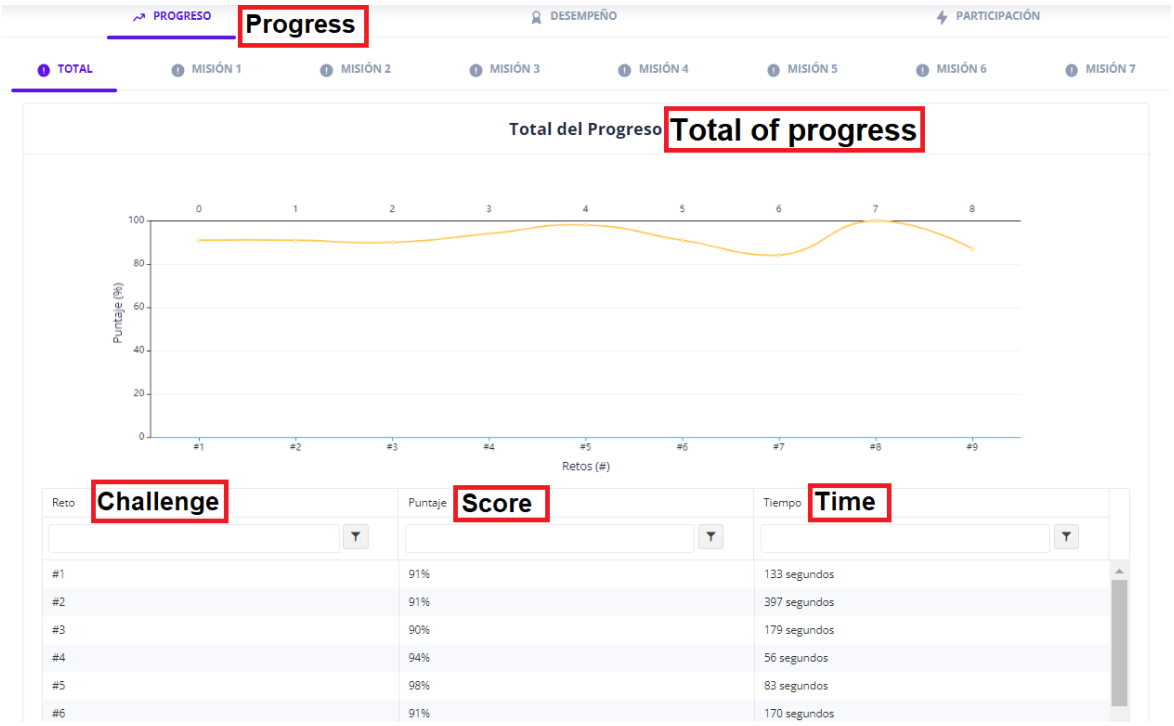

Figure 7. *Example of a report in the teacher's dashboard about* ***progress*** *variable from a random student.*

Performance is analyzed from students' number of correct answers in each one of the missions with respect to the total number of answers responded by the students. A general percentage is displayed in the teachers' dashboard, as presented in Figure 8.

Figure 8. *Example of a report in the teacher's dashboard about* ***performance*** *variable from a random student.*

Participation is measured from the correlation between the time spent in developing each mission and the time limit proposed by the game to accomplish the mission (see Figure 9).

Figure 9. *Example of a report in the teacher's dashboard about* ***participation*** *variable from a random student.*

3 Methodology

In this section I define the methodological approaches that underlined my research process to answer the research question: How does the incorporation of the SG Be (the) 1 Challenge in the classroom environment influence marginalized students' engagement?

Accordingly, I organized students into control and experimental groups. The control group consisted of a total of 19 students who played the game in isolation (intrinsic play) and, in the experimental group, 28 students played the game in groups (extrinsic play).

Altogether, the study took 10 weeks. During the first week, I introduced both groups of students to the game, asked them to create their avatars and explained the gameplay process. This process consisted of playing one mission of the game per week for 8 weeks. Students who played the game in groups had to create one account with the name of the group members. Therefore, the GLA reflected the data from the account that the group created to play the game. This means that the dashboard displayed the information as if it was one person who was playing. However, all the students inside the group participated in decision-making when accomplishing the missions of the game. Regarding the students who played the game in isolation, they were required to create an individual account for each one of them.

The researcher's role was to observe students' interactions during gameplay and take field notes about those interactions. While students were playing the game during weeks 2 through 8, the researcher collected GLA from the teachers' dashboard. Additionally, in weeks 9 and 10, the researcher surveyed students with the purpose of, as proposed by [22], understanding the effectiveness of the use of SGs, their complexity, and dynamics in specific domains (see Appendix I).

Given the nature of the study, I followed [22]'s work which states that quantitative data analysis consists of "determining how to assign numeric scores to the data, assessing the types of scores to use, selecting a statistical program, and inputting the data into a program, and then cleaning up the database for analysis" (p.175). The author states that, after the previous process, the researcher needs to write a descriptive analysis in which measures of central tendency and variation are related. Then, the researcher must develop

an inferential analysis and report the results using tables, figures, and a discussion of them. Finally, the researcher must interpret and summarize the results comparing them with other theories.

Accordingly, quantitative data collection and analysis in my research process consisted of different processes. On the one hand, the statements for the surveys were taken from existing scales from the MAKE framework [24]. Notwithstanding, the statements of this framework were adapted and focused on the evaluation of the game for learning English from the emotional, cognitive, and behavioral engagement perspective. To this respect, [24] assert that numerous observable and non-observable characteristics can be used to evaluate learners' engagement. Hence, the statements for the emotional engagement were focused on describing students' feelings and perceptions about the use of the game. Regarding cognitive engagement, the statements aimed at inquiring students' mental processes such as attention, interest and enhancement while interacting with the game. For the behavioral statements, students' attitude and participation were considered.

Cronbach's alpha was applied to measure the scale reliability of the survey. [23] states that Cronbach's alpha is a measure not only of scale reliability but also of internal consistency. The previous author agrees that a coefficient of 0,93 is high, 0,72 is satisfactory and 0,6 is acceptable. After analyzing the survey results, the Likert Scale statements reported Cronbach's $\alpha = 0,81$ for the intrinsic play group and $\alpha = 0,90$ for the extrinsic playgroup which evidences a satisfactory reliability.

On the other hand, GLA data was downloaded from the teacher's dashboard, analyzed, and graphed in bar charts representing the results of the descriptive statistics of central tendency that were implemented.

Additionally, since the data collected was analyzed from a sociocultural perspective, it becomes important to describe the setting in which the research took place. This research was conducted in a state school called Jorge Eliécer Gaitán High School in Florencia, Caquetá, Colombia. Caquetá is a department that has been deeply affected by the armed conflict. This conflict has led to limited access to technology and internet. Students from the Jorge Eliécer Gaitán High School come from vulnerable families with the lowest socioeconomic level. These families have had to face the murder of their relatives and have had to move from the rural areas to the city due to forced displacement and have had to look for new living options in different cities of the department. Many of the students enrolled in the study were raised in temporary homes which has led them to face difficulties engaging and being motivated in the classroom. The participants of this study were forty-seven 10^{th} graders from Jorge Eliécer Gaitán High School, with ages ranging from 14 to 17 years; 28 were females and 19 males.

This study was conducted with the approval of the principal and the academic coordinator of Jorge Eliécer Gaitán High School. The participants were informed of the purpose of the inquiry and methods to be used and signed informed consent. In the informed consent, the participants were informed that their participation was voluntary, and their personal information was private. Parental or guardian consent was also obtained before data collection. Given the nature of the data, the names of the students were anonymized.

4 Findings

Considering engagement with the game, the mean results of the surveys in the extrinsic play group were higher than of the intrinsic play group in each one of the statements related to emotional, cognitive, and behavioral engagement, as reported in Table 1. This means that the use of the SG in groups had a greater impact on students' engagement. However, it becomes improtant to highlight that intrinsic play group also had high results in all the statements of the survey.

Table 1. *Comparison of engagement results in each group.*

		Group			
		Intrinsic play		*Extrinsic play*	
	Statements	*Mean*	*SD*	*Mean*	*SD*
Emotional Engagement	The vocabulary in Bethe1Challenge was very easy to understand.	2.26	0.93	3.71	0.76
	I have been effective in using Bethe1Challenge as it was engaging.	3.63	0.83	4.11	0.74
	The activities and missions presented in Bethe1Challenge facilitate my active participation.	3.37	0.96	4.07	0.72
	Bethe1Challenge caught my attention.	3.95	0.78	4.18	0.82
	Bethe1Challenge allowed my learning of relevant vocabulary in English.	3.68	0.82	4.32	0.67
	The use of a mobile device to play Bethe1Challenge made me interested.	3.53	0.96	3.79	0.88
Cognitive Engagement	I demonstrated my interest and enthusiasm as well as use of positive humor while using Bethe1Challenge.	3.37	0.76	4.11	0.74
	Bethe1Challenge is relevant for engaging students in vocabulary learning.	3.89	0.99	4.21	0.74
	Bethe1Challenge enhanced my engagement in learning English	3.68	0.82	4.00	0.72
	I focused on the missions assigned in Bethe1Challenge.	3.42	0.96	4.32	0.86
Behavioral Engagement	I completed all the missions in the game.	3.11	0.81	3.50	1.07
	I spent all the necessary time to answer the questions in Bethe1Challenge.	3.63	0.83	3.89	0.79
	If I could not complete a mission in the first attempt, I kept working on it until I completed it.	3.47	0.96	4.39	0.92
	I want to continue using Bethe1Challenge in my learning process.	3.63	0.90	4.11	0.79

Emotionally speaking, students in the extrinsic play group considered that the SG and the use of a mobile device caught their attention and were engaging. Additionally, this group of students considered that the vocabulary in the SG was easy to understand, which facilitated the learning process. Regarding cognitive engagement, students in the extrinsic play group considered that the SG engaged them in vocabulary learning and allowed them to demonstrate their interest, enthusiasm and be focused on learning. Finally, behavioral engagement in the extrinsic play group was influenced by the SG since it enhanced students to spend all the necessary time to complete the missions and to keep working on the most difficult missions. Additionally, students demonstrated that they wanted to keep using the SG in their English class. The previous findings could be confirmed in students' responses to the open-ending questions of the survey:

I think this game was a good method to learn because you can have fun while learning (S4).

I consider this game was a different way to learn and engages students and motivates them to learn and it also facilitates the learning process (S16).

Personally, this game engaged me to study more (S17)

All in all, students in the extrinsic play group demonstrated higher results in all the engagement areas (cognitive, emotional, and behavioral). This could also be evidenced in students' responses to the open-ended questions in the survey:

Playing the game in the school context allowed the interactivity with the classmates, it made it more fun, we were organized in groups and worked cooperatively (S1).

I liked to get support from my classmates because some of them know things that the others don't (S3).

I liked that were all gathered and learnt together (S9).

I liked using the game in the school context because I could listen to my classmates talking about how to accomplish the missions and guessing the correct answer. This made me be more engaged (S11).

Regarding the GLA, the variables *progress* and *participation* evidenced a higher result when students developed extrinsic play as evidenced in Figure 10. This means that students' engagement was higher when they shared with others. Nevertheless, in the variable *performance* the intrinsic play exceeded the extrinsic play. After evaluating this result, it could be identified that given the fact that, in the dashboard, *performance* is measured by analyzing students' number of correct answers in each one of the missions in respect to the total number of answers responded by the students, the results from this variable cannot be generalized as this dashboard displays.

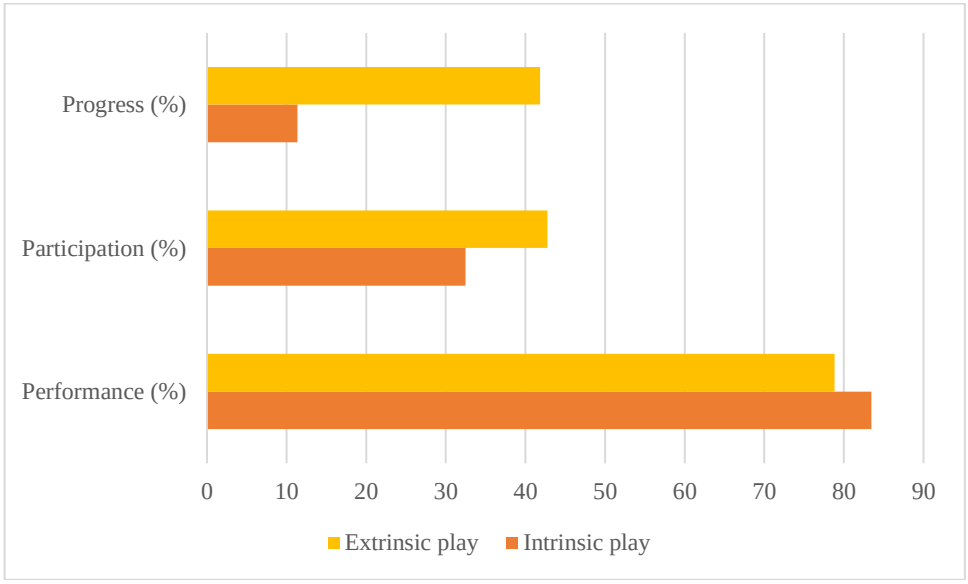

Figure 10. *GLA results in the teacher's dashboard.*

The previously related findings imply that if the student has not completed a mission, the system only counts the results from the missions that the student completed. For example, the GLA that the dashboard displayed from a student from the intrinsic play group reported that he had a 100% in performance, but when checking his individual data, it was noticed that he only completed mission one about interactive use of English (see Figure 11).

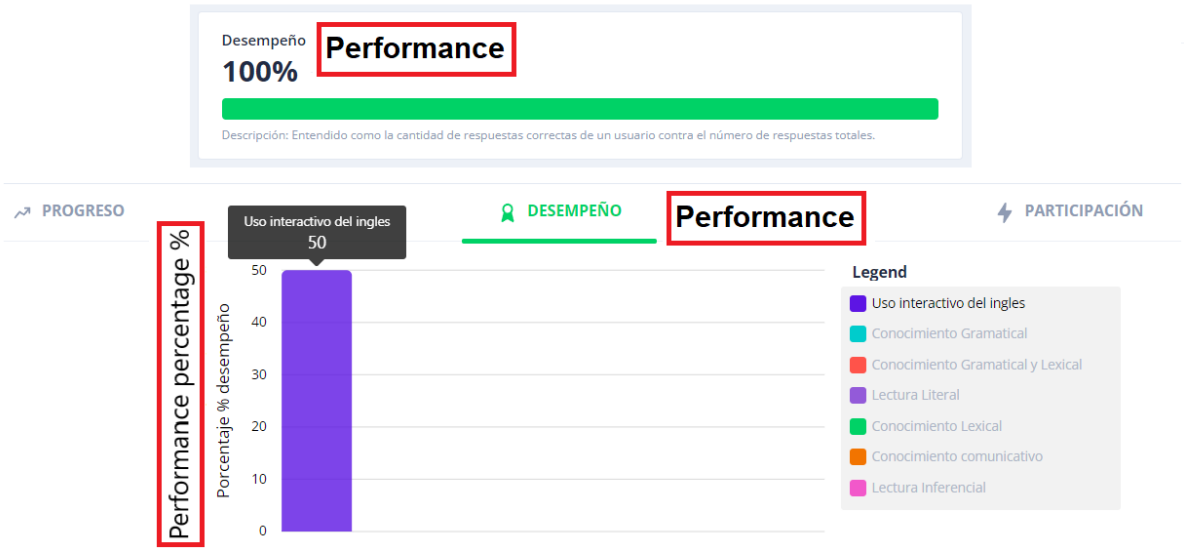

Figure 11. *GLA results in performance variable of a student.*

However, when checking the GLA from one group of students of the extrinsic play group who reported 83% in *performance*, it was noticed that these students had high results in all the missions, the lowest result was of 32,34 out of 50 in the mission about lexical knowledge, see Figure 12.

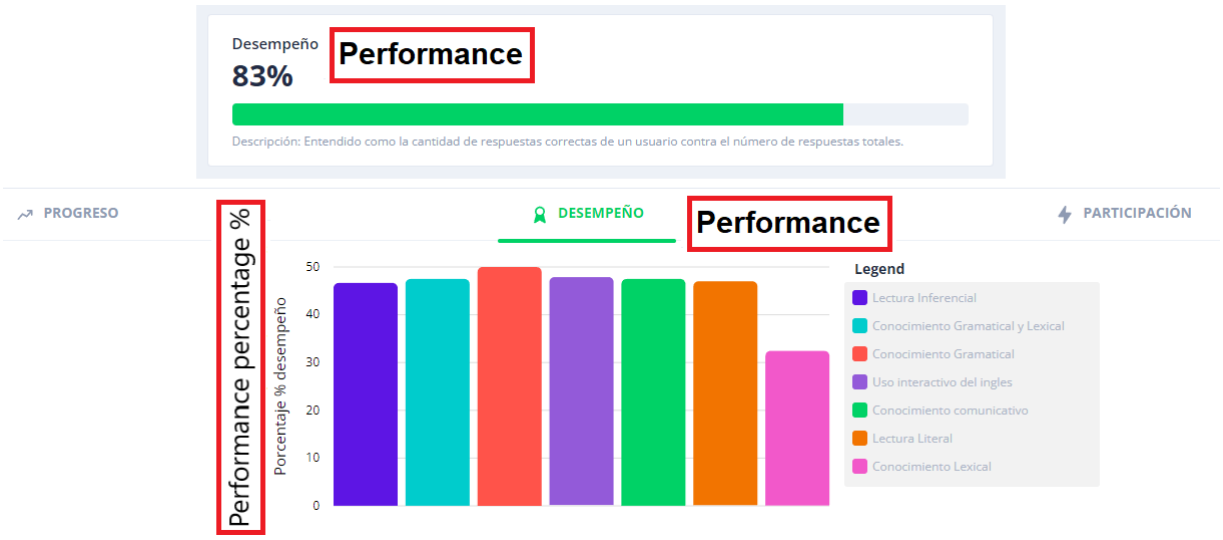

Figure 12. *GLA results in performance variable of a extrincic play group.*

Figures 11 and 12 confirm that the systems "ignores" that the student has not completed all the missions and reports data that must be thoroughly revised by teachers before coming to conclusions. After revising individual performing of both, intrinsic and extrinsic play groups, it was found that extrinsic play students outperformed intrisinc play students in each one of the seven missions as can be appreciated in Figure 13. However, this data had to be manually extracted by the researchers from the teacher's dashboard because the general information that the dashboard displayed was the one presented in Figure 11.

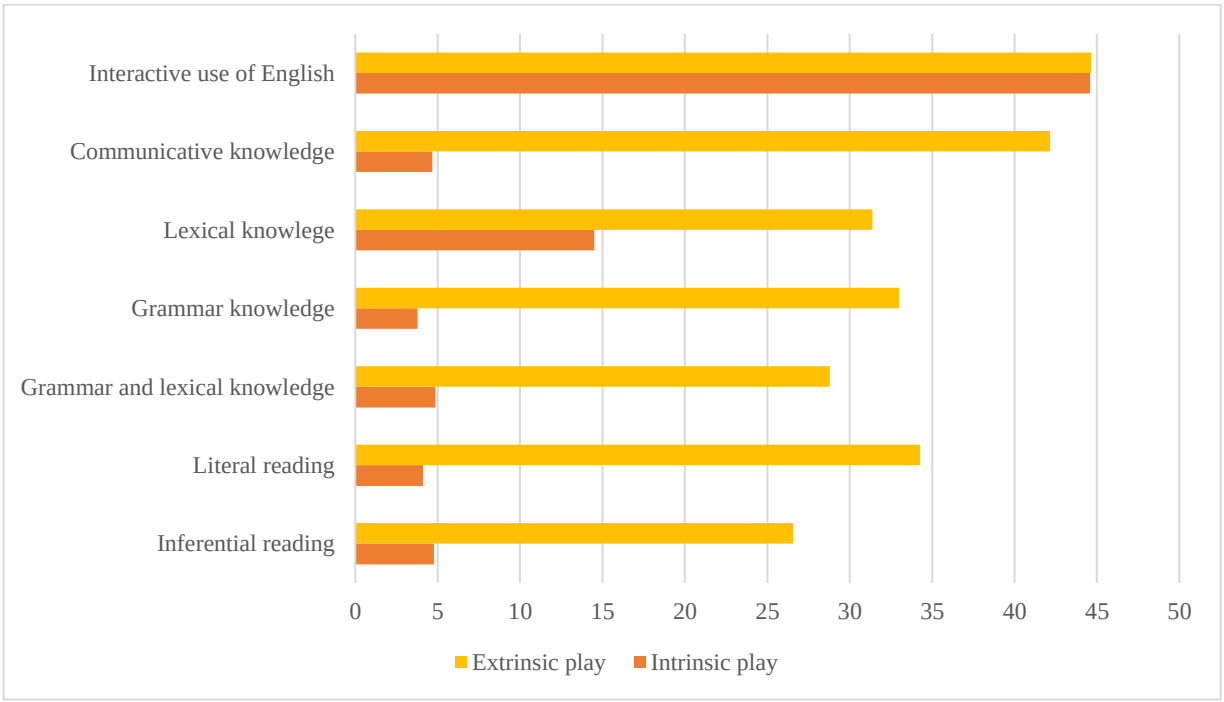

Figure 13. *GLA results in performance, manually extracted.*

All in all, students who played the game in groups had higher results in the three variables *progress, performance* and *participation* of the dashboard. This same group of students also reported higher results in engagement, as previously related in Table 1. These results confirm that the GLA dashboard system allows the visualization of students' engagement with the SG.

Even though quantitative data report meaningful information, it was necessary to analyze the data considering students' sociocultural background. To do so, the RPAM proposed by [20] was implemented. This model provides a network of play in which intrinsic play, computer games, computer-mediated communication (CMC) and construction tools interact. Thus, this interaction leads to a pool of shared resources. The authors also argue that RPAM creates a path of reflective play. In their model, [20] identify three types of reflective play actions: discussion, construction and exchange and sharing. According to these authors, discussion is the most important aspect in reflective play since "players talk to each other about issues around intrinsic play" (p. 365), those issues involve rules, stories, and strategies through CMC channels like online forums.

Since students in my study come from difficult sociocultural backgrounds and do not have access to technological resources and internet to enroll in online environments, the results from the data gathered reflects on the fact that that the types of reflective play are not, as the RPAM proposes, necessarily restricted to online environments. Hence, students in my study had to externalize their intrinsic play through the development of networks of extrinsic play in face-to-face settings. When doing so, students needed to build knowledge with others and created a sense of community in the classroom environment. This implies that while in online settings students can upload scores, download, and read others' game experiences, students from marginalized groups must share their progress in the missions with their classmates in the classroom.

Considering the data previously discussed, the RPAM proposed by [20] was refined by explaining where and how reflective play actions occur with marginalized students (see Figure 14), specifically in the following aspects: the inclusion of the context in which reflective play actions take place and the relationships inside this context in terms of the three types of reflective play actions: discussion, construction and exchange and sharing.

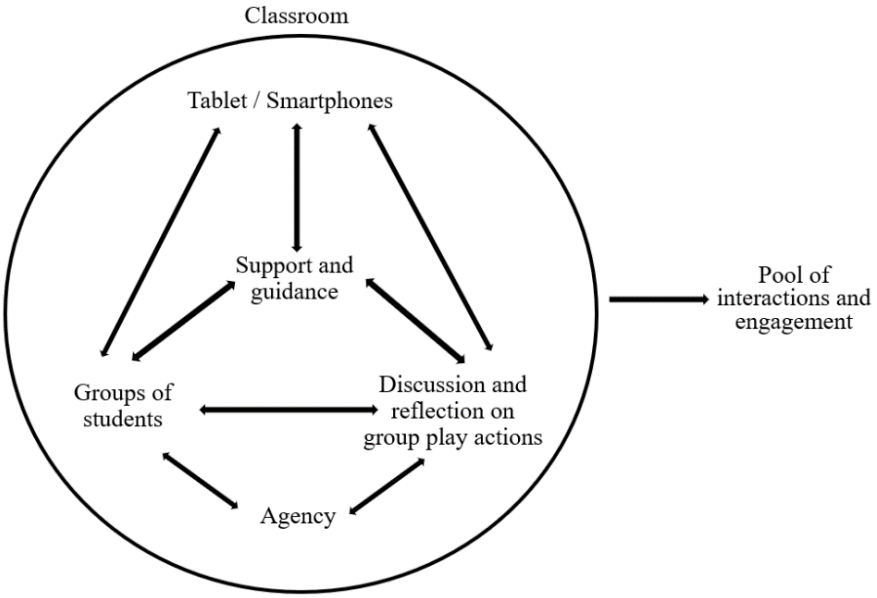

Figure 14. *Reflective play activity model in students from difficult socioeconomical backgrounds.*

This refined model portrays that reflective play with students from marginalized settings occur inside the classroom environment. In such setting, the technological devices (whether tablets, smartphones, or computers) are used by different groups of students and serve to promote discussion, reflection, exchange and sharing both inside the groups and in between the groups, which is mediated by students' agency. In this process, the support and guidance from the teachers or the peers is also crucial. Hence, contradictions emerge from the reflection on extrinsic play, not only from reflection on intrinsic play. When

contradictions are resolved, a pool of interactions and engagement that promoted in-class reflections emerge.

5 Discussion and Conclusions

[25] argue that students' engagement in educational games is limited even though they hold positive attitudes towards GBL. These authors add that if students are positively and significantly engaged in a game, the learning effect can be influenced, which means that "engagement could play an important role in the learning process (p.13)". In addition, [25] ratify that even though student-centered educational games engage and prepare students for knowledge acquisition, games that involve social interaction have received little attention in GBL. Due to the previous facts, it became important to investigate social interactions within game play processes.

Consequently, my study aimed at analyzing, from a sociocultural perspective, how the incorporation of the SG *Be (the) 1: Challenge* influence marginalized students' engagement. These students, as earlier stated, have been socially affected by the armed conflict in their context. Nevertheless, despite students' lack of engagement and their social situation, my study evidenced that students' engagement increased with the incorporation of the SG in the classroom environment.

As noted in the survey results, students in the experimental group had higher results in engagement in comparison to the students in the control group; however, both groups had high engagement results. The experimental group of students, due to their condition, could co-construct extrinsic play reflecting environment in which they discussed game features which enhanced their engagement. Even though [12] assert that the implementation of SGs does not necessarily lead to engagement, my study supports that engagement can be enhanced if students use the SG in the classroom setting. Consequently, my study goes in accordance with previous work developed by [26] and [14] who support that implementing SGs in the school activities changes the traditional schooling and leads to engagement.

It is also concluded that, indeed, the GLA serve to predict students' engagement with a game, which has also been demonstrated in previous research in the area [13][27]. Hence, teachers willing to use *Be (the) 1: Challenge* can predict the extent to which students are engaged by analyzing the data displayed in the dashboard. Nonetheless, GLA from this game must be thoroughly analyzed by the teachers before coming to conclusions since some constrains were found.

Additionally, it was revealed that since the RPAM, proposed by [20], is limited to computer-mediated learning, there was a need to refine this model by explaining where and how reflective play occurs with students from difficult sociocultural backgrounds. In this sense, the model was refined, and three features were introduced into it: agency, willingness to use technology and teachers' and peers' guidance and support.

The refined model of the RPAM confirms that even though the lack of training and internet connection have been inhibiting factors for implementing and using technology in pedagogical contexts [28] [19], the design of SGs that do not need internet connection to be played is crucial in marginalized settings because they allow students to have access to knowledge and engage in learning with their classmates. Additionally, the model evidences that despite the fact that "the degree of engagement that players have in gameplay and its related activities is often stronger and more personal than it is for school-related activities" [14, p.11], engagement can also be increased when SGs are integrated in school activities with students who may have disruptive behavior and lack of engagement due to their social situation.

Finally, it is noted that although it can be difficult to find a suitable game that can be incorporated into the curriculum [29], games "will have a better effect, when the game world and the classroom environment interact with each other coherently" [30, p. 658]. Consequently, my study demonstrates that the use of the SG Be (the) 1 Challenge in the

classroom setting has an engagement impact and can be implemented with marginalized students using the refined RPAM.

All in all, my study is relevant since it provides empirical evidence on the implementation of a Serious Game to learn English in a vulnerable setting. My study also relates how GLA can inform teachers on students' engagement. Moreover, this paper provides the refined RPAM, which supports the analysis of the implementation of Serious Games in marginalized environments. Furthermore, this paper gives insights for teachers on the importance of tracking students' learning analytics while they play SGs.

My results are limited in terms of settings; as such, the findings cannot be generalized to other settings. However, my research gives insights for teachers who are willing to implement SGs for English teaching and to replicate my experience in their settings.

6 Acknowledgments

I want to express my deepest gratitude to my PhD thesis supervisors for their support and advice provided in my research process. I am also extremely thankful to the students who enrolled in my study and cooperated during the whole process, and to their guardians for signing the informed consent. I also appreciate the permission given by the principal and coordinators of Jorge Eliécer Gaitán High School to carry out my research process.

References

[1] Y. Zhou, and M. Wei, "Strategies in technology-enhanced language learning", *SSLLT*, vol. 8 no. 2, pp.471-495. 2018. https://doi.org/10.14746/ssllt.2018.8.2.13

[2] U. Stickler, and L. Shi, "TELL us about CALL: An introduction to the Virtual Special Issue (VSI) on the development of technology enhanced and computer assisted language learning", *System*, no. 56, pp.119–126. 2016. https://doi.org/10.1016/j.system.2015.12.004

[3] M. Warschauer, *Sociocultural Perspectives on CALL*. In: Egbert, J. and Mikel, G (eds). CALL Research Perspectives. Routledge, 2005.

[4] K. Becker, "Digital game-based learning once removed: Teaching teachers", *British Journal of Educational Technology*, vol. 38, no. 3, pp.478–488. 2007. https://doi.org/10.1111/j.1467-8535.2007.00711.x

[5] M. M. Elaish, L. Shuib, N. Abdul Ghani, E. Yadegaridehkordi, and M. Alaa, "Mobile Learning for English Language Acquisition Taxonomy, Challenges, and Recommendations", *IEEE Access*, vol. 5, pp.19033-19047, Sep. 2017. https://doi.org/10.1109/ACCESS.2017.2749541

[6] R. Zhang, and D. Zou, "Types, purposes, and effectiveness of state-of-the-art technologies for second and foreign language learning", *Computer Assisted Language Learning*, pp.1–47. 2020. https://doi.org/10.1080/09588221.2020.1744666

[7] MM. Elaish, L. Shuib, NA. Ghani, and E. Yadegaridehkordi, "Mobile English Language Learning (MELL): a literature review", *EDUCATIONAL REVIEW*, vol. 71, no. 2, pp.257-276, Nov. 2017. https://doi.org/10.1080/00131911.2017.1382445

[8] G. García, F. Questier, S. Cincinnato, T. He, and C. Zhu, "Acceptance and Usage of Mobile Assisted Language Learning by Higher Education Students", *J Comput High Educ*, vol. 30, no. 3, pp.426-45, Mar. 2018. http://dx.doi.org/10.1007/s12528-018-9177-1

[9] U. Ritterfeld, M. Cody, and P. Vorderer, *Serious Games Mechanisms and Effects.* Routledge, Taylor & Francis Group, 2009.

[10] N. Dinçer, and R. Dinçer, "The effect of a serious game on aviation vocabulary acquisition", *International Journal of Serious Games*, vol. 8, no. 4, pp.49–63. 2021. https://doi.org/10.17083/ijsg.v8i4.464

[11] H.C. Hao-Jan, and H. Hsiao-Ling, "The impact of a serious game on vocabulary and content learning" *Computer Assisted Language Learning*, vol. 33, no. 7, pp.1-22. 2019. https://doi.org/10.1080/09588221.2019.1593197

[12] P. Wouters, and H. van Oostendorp. *Overview of Instructional Techniques to Facilitate Learning and Motivation of Serious Games*. In Wouters, P., van Oostendorp, H. (eds).

Instructional Techniques to Facilitate Learning and Motivation of Serious Games. Advances in Game-Based Learning. Springer, Cham, 2016. https://doi.org/10.1007/978-3-319-39298-1_1

[13] A. Tlili, S. Hattab, F. Essalmi, N-S. Chen, R. Huang, Kinshuk, M. Chang, and D. Burgos, "A Smart Collaborative Educational Game with Learning Analytics to Support English Vocabulary Teaching", *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 6, no. 6, pp. 215-224. 2021. https://doi.org/10.9781/ijimai.2021.03.002

[14] R. Godwin-Jones, "Games in language learning: Opportunities and challenges", *Language Learning & Technology*, vol. 18, no. 2, pp.9–19. 2014. http://dx.doi.org/10125/44363

[15] P. Hiver, A. H. Al-Hoorie, J. P. Vitta, and J. Wu, "Engagement in language learning: A systematic review of 20 years of research methods and definitions", *Language Teaching Research*. 2021. https://doi.org/10.1177/13621688211001289

[16] A.M.L. Svalberg, "Engagement with language: Interrogating a construct" *Language Awareness*, vol. 18, pp. 242–258. 2009. https://doi.org/10.1080/09658410903197264

[17] E.A. Skinner, and J.R. Pitzer. *Developmental dynamics of student engagement, coping, and everyday resilience.* In Christenson, S.L., Reschly, A.L., & C. Wylie (Eds.), Handbook of research on student engagement (pp.21–44). New York: Springer. 2012. https://doi.org/10.1007/978-1-4614-2018-7_2

[18] A.M.L. Svalberg, "Researching language engagement: Current trends and future directions" *Language Awareness*, vol. 27, 21–39. 2017. https://doi.org/10.1080/09658416.2017.1406490

[19] J. Egbert, *CALL Essentials Principles and Practice in CALL Classrooms.* Teachers of English to Speakers of Other Languages, Inc. (TESOL), 2005.

[20] C.S. Ang, P. Zaphiris, and S. Wilson, "Computer Games and Sociocultural Play: An Activity Theoretical Perspective", *Games and Culture*, vol. 5, no. 5, pp.354–380. 2010. https://doi.org/10.1177/1555412009360411

[21] P.J. Aguilar-Cruz, and H. Álvarez, "A Serious Game to learn English: The case of Bethe1Challenge" *International Journal of Serious Games*, vol. 8, no. 4, pp.65–80. 2021. https://doi.org/10.17083/ijsg.v8i4.448

[22] I. Mayer, G. Bekebrede, C. Harteveld, H. Warmelink, Q. Zhou, T., … I. Wenzler, "The research and evaluation of serious games: Toward a comprehensive methodology", *British Journal of Educational Technology*, vol. 45, no. 3, pp.502–527. 2013. https://doi.org/10.1111/bjet.12067

[23] J. Creswell, *Educational Research: planning, conducting and evaluating quantitative and qualitative research. 4th edition.* Pearson Education, Inc, 2012.

[24] H. Haruna, X. Hu, S.K.W. Chu, and R.R. Mellecker, "Initial Validation of the MAKE Framework: A Comprehensive Instrument for Evaluating the Efficacy of Game-Based Learning and Gamification in Adolescent Sexual Health Literacy", *Annals of Global Health*, vol. 85, no. 1, pp.1–7. 2019. https://doi.org/10.5334/aogh.1110

[25] Z. Yu, M. Gao, and L. Wang, "The Effect of Educational Games on Learning Outcomes, Student Motivation, Engagement and Satisfaction", *Journal of Educational Computing Research*. 2020. https://doi.org/10.1177/0735633120969214

[26] M. Prensky, *Digital Game-Based Learning.* United States: Paragon House, 2007.

[27] M. Freire, Á. Serrano-Laguna, B.M. Iglesias, I. Martínez-Ortiz, P. Moreno-Ger, and B. Fernández-Manjón, *Game Learning Analytics: Learning Analytics for Serious Games*. In: Spector, M., Lockee, B. and Childress, M. (Eds). Learning, Design, and Technology. Springer, Cham, 2016. https://doi.org/10.1007/978-3-319-17727-4_21-1

[28] J. Burston, "Twenty years of MALL project implementation: A meta-analysis of learning outcomes", *ReCALL*, vol. 27, no. 1, pp.4–20, Jan. 2015. https://doi.org/10.1017/S0958344014000159

[29] C. Stieler-Hunt, and C. Jones, "A professional development model to facilitate teacher adoption of interactive, immersive digital games for classroom learning", *British Journal of Educational Technology*, vol. 50, no. 1, pp.264-279. 2018. https://doi.org/10.1111/bjet.12679

[30] G. Molin, *The Role of the Teacher in Game-Based Learning: A Review and Outlook.* In: Ma, M., Oikonomou, A. (eds) Serious Games and Edutainment Applications. Springer, Cham, 2017. https://doi.org/10.1007/978-3-319-51645-5_28

Appendix I

Encuesta de salida en investigación "DISEÑO Y VALIDACIÓN DE UN MODELO DE ENSEÑANZA BASADO EN UN JUEGO EDUCATIVO PARA APOYAR EL APRENDIZAJE DE VOCABULARIO EN INGLÉS"

EXIT SURVEY ABOUT ENGAGEMENT
ENCUESTA DE SALIDA SOBRE COMPROMISO

Read the following statements and mark an X in each one. 1 means strongly disagree and 5 strongly agree.
Lea las siguientes oraciones y marque una X en cada una donde 1 significa muy en desacuerdo y 5 muy de acuerdo.

Component	Engagement statement	1	2	3	4	5
Emotional Engagement	The vocabulary in *Bethe1 Challenge* was very easy to understand. (El vocabulario en *Bethe1 Challenge* fue muy fácil de entender)					
	I have been effective in using *Bethe1 Challenge* as it was engaging. (He sido efectivo en el uso de *Bethe1 Challenge* ya que me pareció atractiva la aplicación)					
	The activities and missions presented in *Bethe1 Challenge* facilitate my active participation. (Las actividades y misiones presentadas en *Bethe1 Challenge* facilitaron mi activa participación).					
	Bethe1 Challenge caught my attention. (*Bethe1 Challenge* llamó mi atención).					
	Bethe1 Challenge allowed my learning of relevant vocabulary in English. (*Bethe1 Challenge* permitió mi aprendizaje de vocabulario relevante en inglés).					
	The use of a mobile device to play *Bethe1 Challenge* made me interested. (El uso de un dispositivo móvil para jugar *Bethe1 Challenge* me hizo estar interesado en el juego).					
Cognitive Engagement	I demonstrated my interest and enthusiasm as well as use of positive humor while using *Bethe1 Challenge*. (Demostré mi interés y entusiasmo también como un estado de ánimo positivo mientras usaba *Bethe1 Challenge*)					
	Bethe1 Challenge is relevant for engaging students in vocabulary learning. (*Bethe1 Challenge* es relevante para involucrar a los estudiantes en el aprendizaje de vocabulario).					
	Bethe1 Challenge enhanced my engagement in learning English. (*Bethe1 Challenge* mejoró mi compromiso en el aprendizaje del inglés).					
	I focused on the missions assigned in *Bethe1 Challenge*. (Me enfoqué en las misiones asignadas en *Bethe1 Challenge*).					
Behavioral Engagement	I completed all the missions in the game. (Completé todas las misiones en el juego).					
	I spent all the necessary time to answer the questions in *Bethe1 Challenge*. (Invertí todo el tiempo necesario para responder las preguntas en *Bethe1 Challenge*).					
	If I could not complete a mission in the first attempt, I kept working on it until I completed it. (Si no podía completar una misión en el primer intento, seguía trabajando en ella hasta que la completaba).					
	I want to continue using *Bethe1 Challenge* in my learning process. (Quiero continuar usando *Bethe1 Challenge* en mi proceso de aprendizaje).					

1 (strongly disagree) to 5 (strongly agree).

The most interesting thing about playing *Bethe1 Challenge* was: _____

What I didn't like about playing *Bethe1 Challenge* was: _____

Taken and adapted from Haruna et al. (2019)