

WORCESTER POLYTECHNIC INSTITUTE

# Implementing Gamification for 5th and 6th Grade at the Alborada School

An Interactive Qualifying Project Report  
submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfilment of the requirements for the  
degree of Bachelor of Science

by

Jacob Bissonette

Gabriela Chong

James Flynn

Amy Orozco

Samantha Raskind

Date:

11 May, 2021

Project Center:

Cuenca, Ecuador

Report Submitted to:

Maricela Alaña

La Unidad Educativa Particular Alborada

Professors Courtney Kurlanska and Melissa Belz

Worcester Polytechnic Institute

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## **Abstract**

The faculty of the Unidad Educativa Particular Alborada, a private school in Cuenca, Ecuador, strive to motivate their students. Our project goal was to promote engagement for students in 5th and 6th grade through games in the classroom. We developed and implemented a pilot program of games into five classes. We identified the most valuable aspects of the games from both student and teacher perspectives. To ensure that the teachers can continue using gamification, we delivered a folder of game templates and a corresponding guidebook outlining the purpose, the rules, and the modification directions for each game. By determining the most popular game elements for each class, we also recommended which games in our portfolio would be most effective.

## **Resumen**

La facultad de la Unidad Educativa Particular Alborada, una escuela privada en Cuenca, Ecuador, se esfuerza por motivar a sus estudiantes. El objetivo de nuestro proyecto era promover la participación de los estudiantes de quinto y sexto grado a través de juegos en el aula. Desarrollamos e implementamos un programa piloto de juegos en cinco clases. Identificamos los aspectos más valiosos de los juegos desde la perspectiva del alumno y del profesor. Para asegurarnos de que los profesores puedan seguir usando la gamificación, entregamos una carpeta de plantillas de juego y una guía correspondiente que describe el propósito, las reglas y las instrucciones de modificación para cada juego. Al determinar los juegos más populares de cada clase, también recomendamos qué juegos de nuestro portafolio serían más efectivos.

## Executive Summary

Student engagement is the quality of being invested and motivated in learning. It facilitates significant academic, social, and emotional growth in students (Trowler, 2010). However, successfully cultivating engagement in students is the greatest concern among teachers (Fredericks et al., 2016). One engagement technique is gamification, the use of game elements, such as points and competition, for educational purposes. Gamification can be characterized by its use of performance, social, personal, ecological, and fictional elements (Toda et al., 2019). Gamification has previously been shown to not only increase the level of knowledge, but also increase enjoyment and motivation (Zainuddin et al, 2020). Teachers recognize this and many already employ gamification to some extent. Our sponsor, the Unidad Educativa Particular Alborada, a private school in Cuenca, Ecuador, has an interest in novel and engaging educational methods. Their aim is to introduce new, teacher-friendly gamified lessons into their classes which capture their students' attention to the topic and allow them to practice and have fun at the same time.

## Goal and Objectives

Our goal was to promote learning engagement for students in the primary grades at La Escuela Alborada through the addition of games in the classroom. To achieve this goal, we identified three objectives:

1. Understand the needs and interests of faculty members at Alborada in implementing gamification in their classroom.
2. Determine effective and engaging gamified design strategies for Alborada students.
3. Determine which gamification techniques are most valuable and practical to faculty members.

## Methods

As part of the pilot program, we interacted and became acquainted with the students. For seven weeks we Zoomed into 11-15 classes per week where we played games with the students and noted their engagement and behaviors. To gain insight into the teachers' feelings and experiences of using games in the classroom, we interviewed three participating teachers and conducted a focus group with six teachers not affiliated with the pilot program. During the pilot program, we used student feedback surveys and a focus group with all six teachers we worked with to see what improvements could be made to the games. Once the program concluded, we held a final focus group with the six teachers from the program to gauge the effectiveness of the games. We also had the students from each class rank the games to see which were viewed as more enjoyable. Additionally, they were asked to describe something that they did and did not like about the games.

## Key Findings

Throughout our program, both the students and teachers enjoyed our games. Our set of games ranged from 77% to 100% percent favorable by the students in post-game surveys. The primary factors that made games effective were the use of competition (both individual and in teams) and displaying performance through points and levels. In addition, we learned that the games need to maintain a balance between novelty and familiarity so that they are both approachable and exciting to the students. For example, we played Bingo, a game which the students knew already. We found that the students enjoyed Bingo significantly and ranked it highly among all the games they played; it was the 2nd most popular in 5th grade, as they were familiar with the game and thought it was a fun way to be competitive with their classmates.

Finally, the teachers at Alborada enjoy using games in the classroom and have been doing so long before our pilot program. The teachers revealed that they used both table-top and digital games, providing our team with gamification resources, such as Bamboozle and Quizziz, for inspiration. The teachers are highly motivated to continue using gamification and expressed preference in using modifiable games, such as the templates developed through the pilot program that will allow them to independently reapply the game to different lesson topics throughout the school year.

## Final Recommendations

We developed a set of recommendations for the teachers, informed by our experience implementing the games. The first is that the Alborada teachers refer to our [guidebook](#) when implementing the games with their students. The guidebook contains information on each game we adapted, how to implement the games, how to edit the games and what game elements it has. We also recommend that they take student feedback into account when using games in the classroom. This could be done through formal or informal student feedback surveys. Based on student and teacher feedback, future games created or used should have team aspects and point systems. Students responded positively to competition and liked when there was a winner. Finally, we suggest that the teachers share ideas and materials for new games with each other, so that they all have access to those resources. For example, the administration can facilitate workshops for the teachers as a way to collaborate and enhance their learning styles and methods.

## Deliverables

At the end of our pilot program, we gave the Alborada teachers two deliverables:

1. A folder containing all of the games that we made over the course of the program.
2. A guidebook outlining how to play each game and how to edit them.

The [guidebook](#) consists of additional information about the games and their usage, including the games' principal aspects, student directions, teacher directions, editing steps, and the student reactions we received during the pilot program. For convenience and shareability with other educators, the guidebook can be accessed through the QR code.



## Conclusion

We hope that our project has benefited the faculty at Alborada, and that our deliverables will guide them in creating a sustainable environment for gamified learning. We believe that if this happens, the teachers will be able to engage their students more effectively, which would be valuable for both the students and the teachers.

# Gamificación para la Escuela Alborada

Jacob Bissonette, James Flynn, Gabriela Chong, Samantha Raskind, Amy Orozco



## Resumen Ejecutivo

La participación de los estudiantes es la cualidad de estar comprometidos y motivados en el aprendizaje. Facilita un crecimiento académico, social y emocional significativo en los estudiantes (Trowler, 2010). Sin embargo, cultivar con éxito la participación de los estudiantes es la mayor preocupación entre los profesores (Fredericks et al., 2016). Una técnica de participación es la gamificación, el uso de elementos del juego, como puntos y competencia, con fines educativos. La gamificación se puede caracterizar por el uso de elementos escénicos, sociales, personales, ecológicos y de ficción (Toda et al., 2019). Se ha demostrado anteriormente que la gamificación no solo aumenta el nivel de conocimiento, sino que también aumenta el disfrute y la motivación (Zainuddin et al, 2020). Los profesores reconocen esto y muchos ya emplean la gamificación hasta cierto punto. Nuestro patrocinador, la Unidad Educativa Particular Alborada, una escuela privada en Cuenca, Ecuador, tiene interés en métodos educativos novedosos y atractivos, siguiendo su misión de “brindar a los estudiantes experiencias emocionantes” (Alborada, s.f.). Su objetivo es introducir nuevas lecciones gamificadas para profesores en sus clases que capten la atención de los estudiantes sobre el tema y les permitan practicar y divertirse al mismo tiempo.

## Metas y Objetivos

Nuestro objetivo era promover la participación en el aprendizaje de los estudiantes de los grados primarios de La Escuela Alborada mediante la incorporación de juegos en el aula. Para lograr este objetivo, identificamos tres objetivos:

1. Comprender las necesidades e intereses de los profesores de Alborada en la implementación de la gamificación en su aula.
2. Determinar estrategias de diseño gamificadas efectivas y atractivas para los estudiantes de Alborada.
3. Determinar qué técnicas de gamificación son más valiosas y prácticas para los miembros de la facultad.

## Métodos

Como parte del programa piloto, interactuamos y nos familiarizamos con los estudiantes. Durante siete semanas hicimos Zoom en 11-15 clases por semana donde jugamos juegos con los estudiantes y notamos su participación y comportamientos. Para conocer mejor los sentimientos y las experiencias de los profesores sobre el uso de juegos en el aula, entrevistamos a tres profesores participantes y realizamos un grupo de enfoque con seis profesores no afiliados al programa piloto. Durante el programa piloto, dimos encuestas de retroalimentación a los estudiantes y al grupo de enfoque con los seis maestros con los que trabajamos para ver qué mejoras se podrían hacer a los juegos. Una vez concluido el programa, realizamos un grupo de enfoque final con los seis maestros

del programa para medir la efectividad de los juegos. También hicimos que los estudiantes de cada clase clasifiquen los juegos para ver cuáles se consideraban más agradables.

## **Resultados Clave**

A lo largo de nuestro programa, tanto los alumnos como los profesores disfrutaron de nuestros juegos. Nuestro conjunto de juegos osciló entre el 77% y el 100% por ciento favorable por parte de los estudiantes en las encuestas posteriores al juego. Los factores principales que hicieron que los juegos sean efectivos fueron el uso de la competencia (tanto individual como en equipos) y la exhibición del desempeño a través de puntos y niveles. Además, aprendimos que los juegos deben mantener un equilibrio entre la novedad y la familiaridad para que sean accesibles y emocionantes para los estudiantes. Por ejemplo, jugamos al bingo, un juego que los alumnos ya conocían. Descubrimos que los estudiantes disfrutaban del bingo de manera significativa y lo clasificaron en un lugar destacado entre todos los juegos que jugaron; fue el segundo más popular en quinto grado.

Por último, los profesores de Alborada disfrutaban del uso de juegos en el aula y lo han estado haciendo mucho antes de que empezáramos a implementar los nuestros. Los profesores revelaron que utilizaron juegos de mesa y digitales, lo que le proporcionó al equipo recursos de gamificación, como Bamboozle y Quizziz, como inspiración. Los profesores están muy motivados para seguir utilizando la gamificación y expresaron preferencia en el uso de juegos modificables, como las plantillas desarrolladas por el equipo, que les permitirían volver a aplicar el juego de forma independiente a diferentes temas de la lección a lo largo del año escolar.

## **Recomendaciones Finales**

Desarrollamos una serie de recomendaciones para los profesores, informadas por nuestra experiencia en la implementación de los juegos. La primera es que los profesores de Alborada se remitan a nuestra [guía](#) a la hora de implementar los juegos con sus alumnos. La guía contiene información sobre cada juego que creamos, cómo implementar los juegos, cómo editar los juegos y qué elementos del juego tiene. También recomendamos que tengan en cuenta los comentarios de los estudiantes cuando utilizan juegos en el aula. Esto podría hacerse mediante encuestas formales o informales de comentarios de los estudiantes. Con base en los comentarios de los estudiantes y maestros, los juegos futuros creados o utilizados deben tener aspectos de equipo y sistemas de puntos. Los estudiantes respondieron positivamente a la competencia y les gustó cuando había un ganador. Finalmente, sugerimos que los profesores compartan ideas y materiales para nuevos juegos entre ellos, para que todos tengan acceso a esos recursos. Por ejemplo, la administración puede facilitar talleres para los profesores como una forma de colaborar y mejorar sus estilos y métodos de aprendizaje.

## Entregables

Al final de nuestro programa piloto, les dimos a los profesores de Alborada dos entregables:

1. Una carpeta que contiene todos los juegos que creamos durante el transcurso del programa.
2. Una guía que describe cómo jugar cada juego y cómo editarlos.

La [guía](#) contiene información adicional sobre los juegos y su uso, incluidos los aspectos principales de los juegos, las instrucciones de los estudiantes, las instrucciones del maestro, los pasos de edición y las reacciones de los estudiantes que recibimos durante el programa piloto. Para mayor comodidad y capacidad de compartir con otros educadores, se puede acceder a la guía a través del código QR a continuación:



## Conclusión

Esperamos que nuestro proyecto haya beneficiado a la facultad de Alborada y que nuestros entregables los guíen en la creación de un medio ambiente sostenible para el aprendizaje gamificado. Creemos que si esto sucede, los maestros podrán involucrar a sus estudiantes de manera más efectiva, lo que sería valioso tanto para los estudiantes como para los maestros.

## Referencias

- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School Engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59–109. <https://doi.org/10.3102/00346543074001059>
- Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing definitional, measurement, and methodological issues. *Learning and Instruction*, 43, 1–4. <https://doi.org/10.1016/j.learninstruc.2016.02.002>
- Toda, A. M., Klock, A. C. T., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. *Smart Learning Environments*, 6(1), 16. <https://doi.org/10.1186/s40561-019-0106-1>
- Trowler, V. (2010). Student engagement literature review. The Higher Education Academy.
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326. <https://doi.org/10.1016/j.edurev.2020.100326>

## **Acknowledgements**

We want to thank our sponsor, Maricela Alaña of the Alborada School, for the constant support and assistance throughout this project as her help was tremendously beneficial. We also want to thank the administration and the 5th and 6th grade instructors: Carmen, Mercedes, Patricia, Andrés, Paul, and Pablo, as they gave us the pleasure of not only working with them, but also teaching and observing their students. Additionally, a huge thank you to our advisors, Professors Courtney Kurlanska and Melissa Belz. Their feedback and guidance led us to a paper and deliverables that we hope will have a lasting positive impact at Alborada.



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## Authorship

*Jacob Bissonette (JB), Gabriela Chong (GC), James Flynn (JF), Amy Orozco (AO), Samantha Raskind (SR)*

<b>Section</b>	<b>Writer</b>	<b>Editor</b>
Abstract	GC	All
Executive Summary	JB, JF	All
Resumen Ejecutivo	AO	GC
<b>Background</b>		
Introduction	All	All
Relevance of Student Engagement	GC, AO	GC, JB
Lesson Planning	JB, SR	GC
Gamification in Education	GC, JB	JF
Impacts of Gamification	GC	JF, JB
Designing Games for the Classroom	GC, JB	AO, JB
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Goal & Objectives	GC	AO
Initial Teacher Interviews	SR	GC, AO
Initial Teacher Focus Group	AO	JF, JB
Observation during Game Lessons	JF	JB, GC
Student Lesson Feedback Surveys	GC	AO, JF
Focus Group for Game Lesson Feedback	AO	JF, JB
Final Teacher Focus Group	JB	SR, GC
Final Student Survey	JB	SR
<b>Findings</b>		
Findings Introduction	JB	AO

<b>Section</b>	<b>Writer</b>	<b>Editor</b>
Pilot Program Experience	AO	JF, GC
Reception of the Games	GC	JB
Game Presentation and Clarity	JB, SR	JF
Utilizing Different Game Elements	JB	GC
Cognitive Challenge	GC	SR
Challenges to Implementing Gamification over Zoom	JF	JB
Teachers Response to gamification	AO, GC	JF, GC
<b>Discussion</b>		
Ensuring Game Effectiveness	JF, GC	JB
Balancing the Aspects of a Game for One Class	GC, SR	JF, JB
<b>Recommendations</b>	JB, AO	GC
<b>Conclusions</b>	GC	All

## **Introduction**

Motivation guides people on the path to success. In the classroom, a student's motivation is the product of engagement. Engaged students are more likely to reach their full academic potential; they show interest in their studies, enjoy participating, and take on challenges (Fredericks et al., 2004). Teachers want the best for their students, so they use teaching methods that encourage participation and engagement.

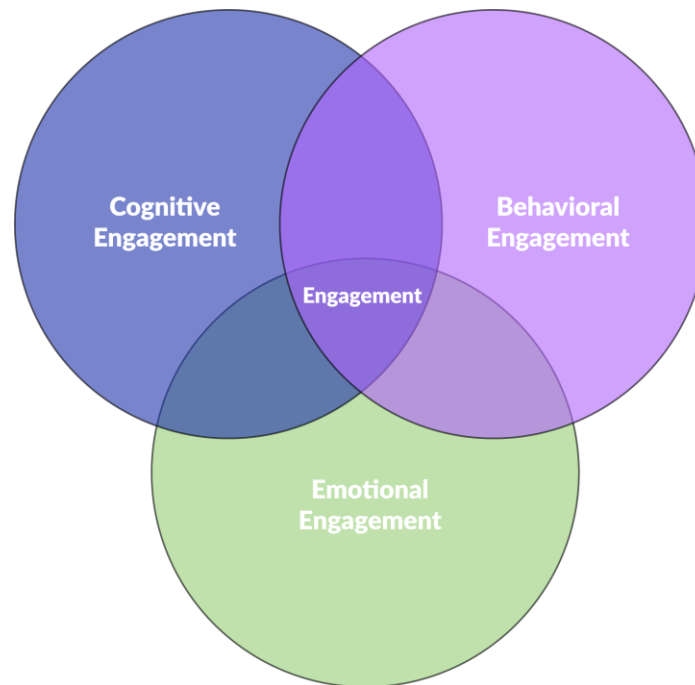
Gamification is one new educational strategy used to motivate students and promote engagement and participation. This strategy uses elements commonly seen in recreational games, such as points, badges, and tournaments, to facilitate students' learning. In Ecuador, recent education reform has allowed for the introduction of innovative teaching methods (Van Damme, 2015), creating a stable environment for teachers to try gamified lessons.

At the Alborada school in Cuenca, Ecuador, faculty enjoy using new and engaging education techniques; last year, the school looked for project-based learning methods, and this year they are interested in gamification. They asked us to promote learning engagement for students in the primary grades through the inclusion of games in the classroom. We assessed the pre-existing classroom through interviews, then designed and implemented a pilot program of games. We observed the students and surveyed the teachers to inform ourselves of improvements. End-of-program student and teacher surveys further helped determine the value and impact of our games. Ultimately, we delivered practical gamification resources for teachers to create and adapt engaging gamified lessons. This report includes a brief literature review of gamification in education, an overview of the methodologies that we employed to gather our data, and a collection of overall themes that we observed over the course of our research, leading to our recommendations on specific games.

## **Bringing Games into the Classroom**

### **Relevance of Student Engagement**

Student engagement is an educational concept which has grown in relevance and conceptual understanding in the past couple decades (Trowler, 2010). Engagement is multi-faceted, consisting of cognitive, emotional, and behavioral dimensions (Fredericks et al. 2004). Behavioral engagement relates to the students and their physical participation. Fredericks et al. (2004) outlines behavioral engagement as positive conduct, involvement in learning and academic tasks, and participation in school-related activities. Emotional engagement involves interest and enjoyment in the learning material and feelings of belonging and self-esteem (Fredericks et al., 2004). Cognitive engagement is defined as the psychological investment in learning (Fredericks et al., 2004). Altogether, engagement is "the attention, interest, investment, and effort students expend in the work of learning," with motivation being a product of the students' engagement (Marks, 2000).



**Figure 1:** Three-part engagement model proposed by Fredericks et al. (2004).

Various studies show that engagement fosters positive outcomes in students (Fredericks et al., 2004). Besides academic achievement, engagement leads to other valuable qualities such as critical thinking, persistence, social competence, self-esteem, and cognitive development (Trowler, 2010). Cognitive development improves because engagement incorporates cognitively challenging tasks and verbal interaction, promoting intellectual development (Marks, 2000). When students are engaged in their academics, they are more likely to achieve their educational and personal goals, regardless of their background (Trowler, 2010). Engagement is also linked to improved retention rates (Fredericks et al., 2016). Engagement is thus highly desirable in the classroom, yet many teachers consider student engagement the biggest challenge they face (Fredericks et al., 2016).

## Lesson Planning

A crucial component to being an effective teacher is establishing engaging lesson plans. Ralph Tyler, *Basic Principles of Curriculum and Instruction*, developed a general model for planning lessons in 1949 that has been adapted and has become a general standard over the years. This model is possible in all types of education planning and comprises four key steps to effective lesson planning (Yinger, 1980):

1. Set and specify learning objectives.
2. Select the learning activities and experiences.
3. Organize the activities and experiences.
4. Evaluate progress and effectiveness.

Creating an effective lesson plan is more than delivering material to the students; it is creating an engaging atmosphere between educator and learner. Teachers have to continuously adapt to students' needs when incorporating their lesson plans, starting with setting learning objectives. Teachers facilitate engagement when they make their learning outcomes clear because

the student knows what they have to do to succeed and can formulate goals and strategies (Fredericks et al., 2011). In developing the learning activities, teachers must ensure that their tasks promote cognitive engagement and organize activities that can promote this engagement in their students. When a task is appropriately challenging for students, there is a balance between their current knowledge set and the knowledge they need to learn to complete the task. Bridging this gap stimulates interest in the task and satisfaction in achievement (Goldspink, 2013).

Evaluating progress and effectiveness is imperative. Teachers must select the appropriate assessment tools to research what is and is not working for students (Jones, 2011). Additionally, student interest and interaction need to be integrated into teachers' learning objectives and should be a criterion for evaluating student performance (John, 2007). If the students are not achieving the learning objectives in a positive, engaging manner, teachers should identify this in their evaluation of their lesson plan, so they can make improvements on future lessons. From this feedback, teachers can adapt their lessons. Although teachers create lesson plans for their material, teachers do not use the same format for creating their lesson plans (Zazkis et al. 2009). While there are frameworks for developing lesson plans, teachers can use what they see fit as the best method for delivering material to their students, pending available time and resources. The recent shift to remote learning from the pandemic is just one instance that has opened space for educators to search for and incorporate new delivery methods in their classrooms.

## **Gamification in Education**

Teachers are interested in using gamification, an emerging pedagogical approach, to boost student engagement (Sánchez-Mena et al., 2017; Pektas & Kepceoglu, 2019; Yaşar et al., 2020). Gamification is defined as the implementation of game elements in other contexts— in this case, education. Research in gamification in education arose because games are commonly employed for entertainment of children, and researchers predicted that *gamified lessons* would increase student engagement. Commonly accepted psychological learning theories support this prediction (Zainuddin et al., 2020).

While game elements can readily be used in low and high tech applications, recent years have seen focus on digital games (Goshevski et al., 2017). Major gamification platforms today include Duolingo, Kahoot, and Quizlet, while more specific off-the-shelf or custom-made digital and non-digital games exist. For example, Kahoot!, a game-based learning platform, is a popular educational technology because it challenges students in the learning process while simultaneously giving them a fun, dynamic learning environment. Correia and Santos (2017) discuss some of the benefits of using educational games like Kahoot!, such as having a motivating environment for the students while also enabling them to learn to deal with mistakes and failure. In their research, the professors who participated said that implementing Kahoot! contains advantages for the students, including immediate feedback and possible discussion among the students regarding their answers. The conclusion is that using Kahoot! can lead to greater involvement and engagement, deeper thinking, and a fostering of academic success for the students (Correia & Santos, 2017).

Four of the most popularly used game elements transferred to lessons are points, badges, leaderboards, and levels (Dicheva et al., 2014; Zainuddin et al., 2020). Toda et al. (2019) collaborated with a large and diverse group of experts in gamification to establish working definitions for the most common game elements, which they then organized into five categories: performance, social, personal, ecological, and fictional. Some examples of elements organized by category are shown in Table 1. Games generally seek to incorporate elements from each category. The performance category entails elements that give feedback to the player, and helps them

understand their progress in the game. The social category entails how people may be connected or influence each other's completion of a task. The personal category consists of cognitive tasks and problems that must be solved by the player. The ecological aspect covers non-social properties or items within the game that create interactivity. Finally, the elements of the fictional category provide meaning and context to the game such as the setting or the storyline.

**Table 1:** Examples of game elements, by category.

<b>Performance</b>	<b>Social</b>	<b>Personal</b>	<b>Ecological</b>	<b>Fictional</b>
badges, levels, progress bars	competition, team tasks	cognitive tasks, puzzles, objectives, redos	in-game markets, virtual goods, time limits	storytelling, cause & effect

### *Impacts of Gamification*

Numerous studies report that students enjoy and learn from gamified lessons (Ng, 2007; Chou, 2012; Rastegarpour & Marashi, 2012; Liu et al., 2013; Vogt et al., 2018; Jagušt et al., 2018; Sanchez-Rivas et al., 2019, Chen et al., 2020). In terms of enjoyment, students considered the gamified experience to be fun and motivating. Sanchez-Rivas et al. (2019) worked with 217 primary level teachers in Spain to implement a gamified curriculum. The model included framing the assessment as a “game” with rules, points, competition, and feedback. The students reported higher degrees of motivation and commitment both inside and outside of the classroom versus the control. Jagušt et al. (2018) tested three gamified alternatives of a 15-minute digital learning activity for students ages 7-8. Performance *during the activity* in all the gamified alternatives significantly increased over time, while performance decreased in the non-gamified control activity. Further, students reported liking the story element; it created a meaningful goal to complete the activity. One significant result, however, was that too much of the time pressure game element, i.e. a short time limit, caused stress. The study concluded that the extent to which a game element is used needs to be balanced; for example, an educator should not rely too heavily on timing their students and instead consider adding other elements to create a more well-rounded experience.

In terms of lower tech games, Chou (2012) demonstrated that using a Monopoly-style game and a Twister-style game motivated students in grades 1-4, where 85% of students said the games motivated them. Similarly, card games and decryption challenges related to chemistry, math, and energy have also been developed, where students also reported greater satisfaction with the games (Ng, 2007; Rastegarpour & Marashi, 2012; Liu et al., 2013; Vogt et al., 2018; Chen et al., 2020;).

Beyond the experience, authentic learning is shown to be stimulated through gamification. In Chou's study, all the students agreed that the games helped them memorize the vocabulary. Importantly, students performed significantly better on a post-test of the learning material versus a control group. Similar results were found in other studies (Liu et al., 2013; Vogt et al., 2018; Sanchez-Rivas et al., 2019), showing the effectiveness of gamification for educational ends.

### *Designing Games for the Classroom*

The design and implementation of gamification parallels that of conventional lesson planning. Several researchers (Huang and Hew, 2018; Simões et al., 2017; Strmečki et al., 2016; Tenório et al., 2020) have laid out step-by-step guidelines. First, a teacher must set clear,



achievable, and measurable learning objectives. Then, the game is developed with the objective in mind. Here, several game elements can ensure lesson planning good practices. For example, elements such as cognitive puzzles and countdown clocks increase the difficulty of a task. Teachers can adjust these elements, creating game levels, to appropriately match their students' need for a challenge, promoting cognitive engagement.

Gamification also allows for the easy delivery of feedback for students by instant scoring. This rapid feedback gives students the chance to develop improvement strategies in the moment (Simões et al., 2017). Recognition via badges and other game rewards also serve as feedback while building the positive relationship between the student and the teacher.

Teachers may also opt for offering choices to promote students' sense of autonomy (Simões et al., 2017), while adding team challenges puts collaborative skills to practice (Huang and Hew, 2011). Finally, teachers must be able to evaluate and adapt their models by changing the game elements used. There are several ways to evaluate the game, such as by analyzing scores over time, observing for engagement, and asking students for self-assessments (Huang & Hew, 2018).

Huang and Hew (2018) tested their own proposed procedure for its effectiveness. Under their procedure, objectives are identified, motivational elements are chosen and then matched to game-like elements to create a game design, the design is implemented, then the design is evaluated and iterated upon. The authors tested this algorithm in two studies by creating a digital game design model for an experimental group of students in a graduate course and comparing their activity with a control. In both studies, Huang and Hew found that students in the gamified class were more likely to complete optional work, perform better in post-tests, feel motivated, and set academic goals (2018). Their evaluation procedure also allowed them to draw recommendations for future gamification, such as to split up challenging tasks into sublevels.

While such research demonstrates the benefits of gamification executed by experts, we also must understand the everyday teacher's perspective in using gamification to achieve motivational qualities (Linehan et al., 2011). One major challenge teachers encounter is the demand that implementing games puts on their skill sets and working processes. Marklund and Taylor (2016) collaborated with teachers and assisted them in the design and implementation of gamified activities delivered through Minecraft: Education Edition. After five months, the authors interviewed the teachers about their experiences and outcomes. The teachers revealed that the issues they faced were not only in ensuring that the games accommodated the curriculum, but also in technologically creating and retaining a framework in which they could reliably conduct the games, highlighting concern over the ability to continue developing these programs unassisted. In all, there are many roles and required skills teachers must take on, such as understanding the technology and handling classes where students have diverse levels of proficiency. Ultimately, for gamification to be a viable option for the teachers, it must be easy to implement, be adaptable, and be low-pressure when creating the games.

## **Current Education System in Ecuador**

In the last decade, Ecuador's education system has gone through substantial change, the role of the State in education has been redefined, with the *Ministerio de Educación* (Ministry of Education) creating a new educational document for the regulation of basic general education in Ecuador. The country's unprecedented improvement of its public services and a greater interest in the education sector have both made this change possible. The National Plan of Good Living and the Ten Year Education Plan are the main policy tools used to orient education reform (Damme,

2015). They play a key role in emphasizing education to achieve poverty reduction and national development (Damme, 2015). This change can be seen as effective because Ecuador has the largest gains in reading scores among the 15 other South American countries tested and the second-largest gains in math between 2006 and 2013 (Schneider, 2019).

Every child's right to education is protected and guaranteed by a legal framework that Ecuador created. Improvement in the educational sector is projected to better the well-being of Ecuadorian citizens and its economy. The Ministry of Education now promotes a curriculum model which focuses on critical thinking and problem-solving skills (Soto, 2015). This national model concentrates on the core courses among the primary and secondary levels. This curricular document, called Curricular Upgrade and Strengthening of Basic General Education, incorporates curricular guidelines and specifications for the four core studies: mathematics, science, social studies, and language literature. The government also provides professional development opportunities for teachers and other educational staff to help them improve their lesson plans and teaching methods and has promised to provide more economic resources to the education sector to improve the physical infrastructure of schools and the tools available (Van Damme, 2015). This change has allowed for the introduction of new teaching techniques, opening the door for using gamification in education.

## **Gamification in Ecuador**

The current body of literature on gamification applied in Ecuador indicates a research gap in primary education. Research in gamification in Ecuador exists primarily in the realm of higher education and places emphasis on digital games (Torres-Toukoumidis, 2020; Beltrán, 2016). Beltrán (2016) used a platform called Moodle to track scores and progression in a Java programming course. Torres-Toukoumidis (2020) evaluated the popularity of gamification techniques and methods by surveying university teachers. This shows that there are no cultural barriers to the implementation of gamification in Ecuador, as both studies yielded positive results.

In a thesis study conducted in Ecuador, Barrera and Jimenez (2018) studied the effects of “didactic games” in the 10<sup>th</sup> grade ESL classroom. The study found that the usage of games in ESL teaching allowed for improvements in student oral proficiency, teacher-student relations, and relations between peers. This study used games involving pictures, role playing, and storytelling.

There have also been proposals for the use of gamification in primary school. Morales et al. (2015) discussed the theoretical effectiveness of the traditional Ecuadorian game called the Forty (Cuarenta) in school. The game focuses on the improvement of students' mathematics skills, particularly that of mental arithmetic. It is very popular outside the classroom, and the authors recommend that culturally relevant games may be especially useful for adaptation into the classroom.

### *Our Sponsor and Project*

Unidad Educativa Particular Alborada, a private school in Cuenca, Ecuador provides education services, extracurriculars, and community service opportunities that allow students to work collaboratively and develop relevant skills (Alborada, n.d.). Alborada's goal is to motivate and support students in pursuing their individual interests/vocations and to help them develop a greater appreciation of the world. The teachers at Alborada wanted new gamified modules for their classes to engage their students and to help them learn. They envision using games throughout their curriculum to add variety to the student's week and make them interact with and practice the learning material in a different and exciting way. Alborada and our sponsor liaison Maricela Alaña

asked us to create gamified activities targeted towards primary school students in Ecuador. During part of the project term, we interacted with students in grades 5 and 6 through the activities we created and then evaluated our activities to determine which would be most useful for the teachers. These templates will allow teachers to apply gamification into their future lesson plans.

## Methods

Our goal was to promote learning engagement for students in the primary grades at La Escuela Alborada through the addition of games in the classroom. We designed and implemented a pilot program of digital games for the students in alignment with their curriculum. For each class, we held two 35-minute game sessions per week per subject (Math, Science, English) over Zoom. To ensure the highest quality games and greatest likelihood that faculty will continue to use gamification, we mapped out three objectives:

1. Understand the needs and interests of faculty members at Alborada in implementing gamification in their classroom.
2. Determine effective and engaging gamified design strategies for Alborada students.
3. Determine which gamification techniques are most valuable and practical to faculty members.

### **Objective 1: Understand the needs and interests of faculty members at Alborada in implementing gamification in their classroom.**

To understand the needs and interests of Alborada faculty members we conducted three teacher interviews and one focus group. From these, we incorporated any necessary changes to our initial menu of games. The interviews and focus groups also informed whether we needed to modify the later methods under objectives 2 and 3; new questions were generated when unexpected themes arose during our first week of research.

#### *Initial Teacher Interviews*

We conducted three 30-minute interviews over Zoom with Alborada teachers before we began working with their classes. We asked about what they would like to see in the games, what topics they would like us to cover, and any previous experience they have with educational games. A full list of questions can be found in Appendix A. Following the guidance of Beebe (2014), we recorded this data by taking field notes with logs and reflections, and asked permission to record the interview. Based on our notes, we transcribed segments of interest. We deconstructed the transcripts into units of thought and then organized them into codes (Beebe 2014, De Munck 1998). By considering the frequency of a given code and the presence of juxtaposing codes within the sample, this analysis informed our team of common attitudes and thoughts teachers held about gamification.

#### *Initial Teacher Focus Group*

During week six of the pilot program, we conducted a focus group with five teachers from the Alborada school who were not directly involved in the pilot program. As our pilot program was limited to only six teachers, this focus group allowed us to better understand the population of the Alborada primary level teachers. It occurred later in the pilot program after our sponsor indicated possible expansion to other grades. We focused our questions on learning about each teacher's previous experience with games and how much they would want to use games in the

future. The focus group was done over Zoom and lasted 30 minutes. All communication was done in Spanish and all group members took notes. We recorded the interaction with permission from everyone involved. A full list of questions asked for this focus group is found in Appendix B.

After the focus group, we transcribed our recording and translated segments of interest into English. We then analyzed this data with recommendations from Beebe (2014) and De Munck (1998). This included going over the transcripts and finding common ideas, which would then be organized into codes. By comparing the codes between the teachers at the focus group and those of the individual interviews, we then summarized common ideas and thoughts regarding gamification by the primary level teachers.

## **Objective 2: Determine effective and engaging gamified design strategies for Alborada students**

We wanted to learn the successful elements of the game lessons and to build upon them to create the most engaging games for Alborada students. To gather feedback, we observed the students in class during our gamified lesson, gave surveys to students after games, and held a focus group with the teachers. We triangulated our three methods to improve each iteration of the game (Beebe, 2014).

### *Observations during Game Lessons*

During each gamified lesson, two members ran the games while two other members observed students' behaviors<sup>1</sup>. When observing, we paid attention to how the students interacted during games, if the students appeared engaged or distracted during the game, and whether students appeared to be succeeding or struggling with the game (Helme, 2001; Skinner, 2009). Pseudonyms for the students were used in our notes. The systematic worksheet we used to document these observations is shown in Appendix F.

We analyzed the data from our observations by tracking the frequencies of each different type of student behavior. We also compared the numbers of on-task indicators and off-task indicators and looked for the most prevalent indicator in each category. By using names in our observations, we could quantify how many students were actively participating. With this data, we were able to see how effectively each of our games engaged the students. We would also note what particular aspects of the games students reacted to.

### *Student Game Lesson Feedback Surveys*

We gave lesson feedback surveys (Thayer-Hart, 2010) to students asking them whether they had fun and felt like the games motivated them to learn, which helped the team determine what games were more effective. Over the course of the project we administered approximately 64 surveys on 13 different games to 5 classes. Students were asked to self-assess their sense of learning; past studies in student engagement recommended self-assessment (Chou, 2014). The questionnaires were administered at the end of each lesson via a google form and were anonymous so students could give responses more freely. Questions were always in their native Spanish.

We created brief surveys for the students that utilized a 4-point Likert-like scale. Sample questions can be found in Appendices D and E. The response data was collected in Excel and visualized as bar graphs. The Likert-like scale was converted into numbers (1–4) so that the

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<sup>1</sup> A letter was sent to their parents informing them of our research, which is found in Appendix B.

responses could be quantified as average response scores for each question. Comparisons of the average responses were then made between games, subject application, and each game element applied.

### *Focus Group for Game Lesson Feedback*

Our group conducted a focus group with six of the teachers we worked with at the Alborada school after our third week in the class. The purpose of this focus group was to gather feedback from the teachers on the game lesson to make improvements going forward. The focus group took place online and the teachers were asked a series of questions about the game lesson. It lasted 45 minutes, was recorded with permission, and with all members taking notes during the meeting. Questions were in Spanish and focused on gauging which elements of our program were successful, and which were not. All questions were open-response, in order to allow us to get as much feedback as possible. A sample of the focus group questions can be found in Appendix G.

As a team, we went over responses and coded common ideas (Beebe 2014, DeMunck 1988). We assigned people to transcribe sections of the focus group and translate any statements we felt were relevant to the project. The goal was to go over all our collected data and interpret the meaning of what is being said, and organize these responses into categories of analysis. By doing this, our group had a better understanding of the responses given by the teachers.

### **Objective 3: Determine what gamification techniques are most valuable and practical to faculty members.**

Once we concluded our pilot program, we needed feedback from both the teachers and the students. This final instance of teacher feedback helped us determine the overall effectiveness of the program, and the student feedback helped us gauge the appeal of the games. We obtained this feedback through a final focus group with the teachers and a survey that was given to the students.

### *Final Teacher Focus Group*

Since the 5th and 6th grade teachers we worked with will be using the games in their future lesson plans, we wanted to comprehend the overall comfort that they had in implementing the games. We conducted a focus group over Zoom with the six teachers we worked with, all communication was done in Spanish, and it lasted 35 minutes. They gave us unanimous permission to record. A full list of sample open-response questions for our final teacher interview is found in Appendix H. Some items we wanted to further understand were:

1. The teachers' level of apprehension/confidence in using the games on their own.
2. If the teachers view the games as worthwhile and beneficial.
3. If the teachers believe the games present value versus traditional instruction methods.

Once we concluded the focus group, we transcribed and gathered their responses into a spreadsheet and categorized the teachers based on subject and grade. With these results collected, we determined if the teachers perceive some of the games as more effective than others for a particular class year or subject and what further instructions or improvements would be most beneficial to them.

### *Final Student Survey*

Considering the 5th and 6th grade students at Alborada were the primary subjects of the pilot program, we wanted to determine which games were more enjoyable. We had the students fill out a Microsoft Forms survey where they ranked all of the games they played, with the most

preferred game being at the top and the least preferred game at the bottom. They were also asked to list one thing they liked about the games and one thing they did not like. Once the students all filled out the survey, we transferred the results into a spreadsheet and interpreted the data. We then made visuals to find trends in the students' preferences of games. An example of the game preference survey can be found in Appendices I and J.

Once we examined the results of both the final teacher focus group and student surveys, we made comparisons between the teachers and the students, noting patterns and similarities between their respective data. After examining the results of the teachers and students separately and collectively, we evaluated the effectiveness of the games from the pilot program and made any needed changes. In the next chapter, we explain the results of our focus groups, interviews, and surveys.

## Findings

In completing our project, we created many games which span multiple subjects as outlined in Table 2. Based on the research discussed in the previous chapter, we learned a great deal about the implementation of digital games in the virtual classroom, and this chapter highlights those findings. After introducing the context and work with Alborada, we focus on the needs of the school's teachers and administration, the more effective and engaging game strategies, and the gamification techniques that are most valuable.

### Pilot Program Experience

Our time with the Alborada school was an amazing learning experience. We zoomed into classes 11-15 times a week and would have two to four classes per day, with each class being 35 minutes long. Most students welcomed us with smiles and excitement when we zoomed in, curious about what game they would play next.

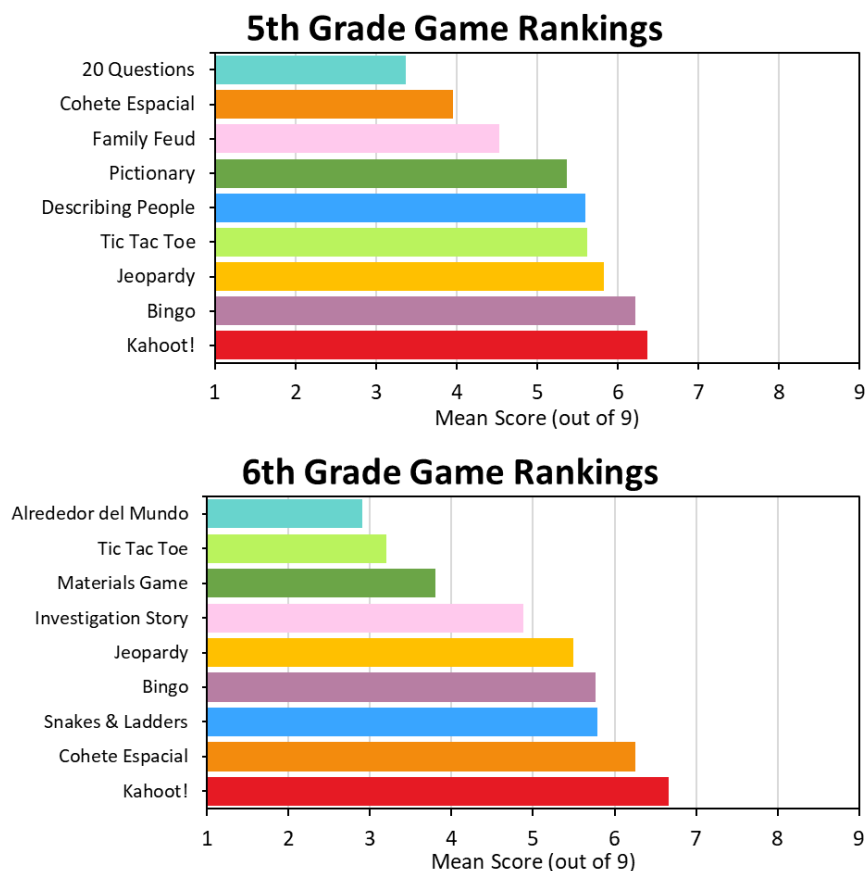
At the start of class, teachers required students to turn their camera on, several students would not, due to internet issues or simply because they did not want to. There were always a handful of students who were especially engaged and vocalized their opinions. Meanwhile, the majority of the students spoke less but still appeared tuned in, and then there were a couple students who we noticed singing, dancing and drawing during class. We found that calling on these students allowed us to identify their engagement better, as those who would respond were managing to pay attention. Students also used nonverbal expressions of joy such as raising up arms, bouncing up and down, and smiling, specifically in reaction to getting a right answer or winning. We also realized early on that the students liked games with interesting or funny visuals; we often employed animated images when possible. The students commented on them, which facilitated communication and drew attention to the game. One sign of excitement we noted was students shouting the answer out loud, it was great to see this engagement, but it also made gameplay more difficult. When the game was over, the students would tell us if they liked the game or not. For the most part it was positive. Often, this feedback would come from the most engaged students, who mostly commented that the game was "*muy divertido*" or "very fun". Although days were long, spending time with these students was the best part.

**Table 2:** Games implemented, by subject. Each hash mark indicates a unique lesson, e.g. for Bingo, 5 hash marks under Math means Bingo was applied to 5 different math lessons.

Game	English	Science	Math	Brief Description
Bingo	×		xxxxxx	Problems shown on the slides have the corresponding answers on an online bingo card.
Jeopardy	×	xxxxxxx		Played like the original game show, except with lesson-based questions. Students are put into random teams.
Kahoot!	xx	xx		Students play individually with lesson-based questions.
20 Questions	×			One student is given a term and their classmates must ask questions to figure out what the term is.
Materials	×			Students are shown pictures of materials and must name them. To win, they must not get 3 questions wrong.
Family Feud	×			Students fill out a survey. They are then split into teams. At a given turn, one team member must guess what they believe the most popular survey answer was.
Investigation Story	×			Students are given a story of a crime and must ask the suspects (the authors) questions to figure out who did it. The students are given choices of questions to ask.
Tic Tac Toe /Tres en Raya			xxxx	Students are in two teams. For each question right, a selected team member gets to place an X/O.
Around the World / Alrededor del Mundo			×	Played noncompetitively. The class is given a question, and for each correct they get to advance across different countries.
Describing People	xx			This is played like 20 questions, except the students were given questions to choose.
Snakes and Ladders		×	×	Students are in 3 teams. Each team goes at a time to solve a question. After getting it right, we roll a virtual die for them and move their playing piece.
Cohete Espacial		xxxx		Students are in 3 teams. For each question, whoever has a teammate respond the fastest gets points. With points, the team's spaceship advances.
Pictionary	×			Played like the original via annotation on Zoom.

## Positive Student Reception of the Games

Overall, the students enjoyed our menu of games and were engaged when seeing it in the classroom. Considering every post-game survey collected, our 4-pt Likert scale responses about how motivated they were to play a certain game could be categorized as favorable (“liked” and “liked a lot”) and unfavorable (“did not like” and “did not like at all”). Our set of games ranged from 77% to 100% percent favorable by the students. In other words, every game was mostly favored by the students and they wanted to play these games. Figure 2 shows the rankings for each of the games, where a larger score indicates greater preference. In fifth grade, games that rated more popular than unpopular (a score higher than 4.5) were Family Feud, Pictionary, Describing People, Tic Tac Toe, Jeopardy, Bingo, and Kahoot!. For sixth grade, popular games were Investigation Story, Jeopardy, Bingo, Snakes and Ladders, Cohete Espacial, and Kahoot!. It is worth noting that the students were already familiar with Kahoot! when we began the pilot program, thus its high rating is an indication of their preference for familiar games. Meanwhile, the teachers who observed our activities said that the students mostly reacted well. One teacher highlighted that the classes were “dynamic” and that “there was a lot of motivation on the students’ part”. Another discussed how their subject, math, can get boring for the students, but they felt that through our game, “they handled [solving math problems] better” because the game was more enjoyable than lecture.



**Figure 2:** Ranking of each game by 5th and 6th grade. The mean score indicates favorability, where a game with a score of 9 out of 9 means every student said it was their first pick, while a score of 1 out of 9 means every student said it was their least favorite.



## Developing Effective Games

### *Game Presentation and Clarity*

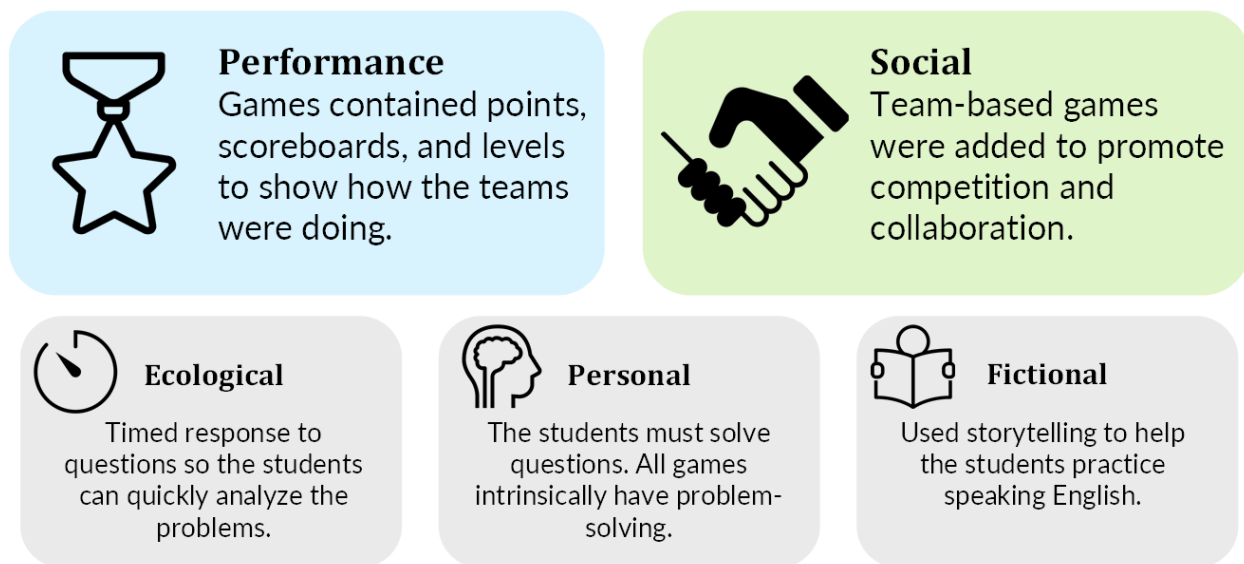
When using a game in the classroom, it is crucial to make sure that the game is appealing and that the instructions are clear and explicit for the students to understand the objective. If the students cannot comprehend the game rules and objectives, it will be difficult for the game to move steadily and properly reinforce the learning material for the students. We learned from both the teachers and through leading the games in class that if the students did not fully grasp the rules of the game, the speed of the game was hindered, some students would ask repeat questions throughout the class period, and an insufficient amount of time would be spent playing the game and practicing the material. For example, when introducing the new game of Family Feud, students asked a total of 10 questions about the rules and how to play, making comments about how they were confused halfway through the actual gameplay. Comparing this to the game of Bingo, which they were already familiar with, the students only asked a total of 2 relevant questions pertaining to the gameplay and instructions. Through these observations, it is clear to see that when introducing a new game, students will ask more questions and slightly hinder the actual game play and practicing of material.

A vital point that teachers discussed was ensuring that the students understand the instructions, and some teachers noted having similar experiences from their years of teaching; they would have to repeat themselves more than they expected. One teacher indicated that they would have preferred for all the games to have written rules visible to the students while being explained so that they can more easily understand. Another reiterated the importance of speaking slowly when explaining the game rules in their class. This feedback showed us the importance for educators to thoroughly comprehend and explain the rules, objectives, and subject matter of games. Leading the games and observing the class reinforced the value of game clarity and presentation for the students. We determined that students react positively to easily identifiable games. When incorporating Bingo and Tic Tac Toe into the classes, the students acknowledged that they already knew the games and were eager to play.

Although only three of the games we made were used in more than one subject, several other games, including Tic Tac Toe, Snakes and Ladders, and Cohete Espacial could be used in other subjects, as the only edits that would be needed are the game questions and answers. While some games were only used in a single subject, they were used across various lessons and subject material. For example, Jeopardy was played only in science classes, but was used for six separate learning topics. We implemented most of the games in only one subject so that we could make more games in an attempt to avoid repetition and disengagement from students. Specifically, with a game like Snakes and Ladders, the layout of the game is not pertinent to a specific subject or material. The game board and pieces would be the same across each iteration, but the teachers can edit the “preguntas” (questions) slides of the PowerPoint and fill in the material for a lesson as they see fit. During our final focus group, we walked the teachers through the layout of Cohete Espacial so they could see how it worked. They were very pleased and excited to see that it was done with Microsoft PowerPoint. Some thought it was a more complicated design system, and they were very satisfied that they could use the game for other subjects than just the science classes that the game was used in. One teacher was happy and stated that he could “use this game in other subjects I teach, like social studies,” after seeing what the game layout was.

### Utilizing Different Game Elements

Games can have differing game elements from each other, with each element presenting respective engaging qualities for the students. For example, while Jeopardy is team-based and thus involves a social element, Bingo is played individually and does not. The game elements we used fell under different characteristic categories as shown in figure 3.



**Figure 3:** Examples of the game elements that were used in our games, by category, with emphasis falling within Performance and Social. Categories from Toda et. al (2019).

From the pilot program, we determined that performance and social game elements are the more relevant and engaging game elements that we used. Student surveys showed that they liked being in teams and having competition with fellow classmates. They also responded positively to games that used points. In the final student surveys, Kahoot! was highly preferred, with 44% of the fifth graders ranking it as the most fun game. In games of Bingo, most of the engaged behavior consisted of comments like “I need 2 more to win!”; in one game of Bingo alone, for example, we observed this type of comment 8 times. This showed us how performance elements (points) and social elements (competition) can keep students engaged. Team competition was also a common theme in the student responses. Team-based Jeopardy was ranked first or second by 38% of the fifth graders, making evident that social elements are also fun and engaging. Furthermore, when asked to write what they liked about the games, most of the students wrote general positive remarks such as “it was fun”, but more importantly, in one class, a third of the students additionally specified that they enjoyed being in teams.

The teachers shared sentiments similar to the responses of the final student surveys. Most teachers said that they preferred games that use groups and competition, noting that students “love feeling like there is a winner” and that it is also “good [for the students] to learn how to lose”. One teacher said how she liked the students playing Tic Tac Toe since “they have to make a strategy to beat the other team and they like that.” She also thought strategy games in general are engaging for students. With this, we were able to use different game elements to positively engage the students in various manners.

### *Cognitive Challenge*

Students need an appropriate level of cognitive challenge. The least well-rated games, for example Materials and Around the World, tended to be quick games that finished at least 10 minutes earlier than the end of the period. Reviewing these games, students would comment that it was “*muy facil*” or “too easy”. In other words, games that do not match the students’ current skill-set drastically increase the pace of the game. Conversely, games can be too challenging. We played the same game, Tic Tac Toe with math problems, for a 5th and 6th grade class, and adjusted the problems to each grade's scheduled lesson topics that week. One crucial difference was that the 5th grade game unintentionally had material that the class had not yet been taught. The 5th grade classes struggled with the game, which was evident as they had to ask questions about the material itself and could only complete one round. The 5th grade teacher commented that “[that day] was a little hard” and would have preferred the game to be less challenging. Conversely, the 6th grade class ran more smoothly, and the students answered the problems at a faster pace. Unlike the 5th grade class, the 6th grade students had no questions about the material other than one for clarification. The 6th grade teacher reflected that she liked the pace and felt that the game was more enjoyable as a result.

One other aspect to cognitive challenge in certain games is whether students have a limited amount of time to respond to a question and how much time they are given. It is important that all students are given enough time to fully complete the problem, even if it is a competition; games should accommodate the diverse skill levels across the classroom. In the game of Kahoot! our first week, students frequently commented that they could not answer the question and needed more time. Consequently, on feedback surveys, playing against the clock was rated less favorably by the students, with a rating of only 3.3 out of 4, while the students liked points better with a rating of 3.6 out of 4. When we went back to using Kahoot! in a later week, we decided to set higher time limits and provided more time for more challenging questions. In one of these classes, the timing feature was rated especially well, with a score of 3.7 out of 4, which was even higher than their rating of the points system. This showed the importance of students having adequate time to read a problem, see the possible answers, and then analyze the correct response. This is further supported by Jagušt et al. (2018), who found that students struggled with and disliked when the timing element became too much of a challenge.

### *Challenges to Implementing Gamification over Zoom*

One challenge in implementing games in the classroom is getting each and every student to participate equally. Based on our observations, we noted that in three of the five classes, a large proportion of the on-task engagement indicators that we observed were contributed by a few highly engaged students, while others would not participate at all. The teachers also noted this during our midterm focus group, with one asking that we “give the opportunity to other children, not always the same ones, and [to] choose those that do not speak.” This shows that the teachers are also aware of this problem, and that it would be in both the teachers’ and students’ best interest to find a way to ensure that everyone is included.

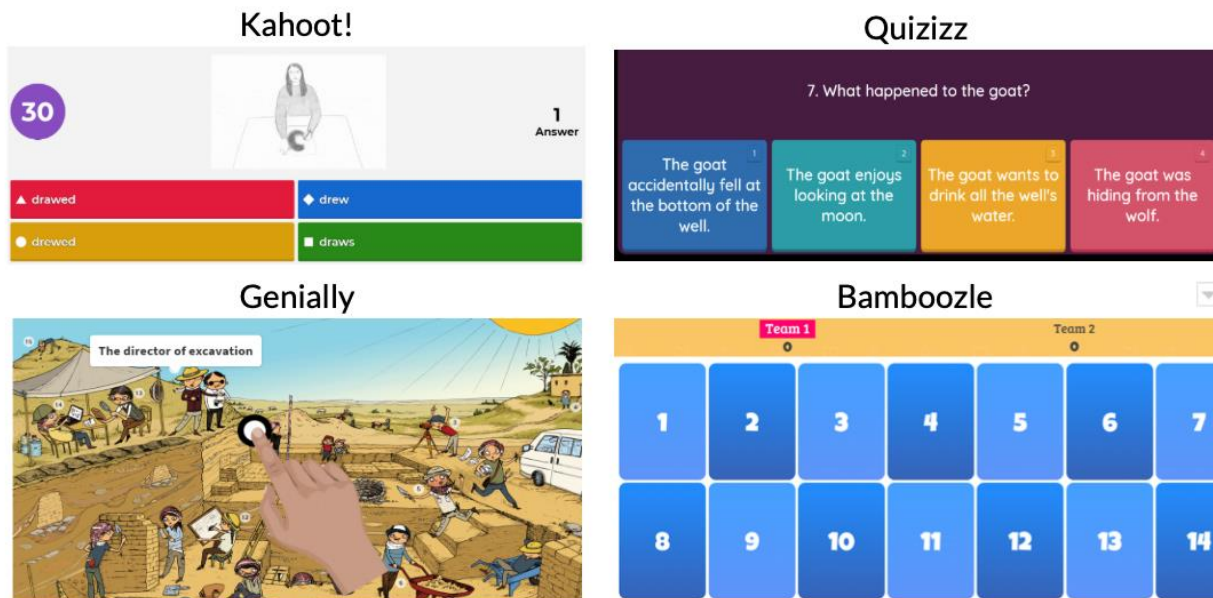
Another limitation we encountered was that we had to implement the games remotely over Zoom, bringing a unique set of difficulties. First, it meant that it was more difficult to capture students’ attention, as compared to in a traditional classroom setting. Second, it was harder to observe all of the students. For example, when we began to play the games, several students in

each class had to turn their cameras off to improve their internet connection, meaning we were unable to observe the physical indicators of those students while we played the game.

Our observation process was also complicated by Zoom-enabled disengagement. This refers to a situation in which a student has their camera off and does not respond upon prompting. In a traditional classroom setting, it would likely be easier to get these students to respond, but in a virtual setting, it was significantly more difficult. The teachers we spoke with said they dealt with this by calling kids directly to participate and forcing all the children to turn on their cameras. When Zoom-enabled disengagement was prevalent during game play it led to pauses, as we had to wait for students to answer and sometimes, they would not answer at all. In addition to engagement challenges, using Zoom created other minor logistical issues. Several students with poor Internet were frequently disconnected from class and had to be readmitted via the waiting room. Additionally, not all online tools worked for every student, largely due to the fact that several students were attending class using a smartphone or tablet instead of a computer. Although this limited our data, it also gave us insight into how being in a virtual classroom setting affects the degree to which games can be successfully implemented.

### Teacher Response to Gamification

After conducting interviews and a focus group, it was evident that teachers are open to integrating new games into their lesson plans. All nine teachers we spoke with wanted to use games in their classroom and have used games before, recognizing the benefits. Overall, most of the teachers agreed that they want their classroom to be more engaging. One teacher remarked that they use games to “try to make [learning] the most dynamic as possible for the kids,” emphasizing the level of priority



**Figure 4:** Game styles of the gamification resources identified by the Alborada teachers.

One teacher stated that the games we created have shown the material that needs to be reinforced. Further, the teachers are motivated to continuously find or develop new games, explaining that with repeated usage of a single game, students “get tired” and are “curious and want new games”. Here, a sense of novelty can help revive engagement. Overall, the teachers involved in the pilot program were interested in working with us to create a menu of games to expand and diversify their toolbox.

The teachers enjoyed the games we made, considering the program to be “a very happy experience”. Half of the teachers even explicitly asked us for our game templates. When we asked which game they would prefer to implement themselves, one replied “I like them all”, stating that they hoped to use them all in future lessons. The others identified Bingo, Jeopardy, Tic Tac Toe, and Cohete Espacial as their top choices; some teachers would state two games instead of one because they could not pick one over the other.

Communication with teachers also highlighted the idea that they like versatile games, such as the ones they chose as their favorites, because they can be used for multiple topics and subjects. The teachers we spoke with discussed the benefit of new games but emphasized how adaptability is more beneficial. They liked how the material could be interchanged, with one saying, “I think these are [games] that you can use in all areas and all topics.” The teachers identified Tic Tac Toe, Bingo, and Jeopardy as games where the content could be edited to correspond to any subject. One teacher suggested Bingo be applied to social sciences, demonstrating their motivation to expand implementing the games. Another teacher also asked about software requirements, and all together they were very enthusiastic and satisfied when shown how the games, including the more intricate ones like Cohete Espacial, were created using only PowerPoint. Even when creating games, we realized how useful it was to make games that could be reused for different subjects. The teachers’ preference for versatility highlighted the importance of collaboration. A teacher mentioned how she shares games with other teachers in different departments. Many times, a game that is successful in one subject, will be successful in others.

## **Discussion**

### **Ensuring Game Effectiveness**

From our literature review we found that teachers feel as though gamification is a new way to capture their students’ attention (Sánchez-Mena et al., 2017). However, based on our findings, the teachers at Alborada have been using gamification for a while now under the same motivation, but they are still looking to further increase student engagement through the creation and use of new games. This has been confirmed through our interviews with the teachers, who said they want to use educational games to engage their students in the material and create a different experience for them. Through interviews and focus groups with the teachers, we have found which games and game elements worked and which ones did not.

Performing a game evaluation through observation, focus groups, and student surveys is important and supported by literature such as Torres-Toukourmidis (2020) and Huang and Hew (2018). Our observational data and feedback from the surveys helped identify problems or improvements that can be made to the games, such as in rule explanation. If the game was entirely new to students, a lack of explicitly stating and restating the rules would result in the game being played with interruptions of what to do next. After initial struggles, we ensured that the rules were clear and written out in the game so the students could read along while we told them the rules. One weakness to using surveys, however, was that some of these students, who are only 9 to 11 years old, may have not self-assessed accurately.

In our research, the game elements that we have found to be most effective when implementing these games are competition elements such as noting points and having a declared winner of the game. Our findings on this support the literature from our background that recommend these elements (Torres-Toukourmidis, 2020; Zainuddin et al., 2020). Students tend to prefer games that have a sense of competition and it feels like they are the winner. This provides a good incentive and further motivates the students to play along and learn more.

No single game dominated all the others; instead, many of the games are effective and engaging. This was shown through the rankings in figure 3, where there is certainly flexibility, given that many of the games have very similar scores. The fact that the post-game surveys were also always favorable for every game further suggests that the students, being kids, simply enjoy games. This is fortunate to see, as this means that the teachers can pull from different games and provide various experiences for their students. Indeed, many of the teachers themselves struggled to isolate a single game as their favorite to implement, because they liked multiple games. Ultimately, the teachers have several good options.

### *Balancing the Aspects of a Game for one Class*

One interesting intersection was that while some teachers explained the need for the students to see new games, students identified quickly with games that were well recognizable. Teachers have indicated that they prefer new games because it provides a new learning experience for the students. However, the students indicated that they prefer games they are familiar with, so it is easier to follow and understand. From the teacher's perspective of trying to engage their students, it can be understood why they would believe novel games bring a level of freshness and excitement to the classroom. However, this novelty comes with the disadvantage of unfamiliarity with the rules, which would need to be addressed by allocating additional class time to explaining the rules to the students.

Another idea about future use is whether these games could be further spread and applied to a more diverse set of subjects. This would make gamification more accessible to more teachers. As shown in Table 2, several other games were reapplied to different topics, such as Jeopardy, which we used for several different lessons of science and one lesson of English. In these different applications, we did not see any discernible difference in engagement; the students simply enjoyed the games. However, further work could be done to actually explore this possibility. Overall, the teachers expressed confidence that they believed it could be done. They had their own ideas about where they could envision games in new subjects, seeing it as a new opportunity to expand usage of the games.

In terms of visual delivery, we also had to accommodate the teacher requests for the games to be modifiable while still maintaining a satisfactory level of novelty and interest for the students who are seeing games every week. Fortunately, our findings show that the two can readily be achieved. For example, Kahoot!, a game with one consistent question style as shown in figure 4, was well liked by the students and ranked highest. When creating our Kahoot! games, we attempted to increase the visual appeal by searching for interesting images related to the lesson, especially animated .gif images. We also did this with Bingo, another game that many students enjoyed a lot. Ultimately this goes a long way for teachers, as this means they do not have to worry about programming or advanced graphic design. Finding eye-catching images and animations online, a process which is much less time consuming, was still effective at transforming a template into a different experience each time it is reapplied.

In addition to balancing novelty and familiarity, we also had to balance game elements. Overall, the “one size fits all” approach will not work when meeting the needs of various classes, even in the same grade and at the same school. For example, it generally has to be up to the teacher’s discretion to determine what an appropriate level of cognitive challenge is for students. Teachers preferred different games, reflecting how their distinct classes react in distinct ways to the games. Further, while a teacher likely understands their class the best, this does not mean they can perfectly predict what degree of challenge is optimal. As we experienced, sometimes we either overestimated or underestimated the difficulty and students struggled. This can happen to teachers as well. The benefits of using a template are thus not only for application to various topics, but to allow teachers to make fine adjustments and fixes as they go and try them out with their students.

## Recommendations

Based on our experiences creating and conducting games, and our communications with the teachers at the Alborada school, we have recommendations for administration and teachers on game creation and implementation.

### *For the Administrators:*

We recommend promoting collaboration within the school and between teachers. All the teachers we spoke with had used games for their respective class; collaboration between teachers would allow them to increase their menu of games. This could be accomplished by either holding a workshop or creating a game resource sharing page or folder to which all teachers have access. Many times, there are games which work for multiple subjects and different material within those subjects. The game Jeopardy, for example works well with questions in any subject. In our case, we used it for Science and English. Also, new games can be made from communicating with peers. We can attest to this as a lot of our game creation came from discussing with one another and drawing inspiration from our own experiences. We believe the same would hold true for the staff at Alborada. From our communication with 16 teachers, we have learned there are teachers who already have games, if given the chance, other teachers could use and learn from.

### *For the Teachers:*

Our teacher recommendations stem from our experience conducting the pilot program:

1. Refer to the game reference guidelines.
2. The top three games we recommend implementing are Kahoot!, Bingo, and Jeopardy because students favored them and they can be modified.
3. Consider using an evaluative technique (such as short student surveys) to determine student preferences for a given game.
4. Ask other teachers about the gamification resources and templates they use to look for games that are novel to your class.

Our biggest recommendation to the teachers would be to reference the guidelines we provided about the games we created. We created a guidebook that describes each game one by one and provides access to them. The games we created were also given to the teachers at Alborada as a folder containing the templates we used. In the guidebook we lay out the general premise of the game, give the rules as they should be read out to the students, state how to modify and edit the game, summarize how the students reacted to it, and offer recommendations. An excerpt can be

found in Appendix K. By using the guidebook, teachers should be able to run the games in their classroom, and they could make changes if they wish to better suit the needs of their class.

From our experience, we most highly recommend the games Bingo, Jeopardy, and Kahoot. These are games that can be edited and were favored by the students. Since the beginning of our research, teachers let us know they wanted all games we created to be editable. It is beneficial if the game can be changed if needed and can serve multiple purposes. Students responded well to these games and the questions can pertain to any subject matter. We used evaluation techniques throughout the pilot program and found it useful. We recommend the teachers regularly ask for students' feedback, because it is a useful way to gauge students' opinions on their games and even other class activities. This could be done through surveys like we did or by asking them directly. Our final recommendation is for teachers to ask their peers for games or game ideas. This could lead to a more diverse and larger game database across the school where every classroom benefits. For example, the games could be shared through Microsoft Office or Google Drive. Also talking to other people about games can lead to game creation. Most of the games we created came from discussing ideas with one another and drawing on past experiences.

## **Conclusions**

Our project goal was to use new gamified lessons to promote engagement and interaction for the 5th and 6th grade students at Alborada. As we delivered the games, we analyzed the lesson feedback surveys and teacher observations. This allowed us to continuously improve each iteration of the games and make them increasingly fun, engaging, and educational. With the research objectives and methods outlined in this report, we used our understanding to guide us towards two deliverables. The first was a set of engaging games that can be accessed and modified by the teachers. The second was a corresponding guidebook for the teachers on how to implement gamification. Gamification should be enjoyable not only for the students but also for the teachers who would incorporate it. The resources we provided, informed by our research, will allow the teachers to craft and use games efficiently. Through our research, we aimed to make gamification sustainable at Alborada in the future.



## References

- Asanov, I., Flores, F., McKenzie, D., Mensmann, M., & Schulte, M. (2021). Remote-learning, time-use, and mental health of Ecuadorian high-school students during the COVID-19 quarantine. *World Development*, *138*, 105225.  
<https://doi.org/10.1016/j.worlddev.2020.105225>
- Barros Morales, R., Rodríguez Domínguez, L. de los Á., & Barros Bastida, C. I. (2015). El juego del cuarenta, una opción para la enseñanza de las matemáticas y las ciencias sociales en Ecuador. *Revista Universidad y Sociedad*, *7*(2), 137–144.
- Beebe, J. (2014). *Rapid qualitative inquiry: A field guide to team-based assessment*. Rowan & Littlefield.
- Berg, B.L., & Lune, H. (2012). *Qualitative research methods for the social sciences*. Pearson.
- Bravo, I., & Alves, M. P. (2019). The curriculum development process: An overview of the educational system in Ecuador. *Euro-JCS*, *5*(1), Article 1.  
<http://pages.ie.uminho.pt/ejcs/index.php/ejcs/article/view/192>
- Chen, S., Zhang, S., Qi, G. Y., & Yang, J. (2020). Games literacy for teacher education: Towards the implementation of game-based learning. *Educational Technology & Society*, *23*(2), 77–92.
- Chou, M. (2014). Assessing English vocabulary and enhancing young English as a Foreign Language (EFL) learners' motivation through games, songs, and stories. *Education 3-13*, *42*(3), 284–297. <https://doi.org/10.1080/03004279.2012.680899>
- Correia, M., & Santos, R. (2017). Game-based learning: The use of Kahoot in teacher education. *International Symposium on Computers in Education (SIIE)*.  
 doi:10.1109/siie.2017.8259670
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School Engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109.  
<https://doi.org/10.3102/00346543074001059>
- Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing definitional, measurement, and methodological issues. *Learning and Instruction*, *43*, 1–4. <https://doi.org/10.1016/j.learninstruc.2016.02.002>
- Goshevski, D., Veljanoska, J., & Hatzia Apostolou, T. (2017). A review of gamification platforms for higher education. *Proceedings of the 8th Balkan Conference in Informatics*, 1–6.  
<https://doi.org/10.1145/3136273.3136299>
- Helme, S., & Clarke, D. (2001). Identifying cognitive engagement in the mathematics classroom. *Mathematics Education Research Journal*, *13*(2), 133–153.  
<https://doi.org/10.1007/BF03217103>

- Huang, B., & Hew, K. F. (2018). Implementing a theory-driven gamification model in higher education flipped courses: Effects on out-of-class activity completion and quality of artifacts. *Computers & Education*, *125*, 254–272. <https://doi.org/10.1016/j.compedu.2018.06.018>
- Jagušt, T., Botički, I., & So, H.-J. (2018). Examining competitive, collaborative and adaptive gamification in young learners' math learning. *Computers & Education*, *125*, 444–457. <https://doi.org/10.1016/j.compedu.2018.06.022>
- Linehan, C., Kirman, B., Lawson, S., & Chan, G. G. (2011). Practical, appropriate, empirically-validated guidelines for designing educational games. *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems*. doi:10.1145/1978942.1979229
- Liu, E. Z. F., & Chen, P.-K. (2013). The effect of game-based learning on students' learning performance in science learning – A case of “Conveyance Go.” *Procedia - Social and Behavioral Sciences*, *103*, 1044–1051. <https://doi.org/10.1016/j.sbspro.2013.10.430>
- Marklund, B. B., & Taylor, A. A. (2016). Educational games in practice: The challenges involved in conducting a game-based curriculum. *Electronic Journal of E-Learning*, *14*(2), 122–135.
- Pektas, M., & Kepceoglu, I. (2019). what do prospective teachers think about educational gamification? *Science Education International*, *30*(1), 65–74.
- Reiss, A. J. (1971). Systematic observation of natural social phenomena. *Sociological methodology*, *3*, 3–33.
- Sánchez-Mena, A., & Martí-Parreño, J. (2017). *Drivers and Barriers to Adopting Gamification: Teachers' Perspectives*. *15*(5), 10.
- Schneider, B. R., Estarellas, P. C., & Bruns, B. (2019). The politics of transforming education in Ecuador: Confrontation and continuity, 2006–2017. *Comparative Education Review*. <https://doi.org/10.1086/702609>
- Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement*, *69*(3), 493–525. <https://doi.org/10.1177/0013164408323233>
- Soto, S. T. (2015). An analysis of curriculum development. *Theory and Practice in Language Studies*, *5*(6), 1129–1139. <https://doi.org/10.17507/tpls.0506.02>
- Strmečki, D., Bernik, A., & Radošević, D. (2015). Gamification in e-learning: Introducing gamified design elements into e-learning Systems. *Journal of Computer Science*, *11*(12), 1108–1117. <https://doi.org/10.3844/jcssp.2015.1108.1117>

- Thayer-Hart, N., Dykema, J., Elver, J., Schaeffer, N.C., Stevenson, J. (2010). *Survey fundamentals: A guide to designing and implementing surveys* [PDF]
- Toda, A. M., Klock, A. C. T., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. *Smart Learning Environments*, 6(1), 16. <https://doi.org/10.1186/s40561-019-0106-1>
- Torres-Toukoumidis, A., Valle-Razo, A. L., & Santis, A. D. (2020). Gamification in higher education instructors from Ecuador, Spain and Mexico. *2020 IEEE ANDESCON*, 1–4. <https://doi.org/10.1109/ANDESCON50619.2020.9272156>
- Trowler, V. (2010). *Student engagement literature review*. The Higher Education Academy.
- Tyler, Ralph W. (1949). *Basic principles of curriculum and instruction*. University of Chicago.
- UNESCO. (2020, March 4). *Education: From disruption to recovery*. UNESCO. <https://en.unesco.org/covid19/educationresponse>
- Van Damme, W., Aguerrondo, I., Burgos, C. C., & Campos, M. R. (n.). A story of change: How Ecuador seeks to sustain its development agenda through large scale education reform. *Journal of Entrepreneurship, Management and Innovation* · August 2018 DOI: 10.15406/ahoaj.2018.02.00061
- Yasar, H., Kiyici, M., & Karatas, A. (2020). The views and adoption levels of primary school teachers on gamification, Problems and possible solutions. *Participatory Educational Research*, 7(3), 265–279.
- Yinger, R. J. (1980). A study of teacher planning. *The Elementary School Journal*, 80(3), 107–127.
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326. <https://doi.org/10.1016/j.edurev.2020.100326>
- Zazkis, R., Liljedahl, P., & Sinclair, N. (2009). Lesson Plays: Planning teaching versus teaching planning. *For the Learning of Mathematics*, 29(1), 40–47.

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## **Appendix A: Initial Teacher Interview Guide (English & Spanish)**

Purpose: To identify the experience and beliefs held by Alborada teachers towards gamification.

### Informed Consent

Hello, welcome to our interview and thank you for choosing to participate in our research. We are part of a team from WPI, a university in Massachusetts, conducting research on the usage of games in the classroom. This research will be published, but no personal information will be included. We want to understand what teachers' familiarity with gamification is. This interview should take no longer than 30 minutes, and you are able to skip any questions you do not want to answer or stop the interview at any time. Do you have any questions before we begin?

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

Propósito: Identificar la experiencia y creencias de los profesores de Alborada hacia la gamificación.

### Informed Consent

Hola, bienvenido a nuestra entrevista y gracias por elegir participar en nuestra investigación. Somos parte de un equipo de WPI, una universidad en Massachusetts, que realiza una investigación sobre el uso de juegos en el aula. Esta investigación se publicará, pero no se incluirá información personal. Queremos comprender cuál es la familiaridad de los profesores con la gamificación. Esta entrevista no debe durar más de 30 minutos y puede omitir cualquier pregunta que no desee responder o detener la entrevista en cualquier momento. ¿Tiene algunas preguntas antes de que comencemos?

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

### Teacher Interview Questions:

1. What is your general teaching style like? *¿Cómo es su estilo de enseñanza general?*
  - a. What has worked the best for you? *¿Qué te ha funcionado mejor?*
2. Are there any changes you would make to your current curriculum? *¿Hay algún cambio que le haría a su plan de estudios actual?*
3. What experience do you have with games used in the classroom to promote learning? *¿Qué experiencia tienes con los juegos que se utilizan en el aula para promover el aprendizaje?*
  - a. Do you have any previous experience with digital games? *¿Tienes alguna experiencia previa con juegos digitales?*
  - b. How have you used digital games in your class in the past? *¿Cómo ha utilizado los juegos digitales en su clase en el pasado?*
    - i. How are digital games played in the classroom? *¿Cómo se juegan los juegos digitales en el aula?*
    - ii. Have you ever had the students play games individually on computers? *¿Alguna vez ha hecho que los estudiantes jueguen individualmente en las computadoras?*

4. What would you like to see in games, for example, team competition and points systems for keeping score? *¿Qué le gustaría ver en los juegos, por ejemplo, competencia por equipos y sistemas de puntos para llevar la puntuación?*
  - a. From your experience, are there certain techniques you would like us to incorporate? *Según su experiencia, ¿hay ciertas técnicas que le gustaría que incorporamos?*
5. How often do you use technology both in and out of the classroom? *¿Con qué frecuencia usa la tecnología tanto dentro como fuera del aula?*
  - a. How comfortable do you feel using technology in the classroom? *¿Qué tan cómodo se siente al usar la tecnología en el aula?*
6. Have you heard or spoken with other teachers about using digital games in the classroom? *¿Ha escuchado o hablado con otros maestros sobre el uso de juegos digitales en el aula?*

## Appendix B: Initial Teacher Focus Group (English & Spanish)

Purpose: To identify the experience and beliefs held by Alborada teachers towards gamification.

### Informed Consent

Hello, welcome to our focus group and thank you for choosing to participate in our research. We are part of a team from WPI, a university in Massachusetts, conducting research on the usage of games in the classroom. This research will be published, but no personal information will be included. We want to understand what teachers' familiarity with gamification is. This focus group should take no longer than 30 minutes, and you are able to skip any questions you do not want to answer or stop the interview at any time. Do you have any questions before we begin?

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

Propósito: Identificar la experiencia y creencias de los profesores de Alborada hacia la gamificación.

### Informed Consent

Hola, bienvenido a nuestro grupo de enfoque y gracias por elegir participar en nuestra investigación. Somos parte de un equipo de WPI, una universidad en Massachusetts, que realiza una investigación sobre el uso de juegos en el aula. Esta investigación se publicará, pero no se incluirá información personal. Queremos comprender cuál es la familiaridad de los profesores con la gamificación. Este grupo de enfoque no debe durar más de 30 minutos y puede omitir cualquier pregunta que no desee responder o detener la entrevista en cualquier momento. ¿Tiene algunas preguntas antes de que comencemos?

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

### Teacher Interview Questions:

1. What grade do you teach and what subject? *¿Qué grado enseñas? ¿Qué material enseñas?*
2. What is your general teaching style like? *¿Cómo es su estilo de enseñanza general?*
  - a. What has worked the best for you? *¿Qué te ha funcionado mejor?*
3. Are there any changes you would make to your current curriculum? *¿Hay algún cambio que le haría a su plan de estudios actual?*
4. What experience do you have with games used in the classroom to promote learning? *¿Qué experiencia tienes con los juegos que se utilizan en el aula para promover el aprendizaje?*
  - a. Do you have any previous experience with digital games? *¿Tienes alguna experiencia previa con juegos digitales?*
  - b. How have you used digital games in your class in the past? *¿Cómo ha utilizado los juegos digitales en su clase en el pasado?*
    - i. How are digital games played in the classroom? *¿Cómo se juegan los juegos digitales en el aula?*

- ii. Have you ever had the students play games individually on computers? *¿Alguna vez ha hecho que los estudiantes jueguen individualmente en las computadoras?*
5. What would you like to see in games, for example, team competition and points systems for keeping score? *¿Qué le gustaría ver en los juegos, por ejemplo, competencia por equipos y sistemas de puntos para llevar la puntuación?*
    - a. From your experience, are there certain techniques you would like us to incorporate? *Según su experiencia, ¿hay ciertas técnicas que le gustaría que incorporamos?*
  6. How often do you use technology both in and out of the classroom? *¿Con qué frecuencia usa la tecnología tanto dentro como fuera del aula?*
    - a. How comfortable do you feel using technology in the classroom? *¿Qué tan cómodo se siente al usar la tecnología en el aula?*
  7. Have you heard or spoken with other teachers about using digital games in the classroom? *¿Ha escuchado o hablado con otros maestros sobre el uso de juegos digitales en el aula?*



## **Appendix C: Letter to Parents About Student Observation (English & Spanish)**

Dear Parents,

We are students from WPI, a university in Massachusetts, and we will be doing a project which involves bringing games into the classroom. We will be interacting with the students in 5th and 6th grade for seven weeks, starting in March and ending in May. Our interaction will include communicating with the children, leading games lessons, and observing the students as they play the game. This will all be done through Zoom because classes are online. The kids will not be recorded at any point. All interactions will be professional and be in line with our research project. If there are any questions or concerns feel free to email us.

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Alborada Collaborator: [maricelaalana@yahoo.es](mailto:maricelaalana@yahoo.es)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

Queridos padres,

Somos estudiantes de WPI, una universidad politécnica en los Estados Unidos, y haremos un proyecto que implica traer juegos a la clase. Estaremos interactuando con los estudiantes de quinto y sexto grado durante siete semanas, comenzando en Marzo y terminando en Mayo. Nuestra interacción incluirá comunicarse con los niños, dirigir lecciones de juegos y observar a los estudiantes mientras juegan. Todo esto se hará a través del Zoom porque las clases están en línea. Los niños no serán grabados en ningún momento. Todas las interacciones serán profesionales y estarán en línea con nuestro proyecto de investigación. Si tiene alguna pregunta o preocupación, no dude en enviarnos un correo electrónico.

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Colaborador en Alborada: [maricelaalana@yahoo.es](mailto:maricelaalana@yahoo.es)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

## Appendix D: Class Observation Sheet (During pilot program)

Purpose: To gauge student level of engagement during our game lessons.

**Section and Date:**

**Total number of students:**

**Note the following times:**

- 1.) when we start explaining the rules:
- 2.) when we start playing the games:

For your section of the class, please note any of the following behaviors tabled below. Simply leave a check next to each item on the table below *for each instance that it occurs* (even if one student repeatedly does it). Note student initials if possible (but not the first/full name). Indicators referenced from Skinner (2009) and Helme (2001).

On-task	Off-Task
<ol style="list-style-type: none"> <li>1. Thinking aloud</li> <li>2. Resisting distractions</li> <li>3. Gestures externalizing thought processes (e.g. counting with hands, showing relative size)</li> <li>4. Exchanging ideas</li> <li>5. Asking relevant questions</li> <li>6. Answering relevant questions</li> <li>7. Making evaluative comments (e.g. "We need more time per question")</li> <li>8. Emotional comments (e.g. "I like math")</li> <li>9. Facial expressions and paralanguage (e.g. smiling, jumpy)</li> </ol>	<ol style="list-style-type: none"> <li>10. Facial expressions and paralanguage (e.g. appearing sleepy/tired)</li> <li>11. Disrupting a classmate or asking a trivial question.</li> <li>12. Not looking at the screen or getting up and going somewhere else.</li> <li>13. Joining in another student's off-topic conversation.</li> <li>14. Emotional comments (e.g. "I give up")</li> <li>15. Not responding when called on.</li> <li>16. Other</li> </ol>

(NEXT PAGE)→

Answer the following about the class overall:

1. Did the students appear to be engaged?
  - a. Never 1 2 3 4 5 Always
  - b. Additional notes
2. Did the class appear to understand the content of the lesson?
  - a. Strongly disagree 1 2 3 4 5 Strongly agree
  - b. Additional notes

## Appendix E: Post-Game Student Feedback Survey (English)

Purpose: To gather students' honest feedback about the games.

### Informed Consent:

Hello, and thank you for participating in this survey. We are a group from WPI, a university in Massachusetts, researching the usefulness of games for class. This survey will be anonymous because we are looking for your honest feedback on the games. This survey will only take 5 minutes, and you can choose to not answer any questions. You may ask us any questions at any time.

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

1. Rate how much the game helped you learn [lesson target, e.g. multiplication, English].

1	2	3	4
Not helpful at all	barely helpful	helpful	Very helpful

2. Rate how motivated you were to play the game.

1	2	3	4
Not motivated at all	barely motivated	Somewhat motivated	Very motivated

3. Rate how much you would want to play the game again.

1	2	3	4
Not at all	slightly	somewhat	A lot

4. Rate how much you liked the [game element 1, e.g. teams, \*see next page].

1	2	3	4
Did not like at all	Did not like	Liked	Liked a lot

5. Rate how much you liked the [game element 2, e.g. points, \*see next page].

1	2	3	4
Did not like at all	Did not like	Liked	Liked a lot

Question 4 and 5 Suggestions for each Game Format

Bingo (Chance)

1. Rate how much you liked needing good luck to win Bingo.

Jeopardy, Tic Tac Toe, Cohete Espacial, Family Feud (Points, Teams)

1. Rate how much you liked having points.
2. Rate how much you liked being in a team.

Kahoot, Space Game (Points, Timer)

1. Rate how much you liked having points.
2. Rate how much you liked playing against the time.

20 Questions, Describing People Game, Investigation Story, Alrededor del Mundo, Pictionary (Class-wide collaboration)

1. Rate how much you like collaborating with your classmates.

Materials (Points, Consecutive correct answers)

1. Rate how much you liked having points.
2. Rate how much you liked needed consecutive correct answers to win.

Snakes and Ladders (Chance, Teams)

1. Rate how much you liked needing good luck to win.
2. Rate how much you liked being in a team.

## Appendix F: Post-Game Student Feedback Survey (Spanish)

### Informed Consent:

Hola y gracias por participar en esta encuesta. Somos un grupo de WPI, una universidad en Massachusetts, que investiga el uso de juegos para la clase. Será anónimo porque buscamos sus comentarios honestos sobre nuestros juegos. Esta encuesta solo tomará 5 minutos y puede optar por no responder ninguna pregunta. Puede hacernos cualquier pregunta en cualquier momento.

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

1. Califica cuánto te ayudó a aprender el juego [*lesson target, e.g. multiplication, English*].

1	2	3	4
no ayudó en absoluto	apenas ayudó	ayudado	ayudó mucho

2. Califica lo motivado que estabas para jugar el juego.

1	2	3	4
sin motivación	apenas motivado	motivado	muy motivado

3. Califica cuánto te gustaría volver a jugar a este juego.

1	2	3	4
sin interés	apenas interesado	algo interesado	muy interesado

4. Califica cuánto te gustó [*game element 1, e.g. scoreboard \*See next page for suggestions*].

1	2	3	4
no me gusta para nada	no me gusta	me gusta	me gusta mucho

5. Califica cuánto te gustó [*game element 1, e.g. scoreboard \*See next page for suggestions*].

1	2	3	4
no me gusta para nada	no me gusta	me gusta	me gusta mucho

Question 4 and 5 Suggestions for each Game Format (Spanish)

Bingo (Chance)

1. Califica cuánto te gustó la necesidad de tener suerte para ganar.

Jeopardy, Tic Tac Toe, Cohete Espacial, Family Feud (Points, Teams)

1. Califica cuánto te gustó anotar puntos.
2. Califica cuánto te gustó estar en equipos.

Kahoot!, Space Game (Points, Timer)

1. Califica cuánto te gustó anotar puntos.
2. Califica cuánto te gustó jugar contra el tiempo.

20 Questions, Investigation Story, Alrededor del Mundo, Describing People, Pictionary (Class-wide collaboration)

2. Califica cuánto te gustó la colaboración entre compañeros en la clase.

Materials (Points, Consecutive correct answers)

1. Califica cuánto te gustó anotar puntos.
2. Califica cuánto te gustó necesitar respuestas correctas consecutivas para ganar.

Snakes and Ladders (Chance, Teams)

1. Califica cuánto te gustó la necesidad de tener suerte para ganar.
2. Califica cuánto te gustó estar en equipos.

## Appendix G: Mid-Project Teacher Focus Group (English & Spanish)

Purpose: To get feedback on the first and second week's game lessons from the teachers who were in the classroom during the game lesson.

### Informed Consent

Hello, welcome to our focus group and thank you for choosing to participate in our research. We are part of a team from WPI, a university in Massachusetts, conducting research on the usage of games in the classroom. This research will be published, but no personal information will be included. We are looking for feedback on our pilot program. This interview should take no longer than 20 minutes, and you are able to skip any questions you do not want to answer or stop the interview at any time. Do you have any questions before we begin?

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisors: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu), Melissa Belz [mbelz@wpi.edu](mailto:mbelz@wpi.edu)

Propósito: Obtener información sobre los comentarios de los maestros sobre nuestro programa piloto y sus opiniones sobre cómo se podrían desarrollar estos juegos para su uso futuro.

### Informed Consent

Hola y bienvenido a nuestra entrevista.

Somos parte de un equipo de WPI, una universidad en Massachusetts, que realiza una investigación sobre el uso de juegos en el aula. Esta investigación se publicará, pero no se incluirá información personal. Estamos buscando comentarios sobre nuestro programa piloto. Esta entrevista no debe durar más de 30 minutos y puede omitir cualquier pregunta que no desee responder o detener la entrevista en cualquier momento. ¿Tiene algunas preguntas antes de que comencemos?

Director del IRB: Ruth McKeogh 508-831-6699 [irb@wpi.edu](mailto:irb@wpi.edu)

Administrador de Protección Humana: Gabriel Johnson 508-831-4989 [gjohnson@wpi.edu](mailto:gjohnson@wpi.edu)

Contacto de Equipo: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

### Focus group Questions

1. How did you think the game lesson went? *¿Cómo cree que fue el juego?*
2. In your opinion, how did the students react to the game? *En su opinión, ¿cómo reaccionaron los estudiantes al juego?*
3. What worked? *¿Qué elementos funcionaron?*
4. What did not work? *¿Qué elementos no funcionaron?*
5. Are there any changes we should make to the games? *¿Hay algún cambio que debemos hacer?*
6. Can you see yourself incorporating the games into your lesson plans? *¿Puede verse incorporando los juegos en tus planes de lecciones?*
7. What questions do you have for us about how to run this game? *¿Tiene preguntas para nosotros sobre cómo ejecutar este juego?*

## Appendix H: Final Teacher Interview Guide (English & Spanish)

Purpose: To get information on what the teachers' feedback is about our pilot program and their thoughts on how these games could be developed for future use.

### Informed Consent

Hello, welcome to our interview and thank you for choosing to participate in our research. We are part of a team from WPI, a university in Massachusetts, conducting research on the usage of games in the classroom. This research will be published, but no personal information will be included. We are looking for feedback on our pilot program. This interview should take no longer than 30 minutes, and you are able to skip any questions you do not want to answer or stop the interview at any time. Do you have any questions before we begin?

Advisor: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu)

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Propósito: Obtener información sobre los comentarios de los maestros sobre nuestro programa piloto y sus opiniones sobre cómo se podrían desarrollar estos juegos para su uso futuro.

Hola y bienvenido a nuestra entrevista.

Somos parte de un equipo de WPI, una universidad en Massachusetts, que realiza una investigación sobre el uso de juegos en el aula. Esta investigación se publicará, pero no se incluirá información personal. Estamos buscando comentarios sobre nuestro programa piloto. Esta entrevista no debe durar más de 30 minutos y puede omitir cualquier pregunta que no desee responder o detener la entrevista en cualquier momento. ¿Tiene algunas preguntas antes de que comencemos?

Contacto de Equipo: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisor: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu)

### Interview Questions

1. How do you think the pilot program went overall? *¿Cómo cree que fue el programa piloto en general?*
2. Which of these games would be your favorite to use in the future? *¿Cuál de estos juegos sería su favorito para usar en el futuro?*
  - a. What makes these your favorite games? *¿Qué hace que estos sean sus juegos favoritos?*
3. What game would be the hardest to implement? Why? *¿Qué juego podría ser el más difícil de implementar? ¿Por qué?*
4. If you had to say, what game did the kids had the most issues with? *¿Si tuvieras que decir, ¿con qué juego tuvieron más problemas los niños?*
5. If you had to identify one thing you would want to improve, what would it be? *Si tuviera que identificar una cosa que le gustaría mejorar, ¿cuál sería?*
6. What support would you need from us to continue using the games? *¿Qué apoyo necesitaría para seguir usando los juegos?*



7. What kind of support or knowledge would you need in order to make your own games in the future? *¿Qué tipo de apoyo o conocimiento necesitarías para crear tus propios juegos en el futuro?*
8. Do you believe these games have value over a traditional learning setting? *¿Cree que estos juegos tienen valor sobre un entorno de aprendizaje tradicional?*

## Appendix I: Post-Program Game Ranking Survey for Students (English)

Purpose: To identify which games the students like the most.

### Informed Consent:

Hello, and thank you for participating in this survey. We are a group from WPI, a university in Massachusetts, researching the usage of games for class. It will be anonymous because we are looking for your honest feedback on the games. This survey will only take 5 minutes, and you can choose to not answer any questions. You may ask us any questions at any time.

Advisor: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu)

Team Contact: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Please answer the following questions based on the games we played in the last few weeks.

Rank the following games based on how fun they were to play. Number 1 being the most fun, and number 6 being the least fun.

Game 1, Game 2, Game 3, Game 4, Game 5, Game 6 (game names/themes will be used in distribution of actual survey)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

1. What is something that you really liked about the games we played in class?
2. What is something that you did not like about the games we played in class?

## Appendix J: Post-Program Game Ranking Survey for Students (Spanish)

### Informed Consent:

Hola y gracias por participar en esta encuesta. Somos un grupo de WPI, una universidad en Massachusetts, que investiga el uso de juegos para la clase. Será anónimo porque buscamos sus comentarios honestos sobre nuestros juegos. Esta encuesta solo tomará 5 minutos y puede optar por no responder ninguna pregunta. Puede hacernos cualquier pregunta en cualquier momento.

Contacto de Equipo: [gr-alboradaD21@wpi.edu](mailto:gr-alboradaD21@wpi.edu)

Advisor: Courtney Kurlanska [cbkurlanska@wpi.edu](mailto:cbkurlanska@wpi.edu)

Responda las siguientes preguntas según los juegos que jugamos en las últimas semanas.

Por favor, clasifica los siguientes juegos según lo divertidos que fue jugarlos. El número 1 es el más divertido y el número 6 el menos divertido.

Juego 1, Juego 2, Juego 3, Juego 4, Juego 5, Juego 6

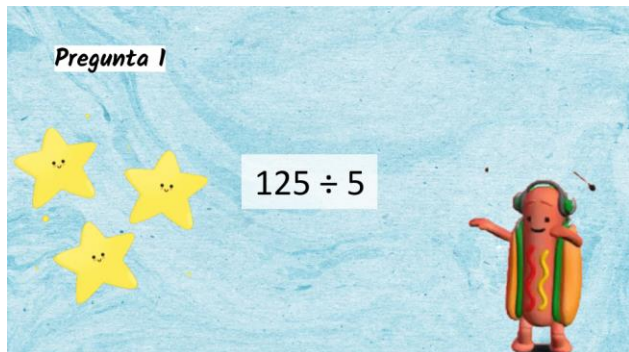
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

1. ¿Qué es algo que realmente te gustó de los juegos que jugamos en clase?

2. ¿Qué es algo que no le gustó de los juegos que jugamos en clase?

## Appendix K: Guidebook Excerpt (English)

### 1. Bingo



#### Main Aspects of this Game:

- This game is useful for quick reinforcement.
- This is a shorter game.
- Very low stakes for the students, so they are more comfortable and less anxious with making mistakes.
- Not as strong of an evaluation/assessment tool as other games.
- Competition element is based on luck.

#### Directions to give to the Students:

The goal is to get Bingo by marking a row or column of answers. I'm going to submit a dashboard link and then share my screen. You will need to have two windows open for this. My screen will have problems that you can write and solve. That answer should be somewhere on the board and you can mark it. Whoever gets a complete row, column or diagonal of marked answers can say Bingo and win the game. Do you have questions?

#### How to carry out the game:

Ask them to say when they are ready to move on to the next question. Check that winning students have the correct answers. After a certain point, the tables are cleared and a new session can begin.

#### How to edit/create:

*Make the questions in a PowerPoint or Google Slides:*

Make a list of your questions and answers on a document. Place the questions in a PowerPoint or Google Slides presentation (you can edit ours). Put one question per slide.

#### *Make the Bingo boards:*

Go to this link:

<https://myfreebingocards.com> . On the left side, click on the tab numbers. From there, click on option 1-25. You will now have the options to change the title and material. Once you have finished completing them, click "next step". Now click on "30 cards for free". A window will appear, click on "Let's go". You will now see a virtual link. Copy and save that link. Put it on your first slide.

#### Results when we played it:

**This game is especially popular with the students! It is a top game.** They get excited when they are close to winning.