

Evaluation of Educational Gamification Through pre and post-surveys  
*Evaluación de la gamificación en educación mediante encuestas pretest y postest*

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Artículo recibido: 19/01/2026 – Aceptado: 05/12/2026

**Abstract:**

Gamification, understood as the incorporation of game design elements into non-game contexts, has emerged as a pedagogical strategy to motivate students. However, evaluating its effectiveness remains a methodological challenge. This study presents a mixed methodology which employs an action-research and feasible-project investigation conducted in a high school course in Spain, in which an ad hoc gamified experience was implemented and a pre- and post-survey design via Google Forms was used to assess changes in motivation, engagement, and learning. The surveys used closed questions based on 4 point Likert scales to study motivational and learning-related variables. These tools enable the observation and measurement of changes when applying active methodologies in the classroom. The main limitation of the study lies in the non-probabilistic convenience sampling, which prevents generalizing the results to the entire population.

**Keywords:**

Pre and post surveys; Gamification; Mixed methodology; Action-research; Likert

**Resumen:**

*La gamificación, entendida como la incorporación de elementos de diseño de juegos en contextos no lúdicos, se ha convertido en una estrategia pedagógica emergente para motivar al estudiantado. No obstante, evaluar su eficacia sigue siendo un reto metodológico. Esta investigación presenta una metodología mixta de investigación-acción y proyecto factible llevado a cabo en una asignatura de bachillerato en España, en el que se aplicó una experiencia gamificada ad hoc que utilizó un diseño de encuestas pretest*

y posttest empleando Google Forms para valorar los cambios en motivación, compromiso y aprendizaje. Concretamente, dichas encuestas usaban preguntas cerradas basadas en una escala de Likert de 4 puntos para medir variables motivacionales y de aprendizaje. Estas herramientas permiten observar y medir cambios al aplicar metodologías activas en el aula. La principal limitación se encuentra en el muestreo no probabilístico de conveniencia empleado que no permite extrapolar resultados al conjunto de la población.

**Palabras clave:**

encuesta pretest; posttest; gamificación; metodología mixta; investigación-acción; Likert

## 1. Introduction

The integration of game elements into non-game contexts, known as gamification, has experienced significant growth in the educational field over the last decade (Aubert *et al.*, 2023; Caponetto *et al.*, 2014). This pedagogical strategy seeks to harness the intrinsic motivation associated with play in order to improve student engagement, academic performance, and satisfaction with the learning process (Deterding *et al.*, 2011; Hamari *et al.*, 2014; Seaborn & Fels, 2015).

Gamification has become increasingly popular in education since 2010 (Cornellà *et al.*, 2020; Deterding *et al.*, 2011) and is grounded in frameworks such as Deci and Ryan's Self-Determination Theory (1985), which explains that intrinsic motivation is based on three fundamental psychological needs: autonomy, competence, and social relations (Aubert *et al.*, 2023).

In recent years, gamification has been incorporated into different educational levels, although to a lesser extent than what might be expected (Roa *et al.*, 2021, p. 5). In educational practice, gamification is implemented through elements such as point systems, badges, progress levels, leaderboards, narratives, and immediate feedback mechanisms (Borrás-Gené, 2022; Dicheva *et al.*, 2015; Usán & Salavera, 2020). Previous studies have documented the positive effects of these interventions on variables such as student motivation, engagement, and academic performance (Hamari *et al.*, 2014; Koivisto & Hamari, 2019).

From a methodological perspective, evaluating the effectiveness of these interventions requires approaches that allow for a rigorous analysis of the changes experienced by students. In this context, the pretest-posttest design stands out for its simplicity and applicability in educational settings (Reichardt, 2019) and has become one of the most widely used strategies, as it enables the comparison of variables before and after the intervention (Caponetto *et al.*, 2014; Dicheva *et al.*, 2015).

However, the literature reviewed reveals a specific methodological gap: many gamification studies use pretest-posttest surveys, yet they rarely describe in detail the process of instrument design, their characteristics –dimensions, items, and scales– or discuss the extent to which these instruments make it possible to analyze the changes

generated in students by the gamified experience, particularly regarding emotional and motivational components.

Likewise, the use of pretest-posttest designs without control groups may limit the ability to establish consistent causal relationships (Dicheva *et al.*, 2015; Seaborn & Fels, 2015). Similarly, methodological literature has highlighted threats to the internal validity of these designs, especially when non-probabilistic sampling methods are employed and results are not triangulated with qualitative data (Campbell & Stanley, 1963; Cook & Campbell, 1979; Shadish *et al.*, 2002). In addition, heterogeneity in measurement instruments, studied populations, and implemented gamification elements hinders comparability across studies and the generalization of results. In communication studies, where contextualized interventions predominate, these limitations may be mitigated through mixed methodological approaches and action research strategies (Creswell & Plano Clark, 2018; Hernández-Sampieri *et al.*, 2014; Kemmis *et al.*, 2014).

Within this context, the present study proposes a methodological contribution aimed at improving the evaluation of gamified interventions through the design and implementation of pre- and post-test surveys that make it possible to break down different dimensions of the student experience. The methodology is illustrated through its application in a gamified high school experience conducted in a public secondary school with two groups of students ( $n = 50$ ) (González-Sanz, 2023). The design includes brief surveys with Likert scales, conceived to minimize social desirability bias and encourage adolescent student participation (Likert, 1932; Spector, 1992; Vinuesa, 2005), as well as mechanisms to ensure parallelism between pre- and post-measurements and to control for possible novelty effects.

This article does not focus on evaluating the effectiveness of a specific gamified experience, but rather on describing and analyzing a research methodology applicable to the study of educational and communication interventions. In this sense, the main objective is to propose and analyze this methodology by identifying its strengths, limitations, and possible applications in communication studies or in the implementation of other active methodologies in the classroom. In doing so, the article seeks to contribute to the methodological debate in this field by offering a flexible, replicable approach adapted to the conditions of applied research.

## **2. A Methodological Framework for Analyzing Educational Gamification**

To measure the effect of a gamified intervention on student motivation when teaching Audiovisual Language in the Audiovisual Culture course of the Arts Baccalaureate at a specific public secondary school (González-Sanz, 2023), surveys administered at two equivalent moments [pretest and posttest] were used, complemented by observational evidence and academic performance data, with the aim of strengthening internal validity and the interpretation of results in educational communication studies. Methodologically, in the case study analyzed, a mixed-methods research design was employed, combining qualitative and quantitative approaches in order to achieve a deeper insight into the object of study and enabling a holistic view of the impact of pedagogical interventions in audiovisual communication contexts (Creswell & Plano Clark, 2018).

### 2.1. Action Research and Feasible Project

This study adopts the principles of action research and the feasible project approach, which materialized in the design and implementation of a gamified proposal for teaching Audiovisual Language that could be replicated, with adaptations, across different educational levels. According to Hernández-Sampieri *et al.* (2014), action research seeks to understand and solve specific problems affecting a community and depends on the full collaboration of participants in identifying needs and implementing the results obtained.

Creswell (2005) identifies two fundamental types of designs in action research practice: the practical design –which focuses on implementing an action plan for the development and learning of participants– and the participatory design –which examines social issues, focusing on changes aimed at improving quality of life. In this case, practical action research was employed, addressing the three phases identified by Hernández-Sampieri *et al.* (2014), which must occur cyclically. These three stages begin with observation –which makes it possible to gain an understanding of the problem, collect data about it, and formulate a plan to address it– continue with the reflection phase –which allows for the analysis and interpretation of the information obtained– and conclude with the action phase –in which the plan is implemented and the results are evaluated.

As a result of the action research process, a feasible project was developed, understood as the “research, design, and development of a proposal for a viable operational model” (Barrios, 1998, p. 7), with the aim of creating a teaching method –in this case, gamification– that could subsequently be improved (Bisquerra, 1989). Feasible projects are conceived as a systematic and coherent set of actions, strategies, and procedures aimed at investigating and transforming a specific educational reality, with the purpose of optimizing contextual conditions and promoting the development of the population involved (Hernández, n.d., as cited in Cisneros-Estupiñán *et al.*, 2012).

Due to its applied nature, as the author explains, this type of research has gained increasing acceptance in academic and institutional contexts, since it is primarily used to diagnose specific problems and formulate viable and contextualized solutions that contribute to the continuous improvement of educational processes. This approach enables the active participation of those involved, promotes critical reflection on existing practices, and facilitates the implementation of improvement strategies.

### 2.2. Pretest and posttest design in educational assessments

As the main methodological approach, the quantitative survey technique was employed. The pretest-posttest design is commonly used in educational contexts for several reasons, as highlighted by Shek and Zhu (2018). First, in certain cases, it is impossible to assign a control group, or it is difficult to implement one within the context of the intervention. Second, limitations in material and human resources often make it challenging to conduct more complex experimental studies. Third, this design enables education professionals to evaluate their own practice within the school environment. Finally, the

pretest-posttest approach represents a cost-effective alternative for carrying out a preliminary analysis of a program's outcomes and determining whether it is appropriate to extend or further develop the research.

Accordingly, researchers responsible for the design of educational research projects frequently employ this technique to assess the effectiveness of educational interventions. As the authors point out, these designs are used as a value-added measure to evaluate student learning and to adapt curricula to learners' needs. Typically, the pretest is administered at the beginning of a course in order to establish students' baseline level in relation to the intended learning outcomes, whereas the posttest is conducted at the end of the course to assess the knowledge acquired, ideally demonstrating a positive improvement in the results. Within this pretest-posttest framework, surveys constitute the principal measurement instrument due to their capacity to capture subjective perceptions such as motivation (Spector, 1992).

### *2.3. Survey construction*

This tool makes it possible to collect objective data on a range of aspects, such as students' motivation, their degree of affinity with the subject, and other variables relevant to the research. In this way, the combination of methods and techniques enables a more comprehensive, balanced, and well-founded understanding of the reality under study.

Given that the gamified experience used as the basis for analysis was designed for a specific group of students, the pre- and post-intervention surveys employed a non-probabilistic convenience sampling method that specifically targeted the census population involved in the intervention. This decision resulted in certain limitations, as the findings cannot be generalized to the wider population, although they do allow for the assessment of whether the implementation of gamification generated a change among participants.

To this end, a limited number of questions were designed -10 in the pretest survey and 11 in the posttest survey- which were distributed to students via Google Forms, with responses collected anonymously. This Google tool was selected because of its accessibility, ease of use, and free availability. Furthermore, it facilitates the collection and organization of information, as it centralizes all responses in a spreadsheet similar to Excel, thereby simplifying the initial processing of results and reducing human errors associated with data transcription (Malette & Barone, 2013). In addition, the platform offers the possibility of automatically generating graphical representations from participants' responses. In order to streamline the process for students, QR codes containing links to each survey were created and projected in the classroom, allowing questionnaires to be completed on mobile devices without the need for a computer.

Despite its advantages, the use of Google Forms also presents several limitations that must be considered within the methodological design. First, one of the principal technical limitations is its dependence on an Internet connection, as questionnaires cannot be completed offline. Furthermore, there are also concerns relating to privacy and data protection (Vansantha & Harinarayana, 2016), given that the information is

stored on Google servers. This may lead to conflicts with ethical or legal regulations if informed consent and data processing are not managed appropriately.

In order to assess the impact of gamification more accurately, the pretest and posttest questionnaires were not limited to measuring cognitive aspects, but also incorporated dimensions related to students' experiences. Specifically, items were included to collect affective variables such as motivation, enjoyment, and degree of engagement, which are particularly relevant in gamified contexts. Nevertheless, it should be noted that this type of instrument only provides an approximation of students' perceptions and presents limitations when attempting to capture the complexity of emotional responses, especially in comparison with other qualitative techniques.

With regard to the questions included in both surveys, it should be noted that closed-ended questions based on a Likert scale were selected. This method of measurement requires respondents to indicate, on an ordered scale, the degree to which they agree or disagree with a particular statement or item (Bertram, as cited in Matas, 2018). For the purposes of this research, a 4-point scale was employed -with 1 representing strongly disagree and 4 representing strongly agree- thereby eliminating central response options in order to encourage participants to take a position and reduce interpretative ambiguity (Likert, 1932; Spector, 1992).

As Vinuesa (2005, p. 191) states, this type of closed-ended question format is straightforward both to answer and to code, and contributes to reducing ambiguity in responses, thereby facilitating comparison between participants. Nevertheless, as the author also points out, this format presents a number of disadvantages. The formulation of such questions requires a greater degree of preparation and specialized knowledge on the part of the researcher. By restricting responses to a limited set of predefined options, the possibility of capturing nuances or personal interpretations is reduced. Furthermore, respondents may interpret the questions differently, introducing a degree of ambiguity into the interpretation of the data.

In order to prevent students from feeling overwhelmed by an excessive number of questions and to maintain their attention, it was decided not to include introductory questions. The wording of the different items followed the principles outlined by Vinuesa (2005): the texts were brief, clear, and free from specialized vocabulary.

Given that the intention was to measure specific issues, primarily the increase in student motivation, the questions administered before and after the gamified experience were closely related. This ensured that the results could be compared effectively. Consequently, the questions were designed with conceptual parallelism between items, making it possible to measure changes attributable to the intervention (Reichardt, 2019). Table 1 presents the pre- and post-intervention questions included in the specific example analysed.

**Table 1**

*Pretest and posttest questions administered to participants*

<b>PRETEST QUESTIONS</b>	<b>POSTTEST QUESTIONS</b>
1- I enjoy participating in class	1- I enjoyed participating in the gamified experience
2- I feel motivated during lessons at school	2- I prefer to be taught through traditional lessons
3- I am very interested in the subject <i>Audiovisual Culture</i>	3- Following the gamified experience, I enjoy the subject <i>Audiovisual Culture</i> more
4- I enjoy learning new things	4- The gamified experience motivated me to want to learn new things
5- After lessons, I continue learning about topics related to what was covered in class	5- Following the gamified experience, I continue learning about topics related to what was taught that day
6- When I wake up in the morning, I feel eager to go to school	6- I would be more willing to go to school if all lessons were gamified
7- During lessons, I usually pay attention to the teacher	7- If all teachers used gamification in class, I would pay more attention to them
8- During lessons, I usually spend my time doing things unrelated to studying or paying attention	8- While the gamified experience was taking place, I spent time doing things unrelated to participating in it
9- After finishing school, I would like to continue studying	9- After finishing school, I would like to continue studying if I knew that all subjects were gamified
10- In the future, I would like to work in something related to the audiovisual field	10- I want to continue studying, even if lessons are not gamified
	11- In the future, I would like to work in something related to the audiovisual field

*Note.* Source: González-Sanz (2023)

The data obtained through the surveys can be triangulated with academic performance indicators in order to strengthen the internal validity of the pretest-posttest design when analyzing the implementation of active methodologies in the classroom. In the example analyzed, this triangulation was carried out by comparing an individual final assessment linked to the gamified intervention with the group's previous average grade, provided by the teachers responsible for the subject. This type of comparison, which is particularly appropriate in the analysis of active methodologies, makes it possible to contextualize the variations identified in the surveys in relation to students' prior academic performance, without attributing the observed changes exclusively to the intervention being evaluated.

### 3. Applications and transferability of the methodology in communication

The methodology that combines action research with pretest-posttest designs through surveys demonstrates considerable potential for application and transferability within the field of communication, particularly in studies of an applied, evaluative, and exploratory nature. Its flexibility, low cost, and adaptability to real-world contexts establish it as an appropriate and valuable methodological approach.

#### 3.1. Evaluation of other active methodologies in education

This methodology is suitable for measuring the implementation of other active methodologies in the classroom -such as the flipped classroom or project-based learning- within communication-related subjects. The use of pre- and post-intervention surveys makes it possible to assess changes in media literacy, critical thinking, or attitudes towards the media following the implementation of educational interventions, workshops, or gamified experiences. This type of design has been widely recommended in educational contexts where the random assignment of control groups presents logistical or ethical difficulties (Reichardt, 2019).

#### 3.2. Applications of the pretest-posttest design in communication

The pretest-posttest approach can be transferred to the study of institutional, political, or social change communication strategies, making it possible to evaluate the impact of communication campaigns on public attitudes, perceptions, or levels of engagement. In these cases, the design assesses the impact of advertising campaigns in these fields by analyzing whether pre-existing attitudes towards particular issues have been modified following exposure to them. For example, in media education it could be used to measure changes in critical competencies before and after workshops on fake news analysis, while in institutional communication it could assess brand perception before and after corporate campaigns.

These applications demonstrate that the combination of action research and pretest-posttest surveys provides a flexible and replicable methodological framework for evaluating contextualized communication interventions in different settings, balancing methodological rigor with practical relevance (Cook & Campbell, 1979).

### 4. Discussion

As Dicheva *et al.* (2015) point out, there are other similar studies on educational gamification, 75% of which employ pretest-posttest designs without a control group. In these cases, longer surveys are generally used, consisting of more than 20 items (Caponetto *et al.*, 2014), which also tend to result in higher dropout and non-completion rates. This contrasts with the approach proposed in the present study, which advocates the use of a minimalist design in relation to the number of closed-ended questions -approximately 10- thereby achieving a higher response rate among students. Furthermore, this design is consistent with recommendations for conducting surveys with young populations (Spector, 1992).

One of the study's principal methodological contributions lies in the integration of action research with quantitative measurement instruments -namely surveys- which made it possible to combine a logic of reflective intervention with the systematic collection of data. As Kemmis *et al.* (2014) argue, action research is particularly appropriate in educational and communication contexts in which the researcher actively participates in the design and implementation of the intervention. Nevertheless, this same level of involvement also represents a methodological challenge, as it may introduce biases derived from the researcher's dual role as both investigator and agent of change. In the present study, this limitation was mitigated through rigorous documentation of each stage of the process, following the recommendations proposed by Creswell and Plano Clark (2018) for mixed-methods studies.

With regard to the use of pretest and posttest surveys, the methodological findings confirm that this design constitutes a viable tool for detecting variations in complex variables such as motivation, engagement, or perceptions of learning. Authors such as Shadish *et al.* (2002) have noted that, despite its vulnerability to threats to internal validity, the pretest-posttest design is widely employed in applied contexts because of its ethical, logistical, and economic advantages. In the present study, the principal difficulty concerned the causal attribution of the observed changes exclusively to the gamified intervention, a limitation inherent to quasi-experimental designs without a control group.

Similarly, the use of non-probabilistic convenience sampling, which is common in educational and communication research, limits the generalizability of the findings. As Teddlie and Tashakkori (2009) warn, this type of sampling is frequently employed in exploratory and action research studies, where the principal aim is not statistical extrapolation but rather a contextualized understanding of the phenomenon under analysis. In this respect, the methodology employed prioritizes practical applicability over population representativeness.

From a comparative perspective, the methodology employed shares similarities with other recent studies that have analyzed gamified interventions or communication experiences through mixed-methods designs and pretest-posttest measurements. The literature consistently indicates that these approaches are particularly useful during the initial stages of research or in contexts where the implementation of controlled trials is unfeasible (Creswell & Plano Clark, 2018). Nevertheless, scholars also emphasize the need to complement surveys with more in-depth qualitative techniques -such as interviews or focus groups- in order to capture nuances that cannot be adequately addressed through quantitative measurement alone, an issue identified as a possible avenue for future methodological improvement.

Regarding the transferability of the methodology to the field of communication, its usefulness is highlighted in the analysis of communication interventions in areas such as media literacy, institutional communication, and educational innovation in communication studies. The combination of action research and pretest-posttest surveys makes it possible to evaluate processes of change within real-world contexts, providing a flexible and replicable methodological framework that can be adapted to a wide range of communication-related topics (Jenkins *et al.*, 2013).

Therefore, although the proposed methodology presents limitations inherent to quasi-experimental designs and non-probabilistic sampling, it constitutes a valuable tool for applied research in communication. Its principal value lies in its capacity to generate contextualized knowledge, improve professional practice, and establish the foundations for future research with greater methodological scope, thereby contributing to the debate surrounding methods of analysis in the field of communication. This methodology offers three key criteria for its transferability: maintaining minimalist surveys when working with young populations; mandatory triangulation in order to validate causality; and rigorous documentation of contextual biases.

## **5. Conclusions**

The present study demonstrates that the use of surveys administered at two different moments in time -before and after an intervention- constitutes an appropriate methodological tool for evaluating processes of change in complex variables such as motivation, engagement, or attitudes towards learning in educational and communication contexts. In this regard, the pretest-posttest design, integrated within an action research approach, makes it possible to transform observations derived from practice into systematic empirical evidence, provided that its methodological limitations are properly recognized and managed.

From a methodological perspective, the administration of the survey at two separate points in time makes it possible to identify variations in students' perceptions and to establish relationships between the intervention and the observed changes. This approach not only contributes to strengthening the internal validity of the analysis, by partially controlling for individual and contextual factors, but also facilitates the identification of differentiated response patterns, enabling a direct and quantifiable comparison of the variables under study.

Likewise, the use of brief and structured surveys proves particularly appropriate in educational contexts involving young populations, as it encourages participation and reduces dropout rates without compromising the quality of the data collected. In combination with other techniques associated with action research, this type of instrument makes it possible to combine quantitative and qualitative analyses, thereby enriching the interpretation of the findings.

In this sense, the principal contribution of the study lies in the proposal of a replicable methodological approach that integrates the pretest-posttest design as an instrument capable of comparatively analyzing different dimensions of the educational experience. This approach makes it possible to move beyond the use of global indicators, facilitating a more precise analysis of the factors that influence students' responses to active methodologies such as gamification.

Nevertheless, the analysis also reveals limitations inherent to the methodological design. Non-probabilistic convenience sampling restricts the possibility of generalizing the findings to broader populations, while the absence of control groups makes it difficult to attribute the observed changes exclusively to the intervention under evaluation. Similarly, the use of four-point Likert scales may be insufficient to capture nuances in

certain variables, suggesting the need to complement this approach with qualitative techniques such as interviews or focus groups in future research.

In terms of applicability, the proposed methodology can be transferred to the analysis of other active methodologies in education, as well as to the evaluation of communication interventions in areas such as media literacy, institutional communication, or communication for social change. In all these cases, the pretest-posttest design integrated within an action research approach provides a viable methodological framework for studying processes of change in these contexts, helping to balance methodological rigor with practical relevance.

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**Funding:** This work is not part of any funded research project.

**Conflict of interest:** The author declares that there are none.

**English translation:** Provided by the author.

**HOW TO CITE (APA 7<sup>a</sup>)**

González-Sanz, F. (2026). Evaluation of Educational Gamification Through pre and post-surveys. *Comunicación & Métodos*, 8(1), 24-36. <https://doi.org/10.35951/v8i1.268>