

Impact of learning based on musical games: action research in a university course for the training of teachers in Primary Education in Spain



Mauricio Rodríguez Lópezⁱ
University of Almería, Almeria (Spain)

Juan Rafael Muñoz Muñozⁱⁱ
University of Almería, Almeria (Spain)

Macarena Castellary Lópezⁱⁱⁱ
University of Almería, Almeria (Spain)

Abstract

This study investigates the potential of musical games to enhance the motivation of first-year students in the Primary Education Degree program, within the mandatory course of Music Didactics in Primary Education. It evaluates the impact of using musical games on learning and teacher training. The research was conducted in four phases: preparation, implementation, evaluation, and action, over a three-week period. The 83 participants completed Likert-scale questionnaires, were observed during the activities, and participated in group discussions. The results indicate that, although 60.2% of participants were unfamiliar with the game-based learning methodology, 90.3% reported feeling motivated after participating in the project. It is highlighted that musical games not only fostered motivation but also improved cooperation and musical skills. This study emphasizes the importance of integrating games as a pedagogical resource in initial teacher training.

Keywords

game-based learning; higher education; musical education; action research.

Impacto da aprendizagem baseada em jogos musicais: um estudo de pesquisa-ação em um curso universitário de formação de professores para a Educação Básica na Espanha

Resumo

Este estudo investiga a capacidade do jogo musical para melhorar a motivação dos estudantes do primeiro ano do curso de licenciatura em Pedagogia, na disciplina obrigatória de Didática da Música na Educação Básica. Avalia-se o impacto do uso de jogos musicais no aprendizado e na formação docente. A pesquisa foi desenvolvida em quatro fases: preparação, implementação, avaliação e ação, ao longo de três semanas. Os 83 participantes responderam a questionários no formato Likert, foram observados durante as atividades e participaram de debates em grupo. Os resultados indicam que, embora 60,2% dos participantes desconhecêssem a metodologia de aprendizagem baseada em jogos, 90,3% relataram sentir-se motivados após a participação no projeto. Ressalta-se que os jogos musicais não apenas fomentaram a motivação, mas também



aprimoraram a cooperação e as habilidades musicais. Este estudo destaca a importância de integrar o jogo como recurso pedagógico na formação inicial de professores.

Palavras-chave

aprendizagem baseada em jogos; ensino superior; educação musical; pesquisa-ação.

**Impacto del aprendizaje basado en juegos musicales:
investigación-acción en un curso universitario para la formación de maestros en
Educación Primaria en España****Resumen**

Este estudio investiga la capacidad del juego musical para mejorar la motivación del alumnado de primer curso del Grado en Educación Primaria, dentro de la materia obligatoria de Didáctica de Música en Educación Primaria. Se evalúa el impacto de usar juegos musicales en el aprendizaje y la formación docente. La investigación se desarrolló en cuatro fases: preparación, implementación, evaluación y acción, durante tres semanas. Los 83 participantes respondieron a cuestionarios tipo Likert, fueron observados durante las actividades y participaron en debates grupales. Los resultados indican que, aunque el 60,2% de los participantes desconocía la metodología del aprendizaje basado en juegos, el 90,3% se sintió motivado tras participar en el proyecto. Se destaca que los juegos musicales no solo fomentaron la motivación, sino que también mejoraron la cooperación y las habilidades musicales. Este estudio enfatiza la importancia de integrar el juego como recurso pedagógico en la formación inicial de docentes.

Palabras clave

aprendizaje basado en juegos; educación superior; educación musical; investigación-acción.

1 Introduction

University teaching has been the subject of wide debate, especially with regard to the effectiveness of traditional methods to promote active participation and meaningful learning (Bigi; García; Chacón, 2017; Castañeda, 2010; Mesa; Gómez; Arango, 2023; Moyano; Bruque, 2006). The literature also highlights the importance of innovative tools, such as gamification and the use of emerging technologies, which seek to increase student motivation (Parra-Santos; Molina; Casanova, 2018; Rodríguez, 2022).

From birth, childhood play plays a crucial role in cognitive and social development, representing a creative and self-determined activity that encourages learning naturally and intentionally (Piaget, 1951; Vygotsky, 1978). While Piaget (1951) highlights play as a mechanism for building knowledge through interaction with the environment, Vygotsky

(1978) conceives it as a space for the internalization of cultural norms and social development.

In this study, “musical games” are defined as structured activities that combine playful elements with clear pedagogical objectives. These activities serve a dual purpose: fostering specific musical learning (such as rhythm, auditory memory, and improvisation) and developing transversal skills (such as collaboration, problem-solving, and creativity). Selected games include rhythm activities, musical memory dynamics, and improvisation exercises tailored to the participants' level.

However, the traditional educational system tends to separate play and learning, relegating the former to early childhood education, while the latter is formalized in later stages (Bruner, 1966; Dewey, 1899). This approach can limit students' active and meaningful participation, particularly in a diverse and multicultural educational environment where students are required to be individually and collectively motivated.

In the context of the Spanish education system, Compulsory Secondary Education (ESO), from 13 to 16 years old, and Baccalaureate, from 17 to 18 years old, represent the stages prior to higher education. These levels, together with the university training of future teachers, include key subjects such as Didactics of Musical Expression, designed to provide students with innovative pedagogical tools. Music, in this context, is not only an artistic discipline, but also a means to develop transversal skills.

Previous research has shown that play-based strategies increase intrinsic motivation, improve knowledge retention, and foster lasting learning (Fernández, 2018; Giraldo, 2023). In addition, recent studies have shown a significant increase in research on educational games, highlighting board games as an effective pedagogical tool (Garrido-Sánchez; Crisol-Moya, 2023).

As Rodriguez (2023) has studied, games have gained popularity in several educational fields within middle school, including music education. In response to this evidence, this study proposes to evaluate the impact of musical games on the learning and motivation of first-year students of the Degree in Primary Education, students who will be future teachers of students from 6 to 12 years old. With a research-action methodology, it seeks to explore how these games can be integrated into the classroom to develop key competencies in future teachers. Specifically, this study addresses four main objectives:

- Evaluate the impact of the use of musical games on learning.

- Analyze how students perceive musical play as an educational strategy.
- Compare the impact of different approaches to musical games, such as rhythms, memory, and improvisation.
- Design and evaluate didactic resources related to the game.

The hypotheses proposed are:

- Musical games motivate students and generate learning.
- Game-based learning improves participants' performance.

2 Methodology

This research has been developed from the action research to respond to the hypotheses raised and objectives described. Action research, a term coined and developed by Lewin (1946) in several of his investigations, is currently used with various approaches and perspectives, depending on the problem to be addressed. There are numerous theorists who recommend its application in secondary education (Efrat; Ravid, 2020; Hall; Wall, 2011; Taylor; Wilkie; Baser, 2006) and praise the benefits it can bring to the classroom after the analysis of the data collected, all agree that educational practice is improved, on the one hand by reflecting on the plans and results obtained and on the other by studying the comments of students, since it is based on a significant approach for them (Laprise, 2017).

This methodology not only involves investigating teaching, but understands it as a process of inquiry in itself, a constant search. In this context, action research redefines teaching work by integrating reflection and intellectual work into the analysis of educational experiences, considering them essential elements of the educational activity itself. In the words of Elliot (1993, p. 88), this methodology involves "[...] the study of a social situation to try to improve the quality of action in it".

Problems direct action, but the most crucial thing in action research is the reflective exploration that the professional makes about his own practice. This is valued not only for its contribution to problem solving, but mainly for its ability to make the teacher reflect continuously, plan it and be able to introduce progressive improvements.

The research has been developed in four distinct phases:

- Preparation phase: selection of games and creation of the necessary teaching materials, after reviewing the literature.
- Implementation phase: development of learning through participation in the different games proposed. In this phase, a first collection of data is developed related to the participants' initial knowledge, real participation, motivation and observed performances.
- Evaluation phase: the previous data are analyzed and the need to implement the musical game as a daily didactic resource is discussed in class.
- Action phase: Participants create, develop and display their own learning materials based on musical games.

In this study, different types of musical games were designed and implemented with specific pedagogical objectives, adapted to the level of the participants. The main types of games used are described below:

1. Rhythm games

- Description: Activities that involve the reproduction, creation and imitation of rhythmic patterns through body percussion, simple instruments (such as drums or boxes) or palms.
- Objective: To improve auditory perception, motor synchronization, and group coordination. These games encourage attention and auditory memory.

2. Music Memory Games

- Description: Dynamics that involve listening to and remembering melodic fragments or sequences of sounds, which must be reproduced later.
- Objective: To develop attention span, retention of musical patterns and identification of melodic structures. This type of game also strengthens confidence in playing music.

3. Improvisation games

- Description: Activities that allow participants to create melodies or rhythms freely within a predefined framework, using their creativity and expressive skills.
- Objective: To encourage creativity, self-expression and musical sensitivity. Problem-solving skills are also worked on by integrating original musical ideas.

4. Collaborative group games

- Description: Activities in which participants must work together to create musical compositions or solve rhythmic and melodic challenges.
- Objective: To enhance collaboration, group coordination and communication skills. These activities seek to strengthen the group's sense of community and cohesion.

All the action has been supervised by the teachers responsible for the group.

2.1 Participants

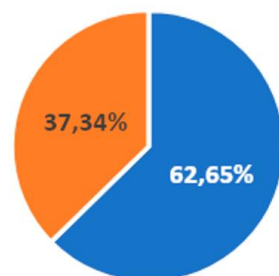
We have worked with the students of the Degree in Primary Education, first year, participant in the Didactic subject of Musical Expression in Primary Education, University of Almería, during the 2022-2023 academic year. The total sample is 83 participants ($n = 83$), which corresponds to the students of group C. The participants have no previous musical knowledge; it is the first subject on music didactics offered in their compulsory curriculum. This subject is within their curriculum in the first training course so that they have the basic notions of music didactics at the time of attending their first classroom practices, which will be during the second year, with students from 6 to 12 years old.

Table 1 – Detail of the study population

	18-20	21-25	26-30	31-40	Total
Female	32	18	1	1	52
Male	24	7	0	0	31
Total	56	25	1	1	83

Source: Own elaboration (2024).

Figure 1 – Detail of the population by sex



■ Female ■ Male

Source: Own elaboration (2024).

2.2 Data collection

The main instrument of data collection has been the form, so it is confirmed that there is a quantitative analysis of the results, although the observation of the participants and the group discussion have also been used as a self-assessment on the materials created. The validity of the content of the questionnaire was evaluated by an expert panel composed of three teachers with experience in playful methodologies and music education. The items were reviewed to ensure their relevance and alignment with the objectives of the study, ensuring that the questions address both motivational aspects and specific skills related to musical games. To validate the structure of the questionnaires, a pilot analysis was performed with 10 participants who were not part of the main sample. This allowed minor adjustments to be made in the wording of items and to ensure that the questions were clear and understandable.

Total participants were 83. The first questionnaire had a participation of cues1 = 83, with a 5-point Likert scale, which was completed during the implementation phase; while the second questionnaire, cues2 = 79, was completed after the action phase.

The questionnaires have been designed through the Google Forms tool and participants have been able to access them through QR codes. As for the qualitative data, collected using Google forms after the debates, they have been grouped around two main axes: individual learning related to musical expression within games and the effectiveness of games to develop cooperation and facilitate group learning.

The reliability of the questionnaire was evaluated by calculating the internal consistency coefficient Cronbach's Alpha, obtaining a value of 0.85 for the first questionnaire and 0.88 for the second. These values indicate a high level of internal consistency, which supports the reliability of the instrument.

In addition, the test-retest method was used with a subgroup of participants to evaluate the temporal stability of the responses. The correlation coefficients obtained exceeded 0.80 in all the variables analyzed, confirming the reliability of the questionnaire at different points in time.

2.3 Data analysis

Age and gender have been defined as classification variables, while two groups have been created as independent variables based on previous experience developing musical games in the classroom and the methodologies that as middle school students have guided their learning, on the one hand, and in a second block of questions those related to motivation, feeling of belonging to the group and evolution of learning.

The data collected in cues1 and cues2 have been processed with the SPSS software in its version 29. Cronbach's alpha for cues1 = .622 and for cues2 = .574, so the statistics shown are for reliability. The qualitative data obtained in the debates have been coded based on the aforementioned axes and grouped according to the answers into three categories: expressive freedom during participation, the ability of music to develop emotions and the importance of music in group learning in Primary Education.

3. Results and Discussion

The results are based on cues1 = 83 and cues2 = 79 applied in the implementation and action phases. With a sample of 83 participants maximum, we are facing a normal probability distribution with a margin of error of $\pm 5\%$.

Analyzed the data from the first questionnaire, it is noteworthy that 74.7% say that they have never or almost never developed game-based projects or acquired any of the key skills through game-related resources, both in the ESO and Baccalaureate stages. However, 39.8% confirmed that in the subject of Music it was common to develop various games in class. Likewise, 75.9% responded that the contents of the curriculum should be developed through a game-based methodology, which corresponds to an average of 4.31 and a standard deviation of 0.896. Table 2 shows the descriptive statistics for items 3 and 7.

Table 2 – Descriptive statistics of the indicated items

	N	Minimum	Maximum	Mean	Standard Deviation
In the music subject, during ESO or Bachillerato, have you played in class?	83	1	5	2.80	0.985

In your opinion, do you think the contents of the curriculum can be better assimilated through games?	83	2	5	4.31	0.896
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Source: Own elaboration (2024).

It is noteworthy, as the data in Table 3 show, that 90.3% of the sample confirms that they were motivated in the middle school stage when they participated in various games, either in the areas of music, language or physical education, which coincides with the postulates of Piaget (1951) on the role of play in the construction of knowledge and with the findings of Fernández (2018), who highlights that ludical activities increase intrinsic motivation.

In addition, with an average of 4.55, with a deviation of .649, they are convinced that the implementation of play in the classroom improves cooperative work and develops problem solving; this average corresponds to 91.6% of participants; the cooperative work observed in this study supports the perspective of Vygotsky (1978), who highlights that play creates a social space where students internalize skills and cultural norms essential for learning.

As can be seen in Table 4, if the data of items 8 and 9 are analyzed, it is observed that the students participating in the study are convinced, at 54.2%, that games motivate to participate, while the frequency is reduced to 0, no participant believes that game-based learning does not promote skills, in item 9.

Table 3 – Descriptive statistics of the indicated items

	N	Minimum	Maximum	Mean	Standard Deviation
In your opinion, do you think that game-based projects can improve student participation and interest compared to other educational approaches?	83	3	5	4.45	0.667
In your opinion, do you think that game-based projects foster skills such as teamwork and problem-solving?	83	3	5	4.55	0.649

Source: Own elaboration (2024).

Table 4 – Analysis of variables 8 and 9

In your opinion, do you think that game-based projects can improve student participation and interest compared to other educational approaches?

Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	NORMAL	8	9.6%
	ALMOST ALWAYS	30	36.1%

	ALWAYS	45	54.2%
Total	83	100.0%	100.0%

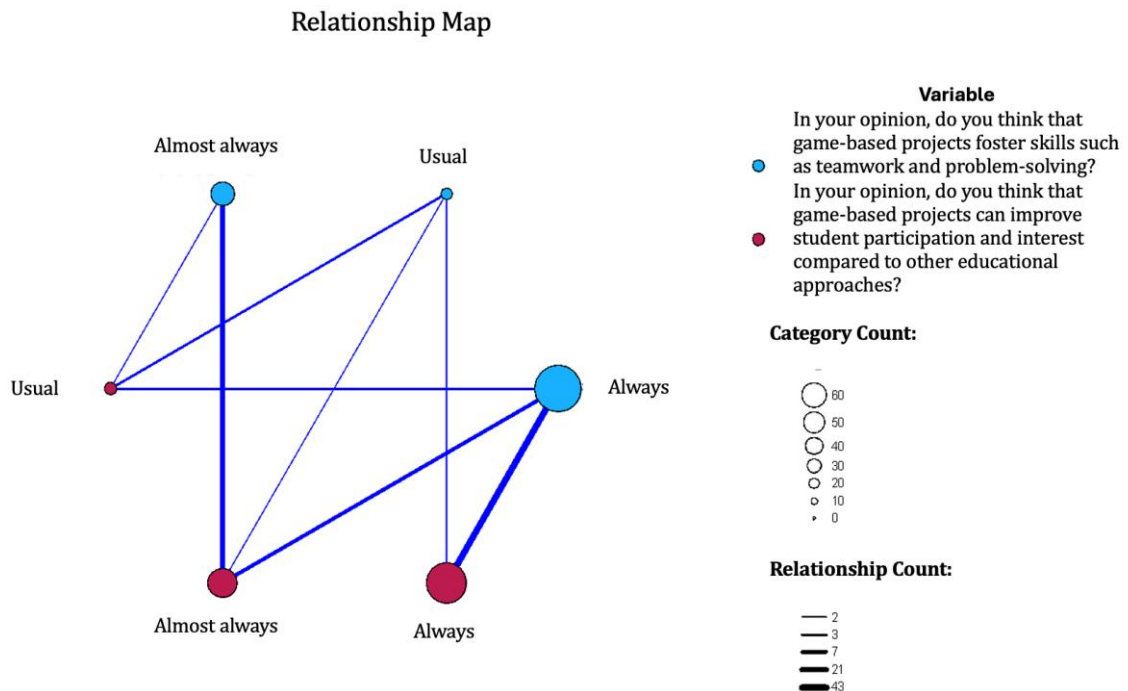
In your opinion, do you think that game-based projects foster skills such as teamwork and problem-solving?

Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	NORMAL	7	8.4%
	ALMOST ALWAYS	23	27.7%
	ALWAYS	53	63.9%
Total	83	100.0%	100.0%

Source: Own elaboration (2024).

In addition to the group results already presented, the individual relationships between variables 8 and 9 of cues1 have been analyzed (see Figure 2). After comparison, it is confirmed that participants have affirmed that game-based learning is capable of developing skills and motivations necessary for the development of competencies within the Primary Education Music classroom.

Figure 2 – Detail of the individual relationships between items 8 and 9



Source: Own elaboration (2024).

For cues2, the sample was n = 79. This second questionnaire has been implemented after the action phase, that is, when all the work teams had already created and presented at least two musical games in class. This second questionnaire follows a

Likert scale similar to the first and has consisted of nine questions, ranging from 21 to 29 (see Table 5).

Table 5 – Detail of cues2 variables

Var21. I have learned new skills related to creating musical games	Var26. The feedback received during the presentation has helped me identify areas for improvement in our musical game
Var22. I feel like my performance has improved in terms of creativity and musical skills	Var27. This experience has inspired me to continue exploring the relationship between music and technology
Var23. The experience of creating and presenting a musical game has motivated me to explore more in this field	Var28. I feel that I have developed effective communication skills by presenting our musical game to the class
Var24. I feel more confident in my musical skills after this activity	Var29. I am satisfied with the end result of our musical game
Var25. Teamwork was effective and contributed positively to our musical game project	

Source: Own elaboration (2024).

100% of the participants indicated in the second questionnaire that they had improved their creativity and musical skills after the implementation of musical games. This finding aligns with previous studies (Fernández, 2018; Garrido-Sánchez; Crisol-Moya, 2023) that highlight that game-based strategies not only increase intrinsic motivation, but also encourage the development of social skills, such as collaboration and problem-solving.

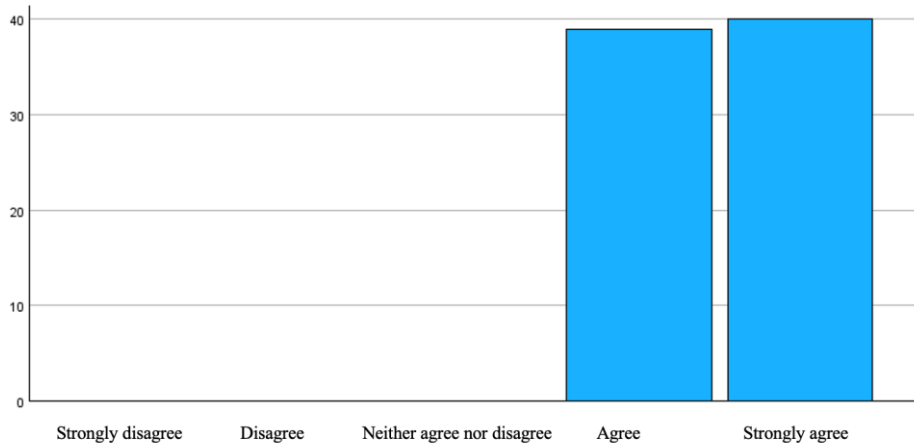
After the presentations of each group, a rubric was applied in which the participants had to assess qualitatively and quantitatively what was observed, so that each student has been aware *in situ* of the possible mistakes made and the suggestions for improvement of their peers¹. In addition, by using this rubric, presented at the beginning of the study and published throughout the research, it is possible for students to be clear about the objectivity of the evaluation, resolve doubts before starting the process, improve the materials to achieve the highest score or be empowered by taking an active role in their learning process.

The implementation of public rubrics throughout the process allowed students to reflect continuously on their learning, which coincides with Dewey's (1899) proposal on the importance of formative assessment as an integral part of experiential learning.

¹ Rubric: <https://view.genial.ly/5bca1ca985b4235ba20aa64b>.

Figure 3 – Detail of the individual relationships between items 8 and 9

Simple Bar Chart: Count of 'I have learned new skills related to the creation of musical games

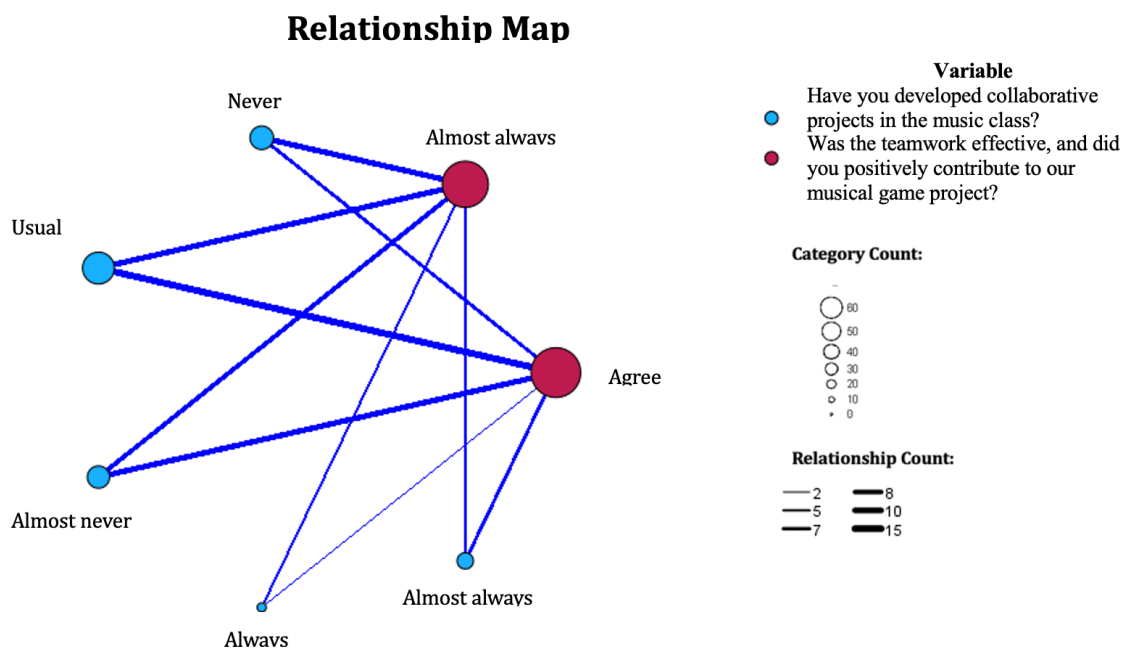


I have learned new skills related to the creation of musical games

Source: Own elaboration (2024).

Figure 3 shows that, with a mean of 4.70 and a deviation of 0.45719, the study population confirms its evolution after the action phase. If the variables of both questionnaires related to cooperation are compared, it is noteworthy that, after the action phase, they do agree with "totally agree" students who during their middle school stage said they had not participated in group tasks (see Figure 4).

Figure 4 – Detail of the relationships between two variables



Source: Own elaboration (2024).

Regarding the results of the qualitative data obtained during the debates, it is noteworthy that only one participant states that through musical games it is not clear that learning can be developed, emotions can be shared or group work can be improved. The rest mention the idea that games have given him the freedom to express himself more freely and personally. Words such as “free” (EM10, EM23, and EM44), or statements such as “I can do whatever I want” (EM09 and EM50) and “express myself as I feel myself” (EM23) suggest that games have provided a space for individual expression. Terms such as “music transmits creativity to me” (EM20), “leaves a more relaxed mind” (EM23) and “working from an early age can be one of the favorite moments of children” (EM33) are mentioned. Even the EM25 participant expresses interest in improving their training through music courses for Primary Education and recognizes the importance of music in this educational environment. This suggests an awareness of the benefits of integrating music into education from an early age.

Some of the notable statements have been:

I did not take into account what music can promote in the classroom, because, in class and with my classmates, I have seen it possible to work on any topic, such as flags, steps such as gymkanas and, in addition, it is very motivating for students (EM03).

Through music, we have expanded our concentration and understanding of music (EM04).

Music and our body are linked, so I have been able to express my feelings through music and its rhythms (EM07).

With games, each person can move to their own form and also express themselves freely (EM08).

Music makes one express themselves freely as they feel (EM10).

The results of this study provide a detailed and nuanced view on the implementation and perception of play-based activities in the educational context of ESO and Baccalaureate in the first place and the perception of the participants after being part of a research-action project in the subject “Didactics of Music Education in Primary Education”, a compulsory subject of the first year of the Primary Education Degree.

Although a large proportion of participants indicated that they had not participated in play-based projects in the past, most expressed interest in this pedagogical approach after the action phase. This finding suggests that although previous opportunities for game-

based learning have been limited, there is a strong desire and belief in the benefits of play in the educational process.

The data reveals that the implementation of play in the classroom not only motivated students, but also significantly improved cooperative work and fostered the development of problem-solving skills. These results support the idea that game-based learning can be an effective educational strategy to foster intrinsic motivation and the development of social and cognitive skills in students.

Regarding the responses to the second questionnaire, it is encouraging to note that 100% of the participants indicated that they had improved their creativity and musical ability as a result of the implementation of the phases of the game. In addition, the positive feedback received during the performance of the musical games created by the groups underlines the effectiveness and relevance of this pedagogical approach.

Overall, the data suggest that the implementation of music games in the classroom has had a positive impact on several key competencies of the grade in Elementary Education, including the application of knowledge, social skills, communication skills, teamwork, and ability to design, manage, and execute tasks personally. In addition, there are benefits in motivation, the development of specific skills and continuous improvement in educational practice.

Degree studies in Education are structured around the development of basic, transversal and specific competences -five, ten and ten groups respectively-; if this competency framework is compared with the analyses shown, it is obtained that:

39.8% of participants have achieved CB2 proficiency (knowledge application) while developing the games.

For the CB4 competence (ability to communicate and social aptitude), 75.9% responded that during the development of the games, communication between groups and later with the large group becomes a fundamental aspect.

Regarding the specific competencies 8, 9 and 10 (related to the areas of music, physical education and classroom management), the results suggest a positive impact on the development of skills through games and motivation for participation in them.

The specific competence related to science, number 6, has been related to having to combine musical concepts and technology in various games.

As noted when analyzing cues2 variable 28, participation in musical games may have improved effective communication skills, related to specific competence number 7: language and communication sciences. The results indicate that the methodology based on musical games has significantly contributed to the development of transversal and specific competences, especially in areas such as effective communication, creativity and classroom management. These findings relate to the ideas of Bruner (1966), who emphasizes that playful activities allow students to apply previous knowledge in a creative and contextualized way, thus favoring meaningful learning.

Having to reflect before, during and after has led to the development of competence related to practice and continuous improvement.

Overall, the results support the idea that active learning, facilitated through musical games, fosters intrinsic motivation and the development of social and cognitive skills. This methodological approach offers an innovative alternative that responds to the needs of current education, as recent studies have suggested (Parra-Santos; Molina; Casanova, 2018; Rodríguez, 2022).

5 Final considerations

This study provides clear evidence on the positive impact of the implementation of play-based activities in the educational setting, particularly in initial teacher training. Despite the participants' limited previous experience in ludic methodologies, a high level of interest and active participation was observed during the implementation and action phases. The results highlight that the introduction of musical games in the classroom not only motivated students, but also contributed significantly to the development of creative and musical skills. In fact, 100% of the participants claimed to have improved in these aspects after the activities carried out.

In addition, there was a notable change in the perception and acceptance of this methodological approach. Although the majority of participants had not previously worked on game-based projects, 75.9% expressed that the contents of the curriculum should be developed using this methodology. This reinforces the idea that future teachers value play as an effective tool to capture attention and encourage meaningful learning in their future students.

The application of rubrics and continuous evaluation during the exhibitions promoted a culture of improvement in teaching practice, with an average score of 4.70 out of 5 that reflects a positive evolution after the action phase. This process not only strengthened participants' confidence in their ability to design and implement innovative activities, but also gave them the opportunity to critically reflect on their own pedagogical practices.

In terms of contributions to the training of future teachers, this study demonstrates that musical games have significant potential to develop essential competencies in teachers' students, such as effective communication, teamwork, problem-solving and creativity. By directly experiencing the benefits of this methodology, participants acquired practical tools that they can transfer to their future classrooms, promoting more dynamic and motivating educational environments.

Finally, the findings underscore the need to integrate game-based strategies into the curricular design of teacher education programs. The implementation of ludical activities not only encourages student participation and the development of transversal skills, but also prepares future teachers to face the challenges of contemporary education. This study contributes to the growing body of evidence supporting the educational value of musical play and calls on educators and curriculum designers to consider its strategic incorporation into teaching.

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Mauricio Rodríguez López, University of Almería

 <https://orcid.org/0000-0003-2129-5103>

Professor specialising in the teaching of music education, active learning and the development of technological teaching resources. *Leading teacher* of the "Meet and Code" project, led by the Ministry of Education of the Government of Spain to develop computational thinking.

Authorship contribution: Project administration, formal analysis, conceptualization, data curation, drafting – first draft, drafting –, review, editing, research, methodology, obtaining funding, resources, software, supervision, validation and visualization.

Email: maim@maim.es

Juan Rafael Muñoz Muñoz, University of Almería

 <https://orcid.org/0000-0002-6601-7329>

Professor doctor specialist in music education didactics, director of the music band of the Faculty of Education and responsible for the area of musical expression. Composer of children's songs and expert in musical pedagogy.

Authorship contribution: Data curation, writing – first draft – and methodology.

Email: jrmunoz@ual.es

Macarena Castellary López, University of Almería

 <https://orcid.org/0000-0002-9463-1764>

Specialist doctoral teacher in music education didactics, expert in music and special educational needs, specifically in the relationship of emotions with music and its effects on students with Down syndrome.

Authorship contribution: Writing – review and editing.

Email: mcl142@ual.es

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