








Per-Q as an intervention project in virtual education for virtual learning environments

Per-q como proyecto de intervención en educación virtual para ambientes virtuales de aprendizaje

Martínez-González, Fernando Eduardo<sup>a</sup>, Macías-Brambila, Hassem Rubén<sup>\*b</sup>, Rodríguez-Jiménez, Liza Mayela<sup>c</sup> and López-Laguna, Ana Bertha<sup>d</sup>

<sup>a</sup>  Universidad de Guadalajara •  KTI-4547-2024  0000-0002-5578-2922 •  1217082  
<sup>b</sup>  Universidad de Guadalajara •  KDN-7103-2024  0000-0002-6540-7464 •  902812  
<sup>c</sup>  Universidad de Guadalajara •  AID-0858-2022  0000-0002-9084-3831 •  396313  
<sup>d</sup>  Universidad Tecnológica de Jalisco •  KTI-4595-2024  0000-0002-8145-7955 •  847437

CONAHCYT classification:

Area: Humanities and Behavioral Sciences  
Field: Pedagogy  
Discipline: Educational theory and methods  
Subdiscipline: Pedagogical methods

 <https://doi.org/10.35429/JBE.2024.8.19.1.11>

History of the article:

Received: September 15, 2024  
Accepted: November 24, 2024

\*  [\[hmacias@utj.edu.mx\]](mailto:hmacias@utj.edu.mx)

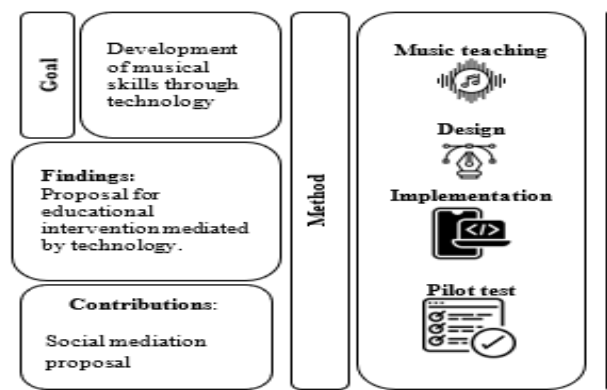


Abstract

This article describes the methodological process in the design, implementation, and evaluation of Per-Q as an intervention project for educational practice in music teaching through the design of multimedia educational resources, social networks, software development and instructional design for virtual learning environments. Considering rhythm as the main element, based on the Rhythmic Dalcroze, Dum-Dum, How to Play, Slap Happy and Rhythm stories methods, as methods that incorporate activities with movements, the game as a didactic element, improvisation, and the possibility of doing it without musical instruments implemented through traditional, constructivist and critical musical didactics approaches. Project aimed at a children's audience based on Jean Piaget's Theory of Cognitive Development and the stage of concrete operations, where initial rhythmic learning is associated with logical operations such as serialization, numbering and classification that are presented at the ages of the target audience. and that contemplates the possibility of implementing social mediation models in existing study programs at various levels of education.

Resumen

El presente artículo describe el proceso metodológico en el diseño, implementación, y evaluación de Per-Q, proyecto de intervención de la práctica educativa en la enseñanza musical, a través del diseño de recursos educativos multimedia, redes sociales, desarrollo de software y diseño instruccional para ambientes virtuales de aprendizaje. Considerando el ritmo como elemento principal, el proyecto está basado en los métodos Rítmica Dalcroze, Dum-Dum, How to Play Slap Happy y Ritmo historias, los cuales incorporan actividades con movimientos, el juego como elemento didáctico, la improvisación y la posibilidad de realizarlo sin instrumentos musicales, todo implementado a través de enfoques de la didáctica musical tradicional, constructivista y crítico. Proyecto dirigido a un público infantil, con edades entre 7 y 12 años, Per-Q está también sustentado en la Teoría del Desarrollo Cognitivo de Jean Piaget y la etapa de operaciones concretas, en donde los aprendizajes rítmicos iniciales se asocian con operaciones lógicas como la seriación, numeración y clasificación que se presentan en las edades del público objetivo y que contempla la posibilidad de implementar modelos de mediación social en los programas de estudio existentes en los diversos niveles de educación.



Musical education, Virtual learning environments, Didactic approaches



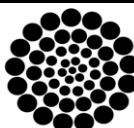
Educación musical, Ambientes virtuales de aprendizaje, Enfoques didácticos

**Citation:** Martínez-González, Fernando Eduardo, Macías-Brambila, Hassem Rubén, Rodríguez-Jiménez, Liza Mayela and López-Laguna, Ana Bertha. [2024]. Per-Q as an intervention project in virtual education for virtual learning environments. Journal Basic Education. 8[19]1-11: e1819111.



ISSN: 2523-2452 / © 2009 The Author[s]. Published by ECORFAN-Mexico, S.C. for its Holding Republic of Peru on behalf of Journal Basic Education. This is an open access article under the CC BY-NC-ND license [<http://creativecommons.org/licenses/by-nc-nd/4.0/>]

Peer review under the responsibility of the Scientific Committee MARVID®. in the contribution to the scientific, technological and innovation Peer Review Process through the training of Human Resources for continuity in the Critical Analysis of International Research.



RENIECYT  
Registro Nacional de Instituciones y  
Empresas Científicas y Tecnológicas

1702902

CONAHCYT

## Introduction

Humanity has found in the use of new technologies a great tool for its educational development. Technological advances in recent decades have significantly impacted the curriculum of existing study programs at all levels of education.

Consequently, music teaching has not been the exception since we find that different approaches to musical didactics coincide with the various models of social mediation that are developed both in virtual learning environments (VLE) and in education.

Starting from the various approaches to didactics we find ourselves first with the traditional approach that contemplates traditional or “classical” models, such as the so-called musical academic model, where theoretical learning is separated from practical learning and musical practice is worked through imitation and repetition (Marín-Liébaña et al., 2021).

This approach is related to the behaviorist mediation model in which students are led to concrete and specific objectives and the replication of behaviors through instruction and reinforcement. Secondly, we identify that the constructivist approach contemplates an active role of the student through their own experience and interaction with the environment that coincides with the cognitive paradigm of mediation that guides students to the resolution of significant activities and practical experiences (Ramírez and Chávez, 2021).

It is also associated with the humanistic model (both didactic and mediational), where the student is placed at the center and his or her needs and interests are attended to, promoting self-evaluation and self-criticism and the student's responsibility in his or her own learning process.

Finally, we distinguish the so-called critical approach to musical didactics that is based on the socio-critical paradigm oriented towards action and transformation where “the teacher is a transformative intellectual, while the student is an active subject who constructs his reality in a socio-economic way constructivist from social interaction” (Marín-Liébaña et al., 2021, p. 18).

As Giroux (2001, cited in García-Vélez and Maldonado, 2017) points out, education is above all a socialization process in which we learn to be citizens, relating to the environment in different sociocultural spaces. The social construction of learning dates to Vygotsky's social constructivism, which considers that human development occurs in a social process.

Vygotsky establishes that cultural aspects as a manifestation of the social are determinants in the cognitive development of the person, his theory is centered on the genetic law of cultural development, which establishes that every cognitive function appears first on the social level, understood as the immediate environment and then on the individual psychological level (Zapata-Ros, 2015). In this way, musical learning can be presented as a process of social and cultural formation.

From a constructivist mediation, the student's own learning experience is involved in the student's process through interaction and participation in accordance with Vygotsky's theory. The relationship between the approaches of musical didactics with the paradigms of social mediation opens new paths in the implementation of musical education in virtual environments.

Calderón et al., (2019), establish that musical education throughout history has been characterized by face-to-face teaching in which a teacher transmitted his knowledge in an almost mystical way to his disciples, creating a bond of companion and accompanied through the path of knowledge.

Although this was understandable and laudable in past times, in the 21st century it may be, if not obsolete, then lacking in ideas that allow us to take advantage of the resources that technological advances offer.

Regarding music and rhythm as part of the comprehensive training of people, the Multiple Intelligences Model is considered, proposed by Howard Gardner in 1983, where the skills that people possess are grouped into at least seven or eight categories or “intelligence”. This model revolutionized the concept of unitary human cognition, speaking of diverse intelligences in all human beings, with the possibility of developing and influencing the teaching-learning process in a different way.

Martínez-González, Fernando Eduardo, Macías-Brambila, Hassem Rubén, Rodríguez-Jiménez, Liza Mayela and López-Laguna, Ana Bertha. [2024]. Per-Q as an intervention project in virtual education for virtual learning environments. *Journal Basic Education*. 8[19]1-11: e1819111.

<https://doi.org/10.35429/JBE.2024.8.19.1.11>

"Each one develops in a particular way and at a particular level, a product of the biological endowment of each person, their interaction with the environment and the culture prevailing at their historical moment. We combine them and use them to different degrees, in personal and unique" (Gardner, 1995).

Among the intelligences established by Gardner is musical intelligence, "made up of people sensitive to the elements of music, which are rhythm, melody, harmony" (Paniagua and Vega, 2008). This intelligence is related to the skills and affinities that people have with respect to music and other forms of rhythmic expression.

Musical intelligence involves emotional development that promotes empathy and the expression of feelings, a process that involves knowledge and improvement of language, and its expression, which includes sociocultural aspects of identification (Rodríguez et al., 2016).

Furthermore, we must keep in mind that when music is performed in a group, and even more so if it is improvised, a high level of understanding of the other, empathy, and verbal and non-verbal expression is required (Davis, 1990).

Now, among the main elements of music we find the following:

- Rhythm, which for Pérez-Aldeguer (2014) is a construct that encompasses both tempo (relative unit of measurement)
- The pulse (as a regular unit of measurement)
- Metric (a specific grouping of sounds with their own meaning, a term inherited from poetry)
- The beat (alternation of strong and weak accents)

Other authors such as Lussy (1982) establish the concept of rhythm as "the order in time or space", or Vignal (1997) as the "ordering of sounds in time". For Jaques-Dalcroze (cited in Pérez-Aldeguer, 2014) rhythm is a vital principle, it is movement and favors the nervous system. Rhythm is also considered a factor of social inclusion and a unifying element between cultures and times.

"Rhythmic education and percussion provide people with an ideal means to develop psychomotor skills, body schema, neuromotor behaviors, temporal space structuring, perceptual organization and psychomotor disorders, among others" (Pérez-Aldeguer, 2014). The different traditions of rhythmic musical teaching allow an approach to multi and intercultural education. For Pérez-Aldeguer (2014), inclusive education comes to be the set of principles that guarantee that the student, regardless of his or her characteristics is a valuable person; It's about an attitude.

Multiculturalism, then, refers to the presence of several cultures in the same society and assuming it means recognizing the right to difference as an educational and social enrichment (Imbernón, 2000). Music can be used as a pedagogical resource that promotes acceptance and recognition of cultural diversity.

Hemsey de Gainza (2004) states that "in European musical pedagogy, the learning of rhythmic-body games and ethnic (especially of African origin) and popular dances" is common.

It also observes that in some Latin American countries children and young people learn music through various popular practices such as singing, dance, games, etcetera, which include participation and bodily performance. Therefore, rhythmic teaching through Communication and Information Technologies (ICT) makes it necessary to develop technological tools considering a curricular design in accordance with the learning objectives and pedagogical development that is managed in an integral manner in the VLE, with the purpose of successfully acquiring the musical skills established by an educational program.

## Methodology

The methodological process implemented for the project is based on the integration of an educational intervention proposal, which contemplates the recognition of rhythmic musical teaching through a Virtual Learning Environment (VLE), the delimitation of the target audience, the selection of the environment virtual learning, the design of the intervention, the definition of objectives, goals and indicators, as well as the definition of strategies and project programming, its implementation and evaluation.

Martínez-González, Fernando Eduardo, Macías-Brambila, Hassem Rubén, Rodríguez-Jiménez, Liza Mayela and López-Laguna, Ana Bertha. [2024]. Per-Q as an intervention project in virtual education for virtual learning environments. Journal Basic Education. 8[19]1-11: e1819111.

<https://doi.org/10.35429/JBE.2024.8.19.1.11>

## Rhythmic musical teaching

Derived from the COVID-19 pandemic, it was necessary for in-person music classes taught by different teachers to migrate to the virtual modality, generating a bias in the use of appropriate pedagogy by the teacher to teach his class, as well as in the elements appropriate to the curriculum contained in the program.

Once the diagnosis was carried out, in which the problems of online music classes were identified, the focus of the proposal was determined both in its main theme, the delimitation of the target audience and the ideal virtual environment for its implementation.

The importance of rhythm as the main element of music and as an example of practical musical learning is presented as an appropriate area for the main theme of the project, considering different aspects in the implementation of its teaching-learning processes.

By determining rhythmic musical learning as the central axis of the proposal a study was carried out of different methodologies in which play, improvisation and multicultural competencies are present as common elements such as Dalcroze rhythmic, the Dum-Dum program, How to play Slap Happy and Rimo Stories, a guide to learning rhythmic stories through musical improvisation.

The following similarities were found among the methodologies:

- Rhythm and movement. (Dalcroze Method, Slap Happy).
- Possibility of making rhythms with movements with parts of the body without having to have a musical instrument. (Slap Happy, Dum-Dum).
- Use of own symbols (Dum-Dum, Rhythm Stories).
- Using a drum pattern (Percussion) or a navigation pattern as rhythmic musical notation. (Dum-Dum, Slap Happy, Rhythm Stories).
- Game as a teaching element. (Dalcroze, Dum-Dum, Rhythm Stories).
- Multiculturalism, music and rhythm in different cultures. (Dum Dum, Slap Happy, Rhythm Stories).

## Delimitation of the target audience

The activities of the methodologies, in which game dynamics are developed, can be easily implemented with children and young people.

Dum Dum is a method designed for primary school children, and the experiences compiled in the diagnoses of teachers Georgina Gómez and Héctor Aguilar, experts in the Dalcroze and Ritmo Historias methodologies, respectively, demonstrate the good practices of the methods in that sector. from students.

Ages 7 and 12 correspond to the ages of the stage of concrete operations established in Jean Piaget's theory of cognitive development, "concrete operations constitute the transition between action and more general logical structures that involve combinatorics and "group" structure. (Piaget et al., 2016) At this stage, children develop their operational schemes and can classify, order, and understand the notion of number.

The structuring of rhythm corresponds to the operations that make up the concept of the notion of time, established in theory: the series of events constituting the order of temporal succession, an adjustment of intervals between specific events, a source of duration, and a temporal metric. (which already acts in the system of musical units, long before any scientific elaboration), isomorphic of spatial metrics (Piaget et al., 2016).

Children between six and twelve years old are in the period of development in which they move from preoperative thinking to concrete operational thinking and in the maturation and progressive transformation towards a reflective awareness of structures.

From these ages, it is possible to introduce rhythmic activities that involve ostinatos (repetition of the same musical idea) and formulas that can be adapted to the possibilities of the children, considering each difficulty overcome to introduce new rhythmic elements (Meece, 2000).

Classification and serialization allow us to understand the order of the rhythm, both in the steps to execute it and to structure it.



The notion of numbers from the perspective of serialization and the understanding of space, time and speed allows us to capture the rhythmic sense not only through repetition, and where the support of a visual representation can be auxiliary as a reference to develop a musical idea. rhythmic.

### Selecting the virtual learning environment

The factor associated with the digital divide as part of the problem of users' limitations in digital skills and competencies can be addressed by selecting a platform that is easy to use, accessible and does not require high technological skills, such as Google Workspace, formerly known as G-Suite.

The variety of tools that Google offers allows on the one hand, to design activities and dynamics that do not imply advanced digital skills in students.

On the other hand, considering the characteristic environments of a virtual learning environment established by Peña (2014), the diversity of tools offers different alternatives for the development of the actions corresponding to each environment:

Sites: Development of the main page.  
Classroom: Main platform with home section.  
Calendar: Agenda information and dates.

#### *Knowledge environment:*

Classroom: Activities supported by resources.  
Drive: Repositories, files, and content.  
YouTube: Channel with content and activities.

#### *Practical and collaborative learning environments:*

Classroom: Space for activities and tasks.  
Options for many "sharing" tools.

#### *Evaluation and monitoring environment:*

Classroom: Grades section.  
Sheets: Spreadsheet for records and functions such as averages.

#### *Management environment:*

Classroom and Sites: Online services.

In addition to the benefits of accessibility and ease of use of Google Workspace as a virtual learning environment, the familiarization of students with Google tools was considered both in the State of Jalisco and at the national level. Since before the start of the pandemic, the Government of Jalisco already had an alliance with Google, and it is since the beginning of the health emergency that it has been established as the main platform to continue with classes.

Below is an excerpt from the Jalisco Government's press release detailing the actions and digitization process that occurred with Google: "Since 2019, the Ministry of Education and Google have been working hand in hand, with a strategy to that all basic education students and teachers could access a free Google Workspace for Education educational account, under the educational domain @jalisco.edu.mx, institutional accounts were created and delivered.

This process was considerably accelerated due to the pandemic, since more than 1.5 million accounts were created for students and just over 80 thousand for teachers.

It should be noted that, along with this process, digital training actions were implemented among the educational community, which resulted in a high adoption of Google tools" ([Gobierno del Estado de Jalisco, 2022](#)).

### Design of the intervention proposal

Per-Q: Rhythmic learning music education program based on methodologies that promote active learning and play as an element in learning. Aimed at children between 7 and 12 years old through Google Workspace (G-Suite) tools.

The name Per-Q arises as a variant of the abbreviation of the word percussion, percu, changing the syllable cu for the letter Q as a phonetic relationship.

The project is based on rhythmic musical teaching as the main object of study, contemplating different methodologies and their implementation in virtual learning environments (VLE), as well as accessibility to learning and content, also considering the approaches of musical didactics and aspects of socio-constructivism for mediation in the VLE.

Martínez-González, Fernando Eduardo, Macías-Brambila, Hassem Rubén, Rodríguez-Jiménez, Liza Mayela and López-Laguna, Ana Bertha. [2024]. Per-Q as an intervention project in virtual education for virtual learning environments. Journal Basic Education. 8[19]1-11: e1819111.

<https://doi.org/10.35429/JBE.2024.8.19.1.11>

Developed as a proposal aimed at children, gamification techniques and tools and the Multimedia Learning Theory are considered in the design of the activities and in the creation of original resources.

Objectives and indicators were designed consistent with the design of the intervention proposal.

General objective

Develop a music education program based on rhythmic musical learning methodologies and from various approaches to musical teaching for children from 7 to 12 years of age through Google Workspace and with the support of self-made digital resources.

Specific objectives

- Implement a first module of the program operating from the Google Workspace platform with Classroom as the main application.
- Implement asynchronous activities presented in video format as educational resources and implement them from Classroom.
- Create original digital resources as an interactive application.
- Use social networks and an official website as means of dissemination and socialization of the program.
- Register the application trademark with the IMPI.

Indicators

- The activities are based on theoretical and practical introductory topics of musical rhythm appropriate for the ages of the participants. ranging between 7 and 12 years old.
- The activities present characteristics of the rhythmic learning methodologies contemplated in the development of the project.
- Mediation in the virtual learning environment corresponds to the paradigms of mediation and its relationship with musical teaching approaches.
- The program is implemented on the classroom platform with the support of other tools from Google Workspace.

Definition of strategies

The definition of the strategies was carried out based on the creation of digital educational material for the development of digital resources considered with the cognitive theory of multimedia learning and gamification techniques. The strategies implemented where:

- Use of Cognitive Theory of Multimedia Learning
- Use of gamification techniques
- Use of interactive quizzes

Project schedule

The project was developed between June 2022 and April 2023. The proposal was proposed in three stages: 1. Preparation, 2. Implementation, and 3. Evaluation. Figure 1 presents evidence of the first stage, preparation.

Box 1

Activity (2022)	apr	may	jun	jul	ago
1-Enterprise image desing					
2- Production of activities and resources					
3.1. Purchase of pera.com.mx domain and hosting					
3.2 Website design on Google Sites					

Figure 1

Preparation stage.

Own elaboration.

Implementation

The implementation process initially considered the preparation stage, in this phase the project identity was created, materials were developed, the registration and opening of virtual spaces and complementary products were generated.

The second moment consisted of the development of the corporate image, Figure 2, providing the graphic identity of the project, which was defined considering the target audience, using primary colors and elements related to percussion, such as the letter Q in the shape of a drum.

**Box 2****Figure 2**

Corporate image PER-Q

*Own elaboration.*

With the intention of establishing the Per-Q project as a formal musical education program, actions were carried out such as the registration of the trademark with the Mexican Institute of Industrial Property, IMPI, the purchase of a domain and hosting to host its own website, and a subscription to the Google Business Starter program.

The Per-Q brand was registered with the IMPI in August 2022, obtaining the resolution at the end of January 2023 and in which the use of the name is allowed for 10 years for educational purposes and musical materials.

In addition, the perq.com.mx domain was purchased in August 2022 through the GoDaddy platform, and then hosting services were obtained from the Tree Design company. For a simple but effective design of a custom website, the Google Sites tool, belonging to Google Workspace, was used, which can be linked directly to an established domain.

Another important action to consolidate the project was the subscription to the Google Business Starter package, with which it is possible to have a personalized Google account for the domain perq.com.mx, as well as the following benefits and extensions of a Google account:

- Video conferences of 150 participants and recording function.
- 2 TB of storage.
- Security and administration controls.
- Program content and activities.

As a program for children and with the objective of presenting practical concepts and activities, the following topics and concepts were established for the pilot module:

**Program Unit - Content of Module 1**

Concepts: rhythm and percussion.

- Percussion instruments.
- Movement symbols and use of percussion sheet music.
- Basic exercises of rhythms produced by the body and movements.

Multiculturalism: rhythm and instruments of pre-Hispanic Mexico. The activities were developed considering the established themes of the first module and considering the following elements of musical teaching approaches:

- Traditional approach: specific objectives, instruction, separation of the theoretical from the practical in different activities.
- Constructivist approach: meaningful activities and practical experiences. Personalized attention to the student.
- Critical approach: active student, socialization of learning.

The multimedia principles of Multimedia Learning Theory were also considered, such as modality, divided attention, multimedia, and navigation. Another common element of the activities was the use of gamified resources. In each activity, the expected learning and elements of the project-based rhythmic learning methodologies present in each activity were specified.

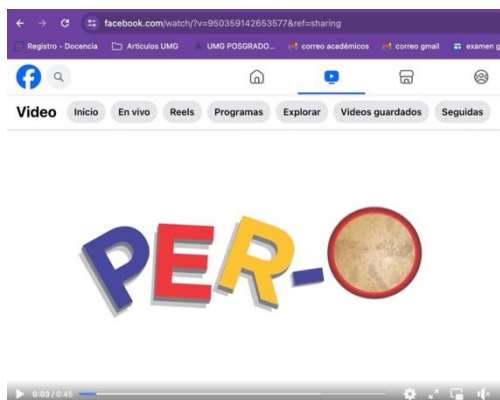
**Pilot test**

During the months of February and March 2023, the pilot test of the first module of activities was implemented. With the registration of the Google Business Starter account and the official page, the activities were uploaded to the Classroom platform from the perq.com.mx account.

The Classroom platform, as a knowledge and practical learning environment within an EVA, allows, in its "Jobs" section, to publish activities presented as tasks. Each activity includes a section with instructions, a link to its respective video, sheet music, and delivery date.

The next step in the implementation of the project was the dissemination of the program. Per-Q's social networks on Facebook, Figure 3, and Instagram were recorded. The module was offered free of charge through the program's social networks and was shared by word of mouth with potential interested parties.

### Box 3



**Figure 3**

Promotional video for social networks

*Own elaboration.*

For registration, parents, or guardians of interested students were asked to complete a Google form. Among the enrolled students, two neurodivergent children participated, both on the autism spectrum, which was also presented as an opportunity to test the implementation of the program with students with special educational needs.

The course was carried out asynchronously from February 20 to March 5, 2023. Throughout the days in which it was held, notices and messages were published to follow up and support participants.

The activities were open throughout the duration of the course, so that participants could do them in their own time and at their own pace. On March 5, the activities were completed, thus closing the implementation of the project.

### Assessment

In the context of the project, the evaluation model of Virtual Learning Environments (VLE) that was considered most appropriate was Marshall and Shriver's Five Level Evaluation Model, which places special emphasis on the teacher as a dynamic agent of training in virtual environments. (Rubio, 2003).

The five levels of the model are the following:

- Teacher: teacher capacity in online training.
- Course materials: in relation to the level of difficulty, relevance, interest, or effectiveness.
- Study plan: evaluation of contents.
- Course modules: based on previous levels.
- Learning transfer allows determining to what extent the course manages to transfer the acquired knowledge (Rubio, 2003).

The digital competencies and skills reflected in the creation and production of resources, the relationship of the study plan with the established objectives of the program, as well as the design of the modules and their contents, are part of the teaching work that can be evaluated following the Model by Marshall and Shriver.

### Results

Derived from the information obtained from the observation guide instrument, carried out by professionals in the field of music teaching, the objective of implementing a first module of the program was achieved operating from the Google Workspace platform in the classroom, correctly integrating elements pedagogical and technological according to the designed program and the target audience.

The results of the evaluation according to the Marshall and Shriver model show that the body movement activities inspired by rhythmic methodologies were attractive to the students, as well as the video of pre-Hispanic instruments that promotes multicultural competencies, therefore it was achieved the development and implementation of a program with activities based on the revised rhythmic musical learning methodologies and their common elements. Also considering that the levels evaluated were appropriate for the characteristics of the project.

The Per-Q project implemented practical learning in virtual environments with original resources, taking rhythm as the main element and relying on methodologies that propose creative and accessible ways of carrying out learning.



The rhythmic musical teaching methods based on the proposal were Dalcroze Rhythm, the Dum-Dum Program, How to Play, Slap Happy and Rhythm Stories; elements and characteristics present in the methods, such as activities with movements, the game as a didactic element, improvisation, dispensing with musical instruments to be able to play rhythms and a multicultural approach, fulfilled one of the objectives expressed in this research work.

## Conclusions

Based on the results of the evaluation, it is concluded that the implementation of the proposal demonstrates that the project has great strengths, among which stand out a solid theoretical base, an innovative proposal and mastery of digital competencies by the team involved to carry out and design quality products and resources suitable both for the public and for use and integration in virtual learning environments.

The choice of "Google Workspace" as a virtual environment is based on its accessibility and its variety of complementary tools that are also easy to use, in addition to the familiarization of users with the Classroom platform, established by public policies at the federal and state levels such as the main platform for the educational field.

Through the diagnoses and case studies presented in the research, the lack of appropriate methodologies and/or strategies to implement practical musical learning in virtual music education environments could be established as a main problem.

Although the target audience was delimited in the formulation of the proposal, the implementation and evaluation demonstrate a whole area of opportunities in aspects of inclusion, considering students with special educational needs when producing the resources and materials.

On the other hand, the project must be constantly updated with respect to the way in which new generations act and interact in virtual spaces to produce more attractive resources that generate greater interest in the public, considering the speed with which the user relationships with technology.

The main weakness of the project was that the target audience, boys and girls, is a sector that does not have autonomy in its decisions and that depends on the decisions of its parents or families to be able to carry out activities related to courses or extracurricular classes.

At the time of offering and promoting the course, information was only obtained about the perception of adults and their criteria for deciding whether their children participated in the module, without being able to really know what the children thought or would have wanted.

On the other hand, the decision to direct the program to a children's audience is based on the possibilities offered by the methodologies contemplated in the project and the experiences of the cases studied in the diagnosis, but it is also reaffirmed when considering the Theory of Cognitive Development of Jean Piaget and the stage of concrete operations, where initial rhythmic learning can be associated with logical operations such as serialization, numbering and classification that are presented at the ages considered in the respective stage.

Linked to this, a reconsideration of the strategies with which the project is promoted and presented is proposed, seeking to make it attractive to families, as well as finding means so that boys and girls can learn about the program directly. It is also considered that the promotion on networks was limited to users who were followers of the program or direct contacts, considering payment for advertising as an option within the area of opportunities.

Derived from weakness, a threat can be identified that gives rise to a new line of research: after two years of pandemic, we are returning to a "normality" in which social isolation is ruled out and where presence is prioritized again. The disinclination of families to have their children carry out online activities may be related to a fatigue with virtuality. The online modality, which during the pandemic was presented as the only way to continue with most educational activities, apparently returns to its complementary status, which opens new research questions:

- ¿What strategies and/or virtual resources do music education teachers and institutions continue to use after the pandemic?

- ¿Have the way music teachers use new technologies for their teaching practice changed?
- ¿What lessons does the pandemic leave us in terms of adaptation and educational innovation?

Without a doubt, the experience of the pandemic shows us the need for both educators and students to be in constant training and development of our technological skills, also having an openness to changes and to try new possibilities outside the established paradigms.

At the time of closing this intervention, the Per-Q project remains active, considering expanding its reach to audiences of different ages and different contexts, such as working with special educational needs, and taking the experience of the implementation of its first course as learning to improve even more the quality of its products from the pedagogical-didactic to the technological.

The search for strategies and implementation of interventions that go hand in hand with the constant technological and social advances in this post-pandemic era is presented as the main challenge, but also as a fertile field of possibilities, for all teachers in the management of learning in virtual environments.

Authors' Contribution

*Martínez-González, Fernando Eduardo:* Contributed to the project idea, research method. He supports the design of the instrument and software.

*Macías-Brambila, Hassem Rubén:* He directed the project and contributed to the selection of the theories, as well as the design and testing of the instruments and applications for its release.

*Rodríguez-Jiménez, Liza Mayela:* She contributed to the validation of each of the theoretical elements, thus contributing to the triangulation of the process, in addition to defining the micro and macro environment.

*López-Laguna, Ana Bertha:* She contributed to the methodological validation, tool selection and validation of the design and evaluation phases of the project.

Funding

The research did not receive any funding.

Abbreviations

COVID-19	Coronavirus disease 2019
G-Suite	Google workspace
ICT	Communications and Information Technologies
IMPI	Mexican Institute of Industrial Property
Per-Q	Percussion
VLE	Virtual Learning Environments

References

Basics

Davis, M. H. (1996). [Empathy: a social psychological approach](#). Boulder, CO: Estados Unidos: Westview Press.

Gardner, H. (1995). [Inteligencias Múltiples: La teoría en la práctica](#). Paidós Ibérica. Madrid, España.

Meece, J. (2000). [Desarrollo del niño y del adolescente: compendio para educadores](#). McGrawHill, México.

Paniagua, K. L., & Vega, M. U. (2008). [La teoría de las inteligencias múltiples en la práctica docente en educación preescolar](#). Revista Electrónica Educare, 12(1), 135-149.

Pérez-Aldeguer, S. (2014). Programa Dum-Dum. 12 Sesiones para mejorar la competencia intercultural mediante la percusión. Laertes. Barcelona, España.

Piaget, J., & Inhelder, B. (2016). [Psicología del niño](#) (ed. renovada). Ediciones Morata.

Zapata-Ros, M. (2015). [Teorías y modelos sobre el aprendizaje en entornos conectados y ubicuos: bases para un nuevo modelo teórico a partir de una visión crítica del “conectivismo”](#). EKS, 16(1).

## Suport

Calderón Garrido, D., Cisneros Álvarez, P., García Fernández, I.D. y de las Heras Fernández, R. (2019). [La tecnología digital en la Educación Musical: una revisión de la literatura científica](#). Revista Electrónica Complutense de Investigación en Educación Musical. Ediciones Complutense. Madrid, España.

Gobierno del Estado de Jalisco (2022). [LA SECRETARÍA DE EDUCACIÓN JALISCO IMPULSARÁ LA INNOVACIÓN EDUCATIVA CON ALIANZA CON GOOGLE](#). Comunicado de prensa.

Lussy, M. (1982). El ritmo musical. Buenos Aires. Ricordi.

Marín-Liébana, P., Magraner, J. S. B., & Nicolás, A. M. B. (2021). [Hacia una conceptualización de la educación musical crítica. Aplicación de los paradigmas científicos, las teorías curriculares y los modelos didácticos](#). Márgenes Revista de Educación de la Universidad de Málaga, 2(2), 3-24.

Ramírez Plasencia, D., & Chávez Aceves, L. (2012). [El concepto de mediación en la comunidad del conocimiento](#). Sinéctica, (39), 01-16.

## Differences

García-Vélez, T., & Maldonado Rico, A. (2017). [Reflexiones sobre la inteligencia musical](#). 451-461.

Hemsey de Gainza, V. (2004). [La educación musical en el siglo XX](#). Revista musical chilena, 58(201), 74-81.

Imbernón, F. (2000). [Escuela y multiculturalidad](#). Pensamiento Educativo, 26(1), 153-171.

Peña, M. (2014). Acompañamiento del e-mediador en AVA. Educación.

Rodríguez-Díaz, E., Ezquerro-Cordón, A., Llamas Salguero, F., & López-Fernández, V. (2016). [Relación entre creatividad e inteligencias múltiples en una muestra de estudiantes de Educación Secundaria](#).

Rubio, M. J. (2003). [Enfoques y modelos de evaluación del e-learning](#). RELIEVE-Revista Electrónica de Investigación y Evaluación Educativa, 9(2).

Vignal, M. (1997). Diccionario Larousse de la Música. Barcelona. Larousse.