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Use of Alternative Methodologies in Veterinary Medicine Learning and Acceptance of Students

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Abstract: Different university degrees focus on students acquiring theoretical and practical knowledge, aiming to develop their professional activity in the future. However, the usual study plans often forget other skills that will be very useful for the correct performance of their professional activity. In the case of veterinarians, these can range from dialogue with farmers to the unification of knowledge, so that they can provide a simple and effective solution to the different questions that may arise throughout their work activity. On the other hand, the perception of the world and the ways of acquiring knowledge have been changing over the years. Currently, our students require new ways of being presented with the information and knowledge that they should acquire, using, in most cases, new technologies. The present study was carried out with two cases. First, we used gamification through role-play as an alternative methodology to generate a method to unify the knowledge acquired in the subject and, mainly, to acquire skills such as the transfer of this acquired knowledge to other classes and situations. The second case aims to verify if the use of new technologies, specifically the use of interactive videos, can improve the acceptance of students and their training. A total of 2 h of videos were recorded, and 31 min and 42 s of that footage were ultimately used. A special edition and some specific illustrations and designs were made for this work, taking care of the format–background relationship. The results obtained show that these alternative-learning methodologies could be applied to many subjects, so that students, in a playful and relaxed way, are able to unify all the knowledge they are acquiring in their training as veterinarians, preparing them to face the exercise of their future professional activity with greater ease and safety. Finally, we provide the degree of acceptance of these new learning methodologies by students.

Keywords: gamification; new technologies; interactive videos; role-play; high education; veterinary sciences; veterinary medicine

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1. Introduction

Changes in culture and new technologies mean that learning methods increasingly need modifications and adaptations to new situations. In this sense, learning through games and new technologies are more useful for science teaching. A recent systematic review about models of gamification indicates the number of scientific publications related to different mechanisms that introduce gamification as a form of learning in higher education [1]. The use of games to propose intellectual challenge has increased in recent years [2]. For this reason, gamification as a way to improve learning has become an increasingly used tool [3] with good demonstrated results [4]. Concretely, in science education, gamification could contribute to students' enjoyment and motivation [5]. In fact, different studies have showed that the implementation of gamification is successful because of user's engagement [6]. Strategies for the use of gamification in higher education are varied, including some more traditional ones such as role-playing games [7]. Several studies have demonstrated the benefits of role-play as a learning method to improve empathy, clinical skills, communication skills, and active listening [8–13]. However, as far as we

know, it has never been applied in the field of veterinary medicine. The current working and professional world in the field of veterinary science requires that our students are increasingly prepared to solve real problems and interact with different actors in the clinic, pharmacy, and livestock environments. Role-playing involves analyzing problems that may arise in the exercise of the profession from the point of view of all the actors involved, making the effort to empathize with the interlocutor. This learning strategy is intended to make a conscious effort, both from "actors" and "spectators", to place oneself in a position different from one's own and try to understand other people [14]. Role-play is a group of dynamic gamification techniques in which two or more people represent a specific situation or case via real-life acting, according to the assigned role. It is one of the main psychodramatic techniques, and several authors agree that this kind of teaching methodology allows not only for the application of certain theoretical concepts but also for the improvement of certain cognitive and psychological aspects of the students [15,16]. On the one hand, the veterinary profession requires a comprehensive vision of active animal production and the sustainability of said production system. On the other hand, it requires empathy and communication skills for the practice of clinical medicine. Role-playing is a gamification strategy that not only allows us to bring a student closer, through playful activities, to the theoretical knowledge and its application but also allows the student to contact possible situations that could be found in the future when they carry out their professional activity.

Furthermore, "new technologies" was an educational term that was widely studied and implemented in the time before the outbreak of the COVID-19 pandemic, and this outbreak has increased the need to reach our students in an alternative way to the physical face-to-face development of classes (as we are becoming used to) or even evaluations [17]. There are studies that ensure that this new trend will not only be used during the duration of the pandemic, but that new generations will value this type of education (albeit in a complementary way). In addition, MOOCs (massive online open courses) are a platform for potential new students who otherwise would be very difficult to attract, and they can serve as a source of advertising [18]. In many cases, the adaptation to physical absence is limited by personal originality, lack of ideas, or resources. As can be shown in the bibliography [19], it was observed that videos with illustrations and animations capture attention in an easier and more effective way, making the teaching–learning process more pleasant. For this reason, our intention is to generate a model of teaching the course material that can be used by the university community. Most currently accepted educational theories try to use individualized teaching [20], assisting each student and trying to enhance learning for each person. There are many cases where this is complicated (number of students, duration of classes, etc.), but this digital methodology allows us to supplement this possible lack by adapting the development time and the level of difficulty, being able to set individual rhythms, and prioritizing attention to diversity, which is especially relevant among our students [21]. However, we need feedback from the students that is easily quantifiable by an objective score, not only in terms of knowledge but also in terms of their feelings during the learning process. Trying to gather information quickly in a way that does not cause students to become tired is another challenge to be tackled, since it allows progress towards quality teaching [22]. When understanding innovation as the change of what already exists in a way that results in improvement [23], society is facing an imposed change.

The aim of this study is the implementation of two alternative teaching methods in veterinary medicine, using role-play as a gamification tool and new technologies such as learning based on interactive videos, to know the degree of acceptance by students as well as the possibility of the usage of such videos as tools in university education.

2. Materials and Methods

2.1. Population and Sample

This trial was performed in the third course of the Veterinary Medicine degree of Universidad Cardenal Herrera-CEU (Spain). The students are ages between 21 to 23 and

the study was performed in the course 2020–2021. The two cases were performed under the same educational conditions, including professors, students, and times (among others). The total of students that performed this study were 332, being 75 males and 257 females.

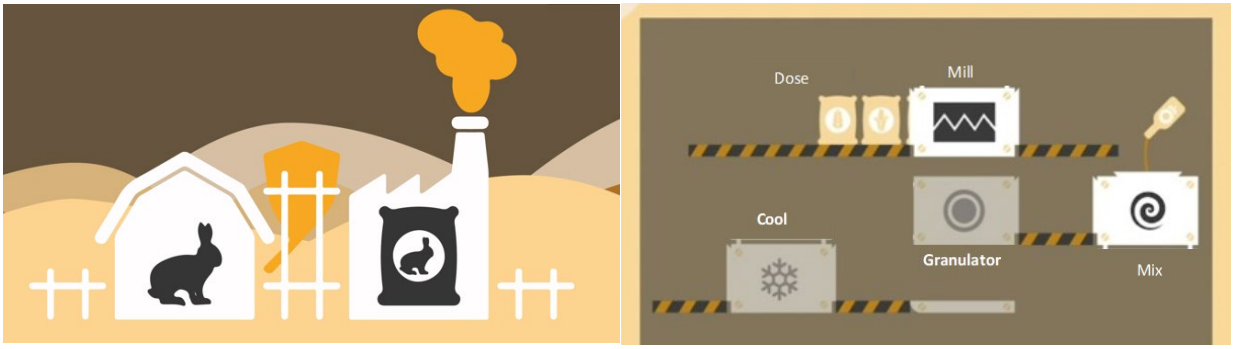
2.2. Study Design

2.2.1. Case 1: Role-Play Game

The students were divided into two groups, each taking a role. One group, the farmers, had 15 min to think about real situations of problems related to veterinary practice on a livestock farming, including production, management, and health problems, among others. The other group, the veterinarians, had 30 min to discover the problem, diagnose the disease in their case, and indicate the treatment or the actions aiming to solve it. If the group of veterinarians managed to diagnose correctly and carry out an effective solution, they earned a point. Otherwise, the point was for the farmer's group.

2.2.2. Case 2: Virtual Visit

The "virtual visit" activity is the example of interactive activity that we proceed to develop in this work. This work arises as an alternative to a presential activity that could not be carried out due to the outbreak of COVID-19. A careful design (Figure 1A) specific to the project was used. Prior to the elaboration of the videos, a script was prepared by the teacher who had previously carried out the same activity. A total of 2 h of videos were recorded, and 31 min and 42 s of that footage were ultimately used. Although some videos were of the installations, an animation of images was made to form what is known as "motion graphics, Figure 1B". All illustrations and videos were edited using the following computer programs: Adobe After Illustrator, Adobe Premiere, and Adobe After Effects. After this, the audio was recorded, which was superimposed on the videos. The total content was divided into a total of 13 videos (2 min and 26 s, on average). The file size was 640 × 480 with 30 frames per second.



(**A**) (**B**)

Figure 1. Example of the format and design of the interactive activity (**A**), as well as an extract of the motion graphics (**B**) created specifically for this activity.

An introductory presentation was made for each video. In each presentation (left side of Figure 2), a division of the screen was made, where the name of the video was noted on the front, the specific icon of each video was on the upper left, and some illustrations that accompanied the explanation and keywords to help understand the most important concepts were on the left. Finally, on the right side, the recorded video appears. All of videos were presented to the students (Figure 2) using Sway program divided into 6 different sections. The first of them introduction (composed of 1 video), the second of them the facilities (composed of 3 videos), the third of them management (composed of 4 videos), the animals (composed of 3 videos) and the last two sections of a video each with the explanation of the feed mill and the machinery, respectively. Accompanying each video was a brief text with questions that were going to be answered in that video, aiming to

draw the attention of the students, and enabling them to extract the main ideas (on average 27 words). Finally, a questionnaire created with the Microsoft Forms program (Figure 3) was sent to find out the acceptance of the students.

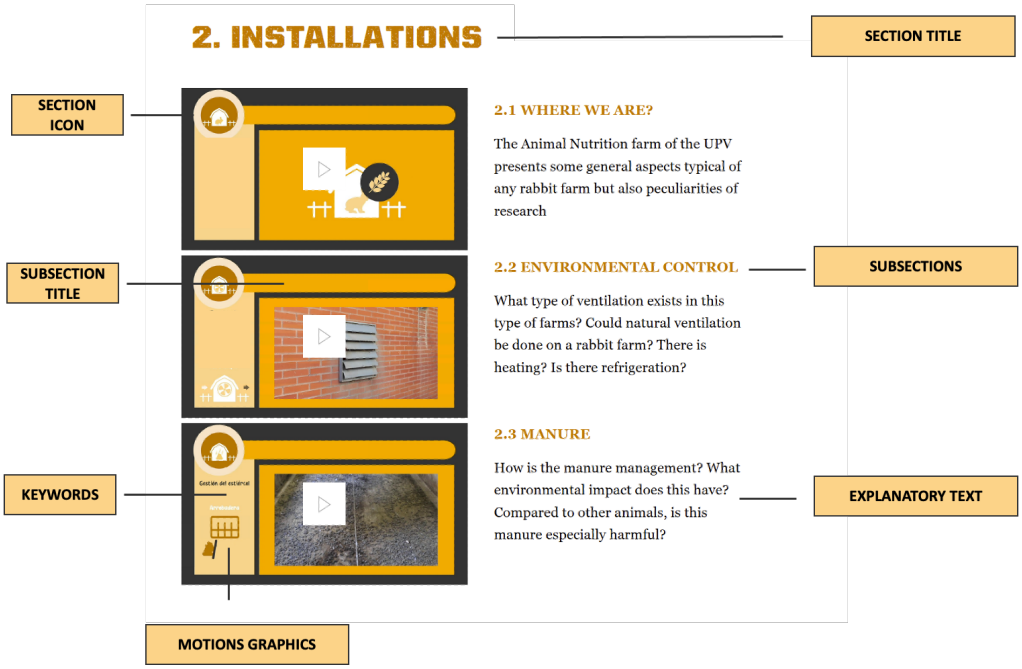


Figure 2. Scheme of one of the sections of the interactive activity. View as observed by the students.

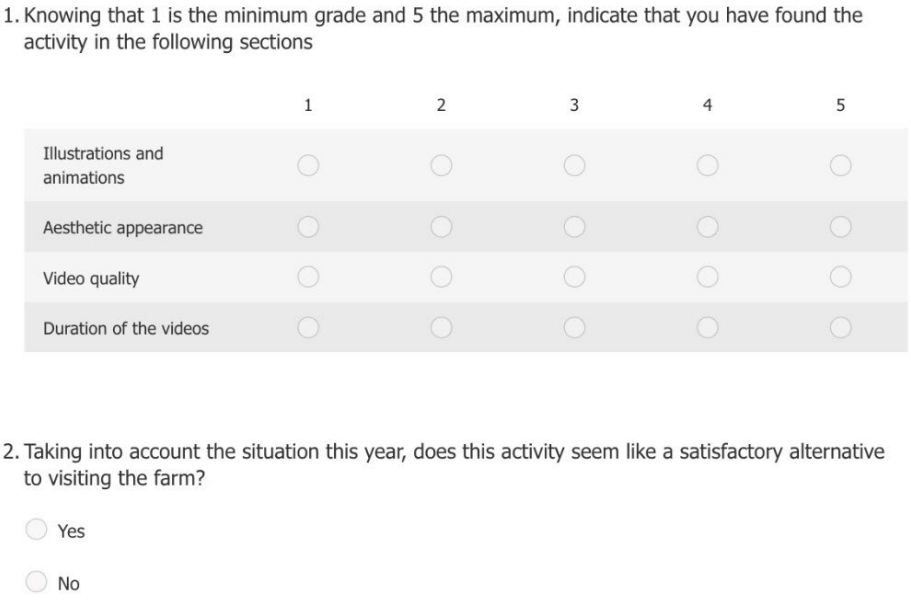


Figure 3. Questionnaire used by the students to evaluate the activity.

2.3. Evaluation of Objectives and Statistical Analysis

2.3.1. Case 1: Role-Play Game

The proposed objectives have been evaluated using two instruments. On the one hand, each of the participating groups evaluated the other group with a score from 0 to 5, considering criteria about whether the information provided was correct or not, if the transmission of the information was clear and easy to understand, and if the questions posed represented real situations that could be posed to students in the future, during

the exercise of their activity. The other instrument to assess whether the objectives of the proposal have been achieved was the completion by the participating students of an anonymous and voluntary survey, in which they were asked the following questions:

1. Has the methodology used served to strengthen your theoretical knowledge?
2. Has this methodology helped you to empathize more clearly with the problems that a farmer may face?
3. Do you consider an appropriate methodology for learning the practical content?
4. In your opinion, would it be interesting to implement this methodology in other areas of knowledge?
5. Would you recommend this methodology to be implemented in other subjects and to your classmates?

These questions were rated by the students with a value between 0 and 5, with 0 being strongly disagree and 5 being in strong agreement. Finally, in this same questionnaire, a space was left for comments and/or improvements by the students and to collect all the information about the acceptance by the students of the teaching-innovation experience. On the other hand, the questions and answers made by both teams were also collected, to subsequently analyze the main interests and/or subjects with greater difficulty for the students.

2.3.2. Case 2: Virtual Visit

As mentioned above, the students were encouraged to complete a questionnaire to find out their acceptance. The questions asked can be seen in Figure 3. In addition, they were allowed to send a comment if they considered it appropriate to do so.

The degree of acceptance by students was analyzed using the GENMOD procedure of the statistical program SAS (North Carolina State University, USA). Within this data logistic-regression model, each factor was used as a fixed effect in their respective statistical analysis. The statistical significance was set at p-value < 0.05.

3. Results

3.1. Case 1: Role-Play Game

In the role-play game, the evaluations that have been made by the students among them, from a score of 0 to 5, have been valued with an average of 4.73 ± 0.28 points, which indicates that the students have considered that their classmates were carrying out the activity seriously and applying the theoretical knowledge correctly. The transition to the online-teaching stage was correct and accomplished without any setbacks, so the activity could be carried out in a similar way to how it had been done face-to-face. Therefore, the results obtained have not been divided into the two types of teaching, instead unifying the results. Regarding the questionnaire with the five questions mentioned above, a total of 157 students responded to at least one of the questions that were asked. The results were analyzed question by question and indicate that the degree of acceptance has been very positive on the part of the students, so that in all the questions that were asked, more than 50% of the students responded with a score of 5 (Figure 4).

In addition, in this questionnaire the students were asked to present their comments about the activity, assessing their acceptance of said activity in a more individualized and less closed way. Of the 157 students who filled out the survey, a total of 54 made some type of comment or suggestion. The comments are collected and classified in Table 1.

The students made two suggestions regarding the method of carrying out the activity. One was that it would be interesting for all students to have the opportunity to exercise both roles, and the other was that it would be interesting to incorporate this activity into other subjects, including subjects related to clinical practice, to improve their communication skills with the clients of a veterinary clinic, for example.

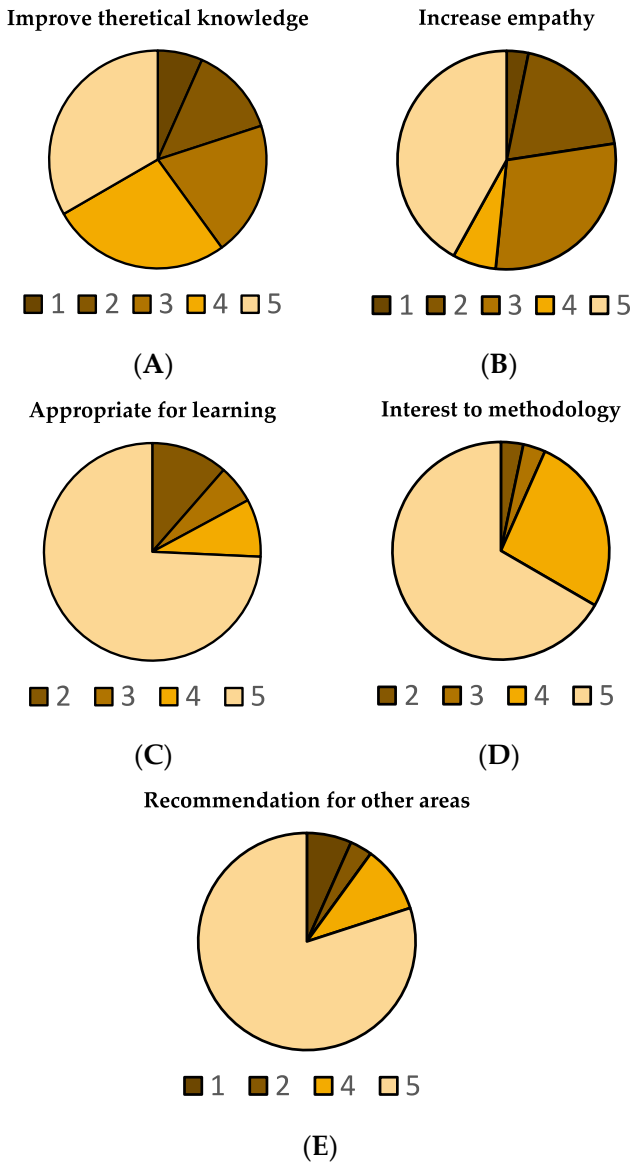


Figure 4. Percentage data collected from the 5 questions asked to the students. The percentages of students who have rated the activity in each of the questions posed, from question 1 (**A**) to question 5 (**E**). (**A**): improve theoretical knowledge; (**B**): increase empathy; (**C**): appropriate for learning; (**D**): interest to methodology; (**E**): recommendation for other areas.

Table 1. Comments and suggestions of students, and total students who answered the survey.

Comment for the Students	Positive (P)/Negative (N)	Textual Examples of Students	Total Students Who Answered the Survey (%)
Suggestions	P	It would be better if all the students could work both roles	3 (1.9%)
Suggestions	P	It would be interesting to implement it in more areas	1 (6.4×10^{-3}%)
General comments	P	This strategy improves our learning It is a fun and entertaining way to learn Interesting because you unify knowledge of different subjects within the areas	41 (26.1%)

3.2. Case 2: Virtual Visit

The average completion of the activity for student participation is 150%, that is, one of every two students has repeated the viewing of the videos. At the end of them, we carried out a survey of the students, with the aim of carrying out an evaluation of the activity. Of the total number of students, 101 responses were received, which means 30% of the total students watched the videos. We were able to observe some very good results. Overall, 98% of the students ($p < 0.05$) assessed this activity as a satisfactory alternative to visiting the farm. In addition, they significantly showed the highest possible score ($p < 0.05$) when they were asked about specific questions of the videos such as the duration (84%), the aesthetic aspect (90%), and the quality in general (85%), as well as the illustrations and animations (94%). In addition, we received very positive comments, for example: "Excellent... Super well done, it has been entertaining, very illustrative and very educational, I found the online adaptation incredible, thank you, impressive".. A summary of the obtained results is summarized in Figure 5.

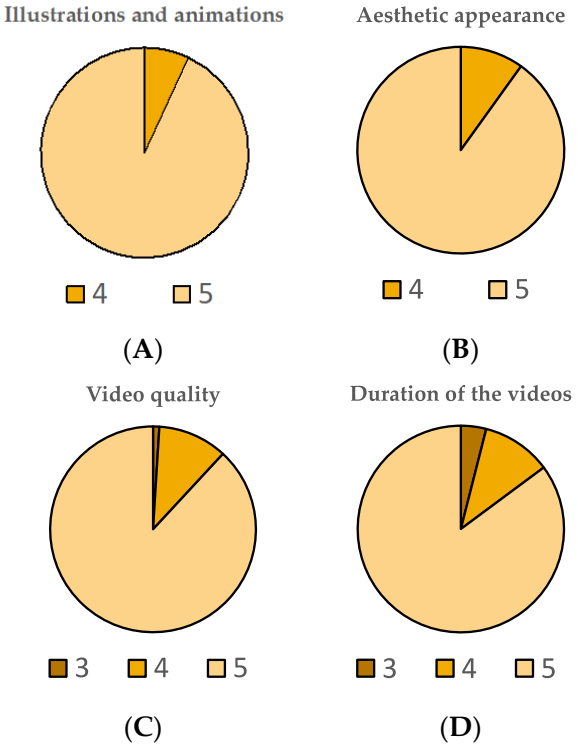


Figure 5. Data collected from the 5 questions asked to the students. Evaluation by the students with aspects related to the activity (1 = lowest score; 5 = highest score). Activation is collected for illustrations and animations (**A**), aesthetic appearance (**B**), video quality (**C**), and duration of the videos (**D**).

4. Discussion

Today's world and the way that undergraduate students see the world have made teachers need to adapt to these changes, aiming for the goal that students become professionals capable of solving problems and that the innovative pedagogical practices can be useful tools for students to actively participate in the learning process [24]. The use of gamification and educational videos have been one of the methodological alternatives that have been used for this purpose [25,26]. Within the use of games as a tool for interactive learning, one of the most used methodologies has been role-play, mainly in areas where the communication skills and empathy are more relevant for professional development [8,9,27]. On the other hand, the recent COVID-19 pandemic has caused higher education institutions to modify most of their activities, since face-to-face activities were suspended. Adaptation to this situation has been a challenge throughout the world, and faculties have had to

adapt their teaching and evaluation systems [28], with satisfactory results [17]. One of the alternative-teaching methods has been educational videos [25]. Alternative student-centered teaching methodologies have been shown to improve student vigor, dedication, and knowledge absorption [29]. However, studies that evaluate the degree of acceptance by students of these new learning methodologies are scarce. In this work, two cases of alternative methodologies have been evaluated by the students: the first case was a role-play game and the second case was a virtual visit with interactive videos.

In the two cases, the acceptance by the students is very positive, and this study indicates that the application of these alternatives in other areas would be interesting from the point of view of interactive learning and the involvement of students in their own learning. In accordance with Crisol-Moya et al. [30], our results show a positive attitude toward active learning, plus these methodologies foster interdisciplinarity and, in the case of the role-play game, promote the development of learning tools, group work, and empathy. As other studies have previously shown, this teaching practice improves the development of communication skills and active listening as well as increasing the enthusiasm and motivation of students, as for other gamification methods [1,8,26,31]. However, this is the first study where a role-play game has been applied to teaching in veterinary medicine. Role-play games are common practice in other disciplines such as physiotherapy [11,27], human medicine [9,32,33], and nursing [12,13], among others. Given the curricular similarities between these disciplines [34], acquiring this type of alternative teaching practices would be interesting for veterinary medicine students, from the point of view of active teaching and improving learning.

As it has been said by Zou et al. (2015) [35], "Further research efforts are needed to evaluate the validity of the investigated model with a diverse sample in different learning contexts". This work aims to deepen our understanding of the interrelationships or causality among variables relevant to technology acceptance [36,37]. The acceptance of students was very positive and the results of this study indicate that the application of these alternatives was interesting [30,38]. As other authors have shown, MOOCs provide potential opportunities, though there are potential challenges that one might face when implementing MOOCs in similar or entirely different contexts [39]. Our data were concordant with that of other authors, who advised that the video length be kept to the longest recommended time (about 6 min) for online educational videos and the file size (640 × 480) [40] be set at 30 frames per second [41]. Further research is needed to establish how the medium of video influences the feedback process, as well as its potential to facilitate dialogue and its effects on student learning [42]. This acceptance has been similar to those obtained by other authors in the applied sciences, such as veterinary medicine [43], in a MOOC courses [44], where it was observed that the findings suggested that coupling these functional approaches into veterinary MOOCs can improve learner retention and promote engagement [45], while the implications for practice and further research continue to be presented. More studies are needed to objectify and find keys to create satisfactory alternatives in the applied sciences.

Different methods for the promotion of self-regulated learning in higher education have been proven, with good results [38]. The digital transformation of teaching due to the COVID-19 pandemic has shown that the use of new technologies can be a great ally in higher education [46,47], and the adaptation by the students has been correct [48]. This opens up a path for the use of new technologies (such as the last one, interactive videos [49]) as a common practice in higher-education studies, including via a hybrid educational model (HyFlex + Tec) and a Massive Open Online Course (MOOC) [50]. Although the application of these new methodologies, mainly MOOCs, has its advantages and disadvantages [51,52], these new teaching methods can significantly improve the learning and motivation of our students, also taking into account individualized learning [53,54]. Our results show a high acceptance by the students, according to the results of other authors [25,55]. In fact, interactive videos in the virtual visit case have been shown to improve the acceptance and motivation of veterinary medicine students.

5. Conclusions

Alternative methodologies for learning are increasingly demanded by undergraduate students. Role-play games are common practice in disciplines such as physiotherapy, human medicine, or nursing. As in these areas of knowledge, in veterinary medicine the acquisition of transversal skills such as empathy and active listening are essential for the proper development of professional practice, so it would be interesting to implement this kind of alternative teaching methodology. Furthermore, the results of this study demonstrate the positive acceptance by students of this alternative methodology. The case of the methodology of a virtual visit through interactive videos presents similar results in the acceptance by students and offers a valid alternative to improve student learning and motivation and to facilitate individualized learning. Some further studies are necessary to verify if these new methodologies improve the academic results of students when using video. We recommend short videos (2 and a half min), supported by a short text (30 words), with graphics that are able to capture the attention of the students. In the case of making an introductory section, it is recommended that the time be less than 13 s.

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