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Original Article

Development of audiovisual resources as a tool for improving the teaching and learning process and scientific divulgation in human physiology

Desenvolvimento de recursos audiovisuais como ferramenta para a melhoria do processo de ensino-aprendizagem e divulgação científica em fisiologia humana

Desarrollo de recursos audiovisuales como herramienta para la mejora del proceso de enseñanza-aprendizaje y la divulgación científica en fisiología humana

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Abstract

Information technology can be a powerful tool for learning, and the video construction model represents an effective educational strategy for disseminating and sharing information for all areas of knowledge. Certainly, physiology teaching should align itself with these strategies and use the digital environment as a channel for applying and disseminating knowledge. Thus, this work is a model that proposes to interrelate teaching, research, and scientific divulgation in the field of physiology through the production of audiovisual resources available in the digital environment. For this work, a team of professors, technicians, and undergraduate and graduate students planned, prepared, and released two videos: one exploring how the physiology of the sensory system facilitates the remarkable ability to read braille and another detailing the appropriate methods for measuring blood pressure. To make these videos, scenes from practical classes were filmed in physiology teaching laboratories, and the scenes of animal experimentation techniques were filmed in research laboratories. The quality of the resources produced was assessed through 173 satisfaction questionnaires that resulted in high levels of acceptance among university students from seven different health courses. The metrics viewed from the social platforms/networks were in line with the findings obtained through the questionnaires. The reports of the undergraduate and graduate students involved in the productions confirmed the model's potential to optimize the relationship between teaching, research and extension. Therefore, this work represented a positive experience in the use of information technologies in the application and dissemination of academic and scientific knowledge in physiology.

Keywords: physiology, practical classes, social networks, digital platforms, educational videos.

Resumo

As Tecnologias da informação e comunicação (TICs) podem ser uma poderosa ferramenta de aprendizagem, e o modelo de construção de vídeos pode representar uma estratégia educacional eficaz para disseminar e compartilhar informações para todas as áreas do conhecimento.

Certamente, o ensino de fisiologia deve se alinhar com essas estratégias e utilizar o ambiente digital como um canal de aplicação e disseminação do conhecimento. Assim, a intenção desse trabalho foi propor um modelo que pudesse inter-relacionar ensino, pesquisa e divulgação científica na área de fisiologia através da produção de recursos audiovisuais. Um grupo de professores, técnicos, alunos de graduação e pós-graduação planejou, elaborou e lançou dois vídeos: 1) como a fisiologia do sistema sensorial explica a impressionante leitura do código Braille?; e 2) métodos adequados para medir a pressão arterial. Para a realização desses vídeos, foram filmadas cenas de aulas práticas em laboratórios de ensino de fisiologia e cenas de técnicas de experimentação animal em laboratórios de pesquisa. A eficácia dos recursos audiovisuais produzidos foi avaliada através de 173 questionários de satisfação que resultaram em elevados níveis de aceitação entre estudantes universitários de sete diferentes cursos da área da saúde. As métricas de acesso das plataformas/redes sociais utilizadas para divulgação do projeto se alinharam com os resultados positivos obtidos dos questionários. Os relatos dos estudantes de graduação e pós-graduação envolvidos nas produções ratificaram o potencial do modelo para otimizar a relação entre ensino, pesquisa e extensão. Portanto, este trabalho representou uma experiência eficiente no uso das TICs na aplicação e disseminação do conhecimento acadêmico e científico em fisiologia.

Palavras-chaves: fisiologia, aulas práticas, redes sociais, plataformas digitais, vídeos didáticos.

Resumen

Las tecnologías de la información y la comunicación (TIC) pueden ser una poderosa herramienta de aprendizaje, y el modelo de construcción de vídeos puede representar una estrategia educativa eficaz para difundir y compartir información para todas las áreas de conocimiento. Con certeza, la enseñanza de la fisiología debe alinearse con estas estrategias y utilizar el entorno digital como canal de aplicación y difusión del conocimiento. El objetivo de este trabajo ha sido proponer un modelo que pudiera interrelacionar la docencia, la investigación y la divulgación científica en el campo de la fisiología por medio de la

producción de recursos audiovisuales. Un grupo formado por profesores, técnicos y estudiantes de grado y posgrado planificaron, produjeron y divulgaron dos vídeos: 1) ¿cómo explica la fisiología del sistema sensorial la impresionante lectura del código Braille? y 2) métodos adecuados para medir la presión arterial. Para producir estos vídeos se filmaron escenas de clases prácticas en laboratorios de enseñanza de fisiología y escenas de técnicas de experimentación animal en laboratorios de investigación. La eficacia de los recursos audiovisuales producidos se evaluó mediante 173 cuestionarios de satisfacción que obtuvieron un alto grado de aceptación entre los estudiantes universitarios de siete cursos de salud diferentes. Las métricas de acceso a las plataformas/redes sociales utilizadas para dar a conocer el proyecto reflejaron los resultados positivos obtenidos en los cuestionarios. Los informes de los estudiantes de grado y posgrado que participaron en las producciones confirmaron el potencial del modelo para optimizar la relación entre la docencia, la investigación y la extensión. Por consiguiente, este trabajo representó una experiencia eficaz en el uso de las TIC en la aplicación y difusión del conocimiento académico y científico en fisiología.

Palabras clave: fisiología, lecciones prácticas, redes sociales, plataformas digitales, vídeos educativos.

1. Introduction

Information technology is a powerful tool for transforming learning (King and South, 2017), and one of the most important aspects of technology in education is its ability to facilitate opportunities for learners. Specifically, the format of videos with well-crafted content and simpler and more accessible language is an important way of making academic knowledge available to society (Alfonso and Garcia, 2015; Brame, 2016). Taking advantage of social networks to improve learning is a logical step in the evolution of health teaching technology (Cheston et al., 2013; McGowan et al., 2012) demonstrated that the use of digital platforms has found its way into the toolboxes of medical students, residents, doctors, and medical educators around the world.

The great potential of digital networks, platforms, and audiovisual resources must be used to promote the dissemination of knowledge in physiology. Silva and Mendoza (2020) elucidated that the construction of knowledge through research, teaching, and scientific divulgation represents the essence of academic development. Moreover, Correia and Alves (2020) highlighted that focusing on audiovisual productions, the careful selection of specific class topics within the broad domain of human physiology, especially those with practical applications and align with institutional research initiatives, is identified as an exemplary strategy for improving teaching and learning experiences. In essence, this interaction establishes a virtuous cycle in which research enriches teaching, teaching enables greater engagement with research, and university outreach activity applies knowledge to the development of society.

Based on this understanding, this work aimed to develop and make available audiovisual content on practical experiences in human physiology in an attractive and easy-to-understand manner. Our hypothesis is that these resources can increase students' understanding and interest in specific human physiology topics.

The strategies and stages of video production, the tools and techniques used will be described. Subsequently, the satisfaction ratings obtained from students from various health courses who watched the videos will be presented. This data will be discussed in the light of Bloom's taxonomy and the experience acquired by the students during the digital content production process. Finally, the importance of using information technologies to expand the possibilities for teaching and learning and scientific communication will be highlighted.

2. Materials and methods

Professors, technicians, and undergraduate and graduate students involved in teaching and research laboratories in the field of physiology came together to develop a series of audiovisual resources that would be made available on a widely accessible video platform. Two main themes were selected for these pilot productions. The first theme was the physiology of the nervous system, specifically sensory physiology (somesthesia),

focusing on the discrimination between two points. In this topic, braille code reading was the focus of the application of knowledge. The second topic was indirect blood pressure measurements with specific emphasis on the prevention of hypertension as a practical application.

The project was approved by the Research Ethics Committee of the Health Sciences Center under no. 6.079.598 and by the Ethics Committee on the Use of Animals under registration no. 8025180618.

Initially, members of the production team underwent training in audiovisual production using a smartphone (iPhone, model 5S, IOS system version 15.8, Apple Inc., USA). Applications such as *Stop Motion Studio*®, version 12.4.2, Cateater, LLC, USA and *Capcut*®, version 11.8.0, Bytedance Pte. Ltd, Beijing, China were used for production and editing. These softwares were selected because they have freely accessible versions with satisfactory availability of resources and a simple-to-use interface.

A systematic approach was adopted for all productions, beginning with a comprehensive literature review conducted by students on the chosen topic. Subsequently, strategies and themes were discussed with the entire team of teachers and technicians. Video scripts and storyboards were meticulously crafted for each thematic segment, and the resulting videos had a concise length of no more than 15 min (Guo et al., 2014).

The physiology and functional pharmacology laboratories served as primary filming locations for practical and experimental sessions, enhanced by additional external video footage. Additionally, images from freely accessible databases on the Internet were incorporated, and custom animations were developed. Both productions featured stop-motion animations to illustrate the main physiological mechanisms. Original scenes were filmed separately using a smartphone, tripods, and lavalier microphones. Furthermore, the audios were prepared on the basis of the scripts, reviewed, recorded, and later edited for perfect integration with scenes and images. The video format adopted was MP4 (16:9 standard), and the content was made publicly available on the YouTube® (Google LLC, California, USA) platform. Concurrently, thematic posts were published weekly on Instagram® (Meta platforms, Inc., Califórnia, USA)

providing additional insights into the themes covered in the video productions. Access data, likes, comments, and registrations, among other markers, were used to assess the engagement and range of the work.

The work generated two audiovisual productions, the video on the physiology of the sensory system and the video on the physiology of the cardiovascular system. The first video began with a general presentation of the project and its theme. This opening scene was created by a former human physiology tutor, who is currently pursuing a master's degree in physiological sciences. An opening vignette was played, and the external video shots began, showing how humans interact with the environment through the sensory system. Subsequently, the application of touch in braille reading was introduced, discussing the code and its importance. An animation using the stop-motion technique was introduced to present in general terms how tactile stimuli are perceived. A scheme showing the main types of somatosensory mechanoreceptors was presented, followed by a practical demonstration of the two-point discrimination test recorded in a laboratory. The video ended with the consolidation of the importance of discriminating between two points for enabling Braille reading, providing examples of research on neuronal plasticity, and expressing gratitude in closing.

The second video focused on the indirect measurement of blood pressure. It began with the opening note and vignette and started by introducing the importance of blood pressure for homeostasis. This video also highlighted the importance of nutrition habits and physical activity in maintaining blood pressure levels and showed how blood flow occurs in the vessels and the determination of Korotkoff sounds using animations and images. Subsequently, we presented the materials and methods and an indirect blood pressure measurement performed in the laboratory. Finally, the video underscored the importance of a healthy diet and regular physical activity in maintaining cardiovascular health and overall wellbeing.

To evaluate the public's perception of the quality of the produced material, anonymous satisfaction questionnaires were provided immediately

following the presentation of the videos to students enrolled in various undergraduate courses. The designed teaching and learning strategy was implemented in seven undergraduate health sciences courses. The first video was presented to the Nursing, Occupational Therapy, Physical Education, Physiotherapy, and Speech Therapy courses. The second video was applied to the Dentistry, Pharmacy, Physical Education, and Physiotherapy courses.

In the sensory physiology video, five objective questions were posed (Table 1), while the cardiovascular physiology video featured the questions presented in Table 2. In addition, a free-response questionnaire was used to qualitatively assess the opinions of the students involved in the production of the videos. This questionnaire sought insights into the students' experiences during the execution of the work.

Table 1: Objective questions applied to viewers of the sensory physiology video

1. On a scale of 0–10, how important do you believe this video is for your professional field?
2. Before watching the video, did you think that you understood the technique of measuring blood pressure well?
3. After watching this video, how do you rate your understanding of this process?
4. On a scale of 0–10, how illustrative do you think this video is in explaining the blood pressure measurement procedure?
5. On a scale of 0–10, how much do you think the video contributed to your understanding of the topic?

Note: Questions 2 and 3 of each questionnaire contained options on a Likert scale, spanning from very poor through poor, good, very good, and excellent. Questions 1, 4, and 5 were answered with an entire number between 0 and 10.

Table 2: Objective questions applied to viewers of the blood pressure measurement video

1. On a scale of 0–10, how interesting was this application of physiology to reading Braille code?
2. Before watching the video, what did you think was your understanding of the process of discrimination between the two points?
3. After watching this video, how do you rate your understanding of this physiological process?
4. On a scale of 0–10, how illustrative do you think this video is in explaining this physiological process?
5. On a scale of 0–10, how much do you believe the video contributed to your understanding of the topic?

Note: Questions 2 and 3 of each questionnaire contained options on a Likert scale, spanning from very poor through poor, good, very good, and excellent. Questions 1, 4, and 5 were answered with an entire number between 0 and 10.

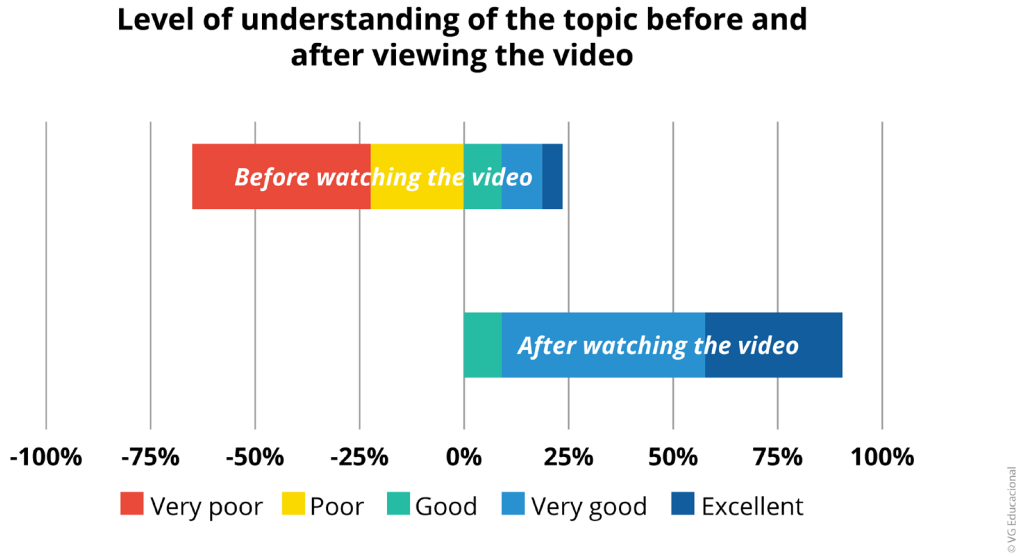
2.1. Statistical analysis

Initially, the data were subjected to the Shapiro–Wilk normality test. Descriptive statistics, including percentiles, medians, and mode, were employed for the Likert scale variables. The chi-square test was applied to analyze these variables. The Kruskal–Wallis test was used for the other satisfaction variables. The significance level was established at $p = 0.05$.

2.2. Results

The data show that the participants had very high satisfaction and knowledge learning (Figures 1 and 2; Tables 3 and 4). The understanding of the topics covered in the two audiovisual productions (somatosensory system and blood pressure measurement) underwent significant changes before and after viewing the respective videos.

Figure 1. General level of understanding of the topic, based on a Likert scale, before and after watching the video: How does the physiology of the sensory system explain the impressive reading of the Braille code? Values expressed as a percentage of students' opinions on a scale covering the following levels: very poor, poor, good, very good, and excellent.



This transformation is evident both in the consolidated global data covering all students (Figures 1 and 2). The students' self-reported level of understanding shifted significantly from predominantly poor or very poor to predominantly excellent or excellent (Figures 1 and 2 and Table 4). On a scale of 0–10, the averages were all around 9.5, revealing a high level of interest/importance, explanation/illustration, and understanding of the topics discussed in the two audiovisual productions (Tables 3 and 4).

Figure 2. General level of understanding of the topic, based on a Likert scale, before and after watching the video: Appropriate blood pressure checking methods. Values expressed as a percentage of students' opinions on a scale covering the following levels: very poor, poor, good, excellent, and excellent.

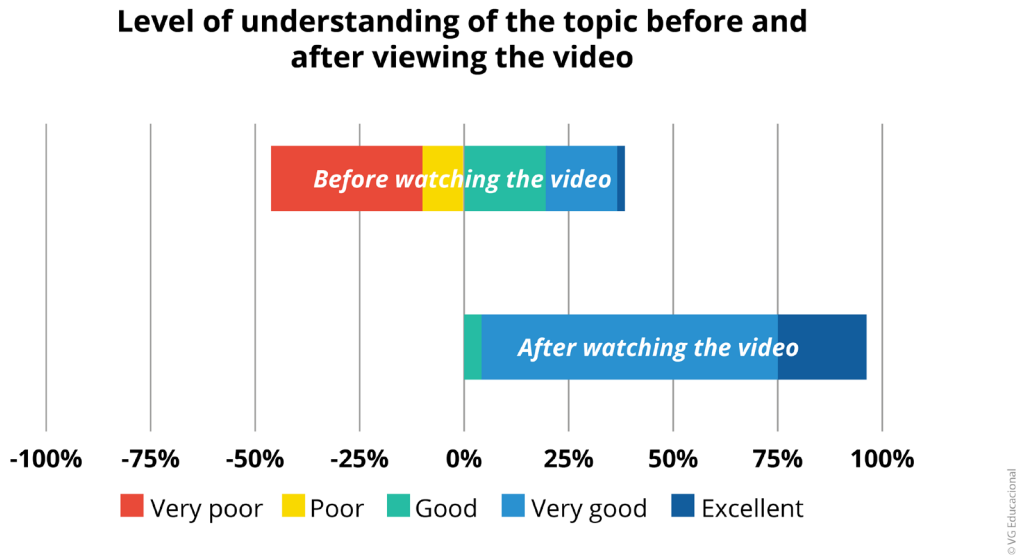


Table 3. Representation of the effectiveness level, both overall and by undergraduate course, of the audiovisual production "How does the physiology of the sensory system explain the impressive reading of the braille code?" after its exhibition.

Classes	On a scale of–10, how interesting do you believe the video is?	On a scale of 0–10, how well does this video explain the topic?	On a scale of–10, how much does it contribute to your understanding?
Nursing (n = 23)	9,92 (9–10)	9,92 (9–10)	9,88 (9–10)
Occupational therapy (n = 21)	9,81 (7–10)	9,33 (7–10)	9,10 (7–10)
Physical education (n = 23)	9,13 (6–10)	9,78 (8–10)	9,04 (6–10)
Physiotherapy (n = 21)	9,86 (8–10)	9,38 (8–10)	9,52 (8–10)

Phonoaudiology (n = 15)	9,73 (8–10)	9,67 (8–10)	9,40 (8–10)
Total Mean (n = 103)	9,68	9,62	9,39
Values expressed as averages (minimum and maximum values) of the marks indicated by the students for the audiovisual production on a scale of 0–10 for each question Note: The wording of the questions is intentionally abbreviated.			

Table 4. Representation of the effectiveness level, both overall and by undergraduate course, of the audiovisual production "Adequate methods for checking blood pressure" after its exhibition.

Classes	On a scale of 0–10, how important do you believe the video is?	On a scale of 0–10, how well does this video explain the topic?	On a scale of 0–10, how much did you contribute to understanding?
Dentistry (n = 16)	9,68 (8–10)	9,50 (8–10)	9,56 (8–10)
Pharmacy (n = 29)	9,65 (6–10)	9,44 (6–10)	9,41 (7–10)
Physical education (n = 08)	9,87 (9–10)	9,62 (8–10)	9,87 (8–10)
Physiotherapy (n = 17)	9,88 (9–10)	9,64 (8–10)	9,64 (9–10)
Total Mean (n = 70)	9,50	9,52	9,55
Values expressed as averages (minimum and maximum values) of the marks indicated by the students for audiovisual production on a scale of 0–10 for each question. Note: The wording of the questions is intentionally abbreviated.			

As the first question in both questionnaires was different, i.e., they investigated different aspects of each audiovisual production, both questions obtained high satisfaction levels. A comparison was conducted for questions 4 and 5 of each survey instrument, which were similar in nature. Upon analyzing the consolidation of class grades for both videos (for questions on a scale of 0–10, how much did you find this video illustrative

and how much does it contribute to the understanding of the subject), no significant difference was observed between the scores obtained for both questions across the two videos ($\chi 2 = 0.509$ with $p = 0.47$ and $\chi 2 = 1.002$ with $p = 0.31$, respectively). Concurrently, in relation to the Likert scale-based questions and the combined evaluation of results from both questionnaires ($n = 173$), it is noteworthy that the median and mode of opinions shifted from a weak score before viewing the video to an excellent score after watching the video (Table 5).

When comparing opinions on comprehension levels before and after watching the videos, whether focusing only on the first video ($\chi 2\ (8) = 18.03$, $p = 0.021$), exclusively on the second video ($\chi 2\ (8) = 13.97$, $p = 0.082$), or considering the consolidated result of both videos ($\chi 2\ (8) = 27.74$, $p < 0.001$), it can be suggested that there was a change in the participants' opinion regarding their understanding of the topics covered after exposure to materials.

Table 5. Students' perceptions before and after the audiovisual resources were shown regarding their understanding of the topics covered in both productions.

Students' choices	**Before**		**After**	
	Frequency	%	Frequency	%
Very poor	30,0	17,3	0,0	0,0
Poor	67,0	38,7	0,0	0,0
Good	52,0	30,1	25,0	14,5
Very good	18,0	10,4	100,0	57,8
Excellent	6,0	3,5	48,0	27,5
Total	173	100	173	100

Distribution of frequencies and percentages of each satisfaction level of all the participants in the exhibition of the audiovisual resources created (values expressed as absolute frequencies and percentages relative to the total number of students).

According to the data presented in Tables 3 and 4 and to the collective opinion of the participants in all courses, the videos obtained high importance and relevance ratings. The participants considered the videos explanatory and interesting concerning the concepts discussed, leading to a perception of contribution to the understanding of the subjects.

Examining the reports provided by the project participants revealed key competencies experienced, such as increasing knowledge/studying, developing abilities, enhancing collaborative capacity/integration, exchanging experiences, and using creativity. The reports were unanimous in indicating that the interaction between undergraduate and graduate students was productive. It is also possible to identify some difficulties experienced, especially in relation to recording techniques, editing/assembling, and publishing digital content.

In terms of accessing metrics for the project's social network, there were 68 project-related posts shared on Instagram, reflecting a substantial increase in the number of followers (734 followers at the latest count). Likes, comments, and accounts reached (a cumulative reach of 1619 accounts).

3. Discussion

This observed change highlights the impactful influence of audiovisual resources on improving students' levels of understanding. Additionally, the scores obtained by the students from various health courses seemed to confirm the effectiveness of the application of the two videos. Creating educational or health promotion videos is not new; however, the difference in the present work lies in the distinctive process through which they were developed, the specific focus, who was involved in the production, and the strategic approach to content dissemination. It is important to highlight that audiovisual resources are recognized as complementary and supplementary tools in the teaching–learning process, which has evolved into a complex and multifaceted system (González-Zamar et al., 2020). Although most participants demonstrated substantial progress in their understanding of the topics covered in the videos, it is essential to approach this observation with caution. The relevant finding lies

not in the videos that fully explain and ensure complete understanding of the concepts discussed, but rather in the overall increase in knowledge (without specific classification) compared with the condition before the application.

In this context, Bloom's taxonomy has been widely discussed, demonstrating its utility beyond merely evaluating the teaching–learning process. It also serves as a robust instrument for planning and implementing lessons, as well as creating various teaching strategies (Pinto, 2015). According to the revised Bloom taxonomy structure (Krathwohl, 2002), the subcategories "understand" and "apply" are within the cognitive domain and reflect successive levels of learning. These subcategories are preceded by "remember," which forms the basis of this taxonomic classification. The questionnaires provided to the participants did not include a direct and specific survey on the ability to remember the content in the videos. Indirectly, there are questions about the interest and importance of the topics covered in the audiovisual productions, the results of which show high scores for these parameters. Considering that the process of remembering/memorizing is closely related to interest/motivation and the importance attributed to certain knowledge (Tyng et al, 2017), it can be inferred that there is some level of favorability for memorizing the topics covered in the videos. The questions provided to the participants directly addressed their level of "understanding" of the topic before and after the audiovisual experience. The results clearly show an increase in this perception. Regarding "apply," the content of the videos involves the application of theoretical knowledge of physiology to understand practical processes, such as reading in braille or the method of measuring blood pressure. The concept of "applying" as "the way of making" was experienced by the students who produced the videos. The participants' reports corroborate the suggestion that making videos could be a promising teaching–learning strategy at the undergraduate level for students of human physiology. An example from a report reveals the practical relevance of knowledge for students: "It was a very interesting experience because by using creativity to record the scenes, I was able to see how physiology is present in our lives every day and in various moments of our routine, whether we perceive it or not." However, interestingly, despite belonging to a generation immersed in technology, reports suggest some difficulty

among students in creating digital content for the project.

The strategy to show more fundamental information has significant additional implications. First, it cultivates the abilities of the team's students to fully understand the physiology concepts and develops their ability to synthesize them. In other words, in this phase of preparation for audiovisual production, the student (member of the team) must look at the key concept to understand it properly and extract its essence. The process of identifying the most fundamental aspects of a physiological mechanism is a valuable exercise in refining skills. One of the characteristics of mastering a topic is the ability to teach it simply (Ngugi and Thinuri, 2014).

It is important to highlight that presenting or adapting complex physiological concepts into a simpler and more accessible language is an inclusive action. This approach makes it possible to reach individuals from several backgrounds besides higher education, including those at technical and secondary levels, as well as other essential health-care professionals. Furthermore, emphasizing the practical application of knowledge brings the student's reality closer to the object or theoretical concept portrayed on the screen, effectively engaging them in the learning process (Matias, 2016). Both in the sensory physiology video (where braille reading illustrated the concept of tactile stimulus localization) and in the cardiovascular physiology video (where methods for checking blood pressure were discussed), the theoretical concepts had practical applications, emphasizing the importance of this knowledge. The combination of these aspects likely contributed to the positive results obtained.

Digital tools that depend on the availability of the Internet provide some advantages over traditional face-to-face educational methods, as they can overcome physical or temporal restrictions, thus improving accessibility, maintaining good cost-effectiveness, and immersing students in a platform that facilitates simultaneous reading and research. In addition, animations, when combined with verbal descriptions, improve viewer engagement (Thomson et al., 2014). Brame (2016) corroborated that video has evolved into an important component of the teaching process. In the construction and subsequent effectiveness of an educational video, managing cognitive load is crucial. In line with this perspective,

we chose to create concise videos, taking advantage of fundamental concepts in physiology and focusing on the practical application of these concepts. Shorter videos increase student engagement (Guo et al., 2014). Concurrently, the advantage of shorter videos lies in the ease of handling during the editing process–assembly of scenes, audio synchronization, and efficient file manipulation and transfer between team members through downloads and uploads to platforms.

At this point, it is imperative to emphasize that the quality of the material available on the Internet must be treated very carefully with attention, adhering to rigorous criteria, ethics, and a deep sense of responsibility. The processes of script review, audio review, scene review, final edit review, and approval for publication on platforms demonstrate a process of checking and rechecking in which the content was extensively processed and adjusted. This meticulous process has also extended to the dissemination of information through publications on social media.

It is important to mention that the access metrics on digital platforms corroborate the results derived from the in-person questionnaires administered to students after the video presentations. With regard to student engagement, maintaining posts on Instagram during preparing videos for YouTube proved to be an effective strategy because it generated expectations about the final production. The processes ran concurrently, meaning that as the students/work team prepared scenes for the videos, they also gathered materials, images, and animations that formed the foundation for the Instagram posts, and vice versa. Instagram posts illustrated key concepts that would make up or contribute to the understanding of the video being produced. This dual approach facilitated an interactive and dynamic relationship between the two platforms. Maintaining this contact with followers, fed weekly with the main content of the videos, not only fueled a consistent connection with the audience but also laid the foundation for improving their understanding of the information finally consolidated in the final video. This approach exemplifies an integrated and synergistic use of social media platforms to engage the audience. According to King and South (2017), technology should provide all students with engaging and empowering learning experiences in formal and informal contexts that prepare them to be active, creative, knowledgeable,

and ethical participants in our globally connected society. Although the mere presence of technology does not guarantee equity and accessibility in learning, it has the transformative potential to mitigate obstacles and reduce barriers that were practically unbreakable a generation ago.

Another aspect that deserves to be highlighted was the promotion of interaction between graduate and undergraduate students during the development of the project. This collaborative interaction has a positive impact on the academic growth of the students involved and will strengthen the important and necessary links between teaching and research in the institutional environment. Furthermore, there is a reasonable expectation that projects of this nature can facilitate undergraduate students' transition to graduate studies because they were exposed to techniques and experiments and interactions with master's and doctoral students with whom they were able to exchange experiences and impressions. Video productions can also serve as complementary tools to improve face-to-face teaching interventions in a normal classroom environment. The sensory physiology video can serve as an introductory component for a theoretical or practical class on somesthesia. Likewise, the video illustrating blood pressure checking methods can be incorporated at the end of a hemodynamics class or as a prelude to a practical session on indirect blood pressure measurement. Despite the accessible language, the teacher or facilitator has the flexibility to take advantage of pauses in the video to delve deeper into specific concepts, providing additional information and context as needed. This dual functionality reinforces the versatility and potential pedagogical impact of videos produced to improve traditional classroom teaching.

Considering the results derived from the Likert scale and the scores obtained in relation to perceived importance, representativeness/explanation, and contribution to understanding, it is reasonable to suggest that the audiovisual resources achieved high levels of satisfaction and learning.

In conclusion, this work represents a contribution to the greater reach of human physiology on digital channels. The strategic use of information technologies to optimize the teaching–learning process has never been so timely. It promoted opportunities to expand student training through mastery of emerging skills of interaction and interpersonal promotion

provided by digital media. It also provided a promising opportunity for interaction between undergraduate and graduate students. Finally, it represents an improvement in the use of remote modality in the application and dissemination of academic and scientific knowledge to society. In doing so, it effectively reinforces and sustains the interconnected relationship between extension, research, and teaching, thus strengthening the institutional commitment to the holistic and sustainable dissemination of knowledge.

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