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ORIGINAL ARTICLE

Musical educational technology for lactation physiology learning: knowledge translation

Tecnologia educativa musical para aprendizagem da fisiologia da lactação: tradução do conhecimento

Tecnología educativa musical para el aprendizaje de la fisiología de la lactancia: traducción del conocimiento

Daiani Oliveira Cherubim[I]
ORCID: 0000-0002-7741-1727

Stela Maris de Mello Padoin[I]
ORCID: 0000-0003-3272-054X

Cristiane Cardoso de Paula[I]
ORCID: 0000-0003-4122-5161

[I] *Universidade Federal de Santa Maria. Santa Maria, Rio Grande do Sul, Brazil.*

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Corresponding Author:
Cristiane Cardoso de Paula
E-mail: cristiane.paula@ufsm.br

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ABSTRACT

Objective: create and validate a musical educational technology for lactation physiology learning for professional training in health. **Method:** methodological study with application of a conceptual framework of Knowledge Translation. In the creation cycle, the knowledge of the physiology of lactation was synthetized in key points to create the lyrics and the melody. In the action cycle, the content of the musical educational technology was validated by judges experts in breast feeding, in the period from September to December 2017. **Results:** 18 judges from all Brazilian regions participated in the validation. The content of the technology obtained a global Content Validity Index of 0.94 with one round of validation. **Conclusion:** the musical educational technology is validated to introduce the content of the physiology of lactation in the learning process of students, mediated by the teacher.
Descriptors: Breast Feeding; Educational Technology; Translational Medical Research; Nursing; Validation Studies.

RESUMO

Objetivo: criar e validar uma tecnologia educativa musical para a aprendizagem da fisiologia da lactação na formação profissional em saúde. **Método:** estudo metodológico com aplicação de Modelo Conceitual de Tradução do Conhecimento. No ciclo de criação foi sintetizado o conhecimento da fisiologia da lactação em pontos-chave, com os quais foram criadas a letra e a melodia. No ciclo de ação foi validado o conteúdo da tecnologia educativa musical por juízes experts em aleitamento materno, no período de setembro a dezembro de 2017. **Resultados:** 18 juízes de todas as regiões brasileiras participaram da validação. O conteúdo da tecnologia obteve Índice de Validade de Conteúdo global de 0,94 com uma rodada de avaliação. **Conclusão:** a tecnologia educativa musical está validada para introduzir o conteúdo da fisiologia da lactação no processo de aprendizagem de estudantes, mediado pelo docente.
Descritores: Aleitamento Materno; Tecnologia Educacional; Tradução do Conhecimento; Enfermagem; Estudos de Validação.

RESUMEN

Objetivo: crear y validar una tecnología educativa musical para el aprendizaje de la fisiología de la lactancia en la formación profesional en salud. **Método:** estudio metodológico con aplicación del Modelo Conceptual de Traducción del Conocimiento. En el ciclo de creación, el conocimiento de la fisiología de la lactancia fue sintetizado en puntos clave con los que se crearon la letra y la melodía. En el ciclo de acción, el contenido de la tecnología educativa musical fue validado por jueces expertos en lactancia materna, en el período de septiembre a diciembre de 2017. **Resultados:** 18 jueces de todas las regiones brasileñas participaron de la validación. El contenido de la tecnología obtuvo un Índice de Validez de Contenido global de 0.94 con una ronda de evaluación. **Conclusión:** se validó la tecnología educativa musical para introducir el contenido de la fisiología de la lactancia en el proceso de aprendizaje del alumno, mediado por el profesor.
Descriptores: Lactancia Materna; Tecnología Educacional; Traducción del Conocimiento; Enfermería; Estudios de Validación.

INTRODUCTION

The traditional teaching model, in which the teacher transmits and the student captures the information, is being replaced by the liberating model, which makes them become co-participant and co-responsible in the learning process. The use of liberating pedagogical models stimulates the learner to be interested in the content presented[1-2]. This model is guided by the principles of self-learning and interlearning, from collaborative learning, and by research discovery of what effectively integrates professional practice with the theories and principles that support it during all the training time[3].

In nursing and health education, the pedagogical postures adopted bring the intention of transformation, with dialogue, cooperation and active participation[4]. However, the lack of knowledge and skills of health professionals has been considered as a cause of failures in care, such as support for breastfeeding. It brings consequences for training, since students need knowledge about breastfeeding to support women[5-7]. The importance of this preparation stands out considering the positive results, for example, the support of nurses in the beginning in opportune time, and the maintenance of exclusive breastfeeding, both in the provision of direct care and in the organization of care[8].

Changes in the learning process in health education will improve knowledge, confidence in breastfeeding management and attitudes and practices to support breastfeeding[6]. Interventions have demonstrated effectiveness to promote learning about breastfeeding[9-10]. Considering the effectiveness of the interventions, the use of educational technologies (ET) as learning *subsumers* is pointed out. In other words, anchorage points, called "subsumers", are necessary for the learning, relating the new information to what is already known, considering that the learning process consists in the interaction of a new concept with the cognitive structure of the learner[1,11].

The production of ET may be the result of the connection between the learner's experiences with research, expanding the set of scientific knowledge. It is possible to create an ET starting from different points, among them, the experiences of students, making the teacher and student use the creative consciousness. The focus is on the possibility of learning together with a view to contributing to their professional and individual growth[12-14].

The physiological content of breastfeeding is introductory for students to understand this practice. However, the problem of this research resulted from the recognition that the content is configured as an abstract knowledge and complex understanding, implying the need for learning subsumers, which are a gap from the translation of the knowledge into action that can be completed by tools such as the ET.

Thus, we have proposed the following guiding questions: What are the key points of the physiology of lactation for the creation of musical ET? Is the content of the musical ET adequate, in the judges' evaluation, to introduce the content of the physiology of lactation in the learning process, mediated by the teacher, to undergraduate students in the health area?

This study supports the possibility of creating ET and the synthesis of scientific evidence, called Knowledge Translation[15]. This model was applied to translate knowledge of the physiology of synthesized lactation into a tool to promote learning in the health area: in this case, musical ET.

The use of music is justified by its potential in the field of learning. Even if there is no theoretical knowledge about the content of music, it is possible to incorporate it into some activity without being perceived, making abstract knowledge understandable to students in the health area. In addition, music helps in the development of critical and reflective thinking, allowing freedom and sensitivity in the construction of knowledge, contributing to a humanized formation[16-19].

OBJECTIVE

To create and validate a musical educational technology for the learning of the physiology of lactation in professional training in health.

METHOD

Ethical aspects

This study followed ethical precepts according to Resolution No. 466/2012 of the National Health Council. The proposal was reviewed and approved by the Ethics and Research Committee of the Federal University of Santa Maria. We sent an e-mail to each of the potential participants containing a letter of invitation, the Informed Consent Form and a Confidentiality Term of the ET. Only after the return of the signed terms, the field stage began.

Design, place of study and period

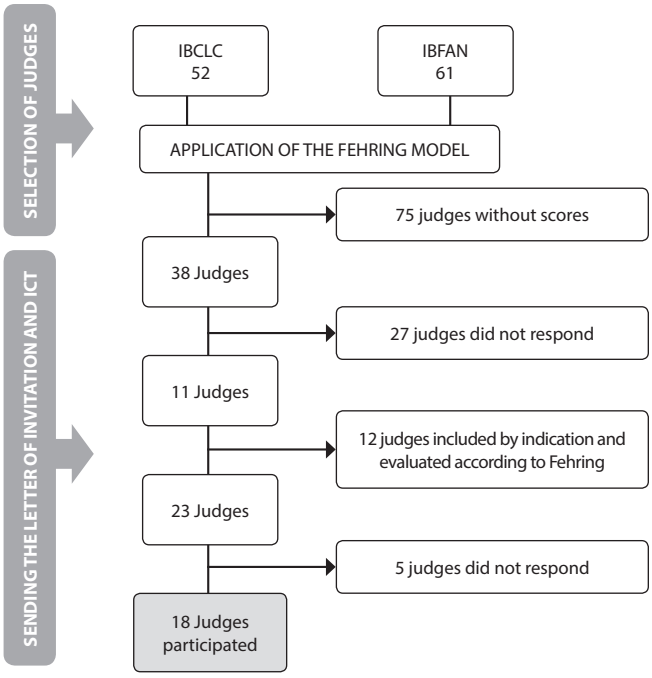
Knowledge Translation was applied in the methodological study. The main objective of this model is to translate and adapt the knowledge obtained through the surveys to the context to be inserted, bringing the participant closer to the practice, reducing the distance in the learning process[15].

The conceptual model, originated in the health field, is a dynamic and interactive process that includes the synthesis, dissemination and exchange of knowledge, with a view to developing tools for the improvement of the health area. Its development occurs through an integrating process between the cycle of knowledge creation and the cycle of action (or application) of knowledge[15]. The place where the research problem was identified in was the classroom environment of the Undergraduate Nursing Course at the Federal University of Santa Maria, in southern Brazil. The period for the creation of music was the first semester of 2017, and the content validation took place in the second semester of the same year.

Sample: eligibility criteria for professionals to be judges

The judges, as specialists in the subject, should meet the criteria proposed by Fehring[20], which were adapted to meet the Brazilian reality of qualification of professionals. The "snowball" technique was also used to meet the sample and regional representativeness. The application of the criteria was developed by consulting their curriculum on the Lattes platform. To define eligibility, information was sought from the International Network for the Defense of Breastfeeding Rights and professionals registered and certified by the International Board Certified Lactation Consultant.

The contact happened via e-mail, by which they accessed the invitation letter, the Informed Consent Term and the Music Confidentiality Term. Afterwards, we sent them the music file and the link for access to the validation instrument. Of the 50 judges who met the criteria and received the invitation, 23 answered with the signed terms, and 18 answered all the steps (Figure 1).



Note: IBCLC - International Board Certified Lactation Consultant; IBFAN - Internacional Baby Food Action Network.

Figure 1 - Flowchart of the sample composition of judges specialists in breastfeeding, Santa Maria, Rio Grande do Sul, Brazil, 2017

Study protocol

The application of the Model of Knowledge Translation for the creation and validation of musical ET about the physiology of lactation for learning in professional health training in is represented in Figure 2.

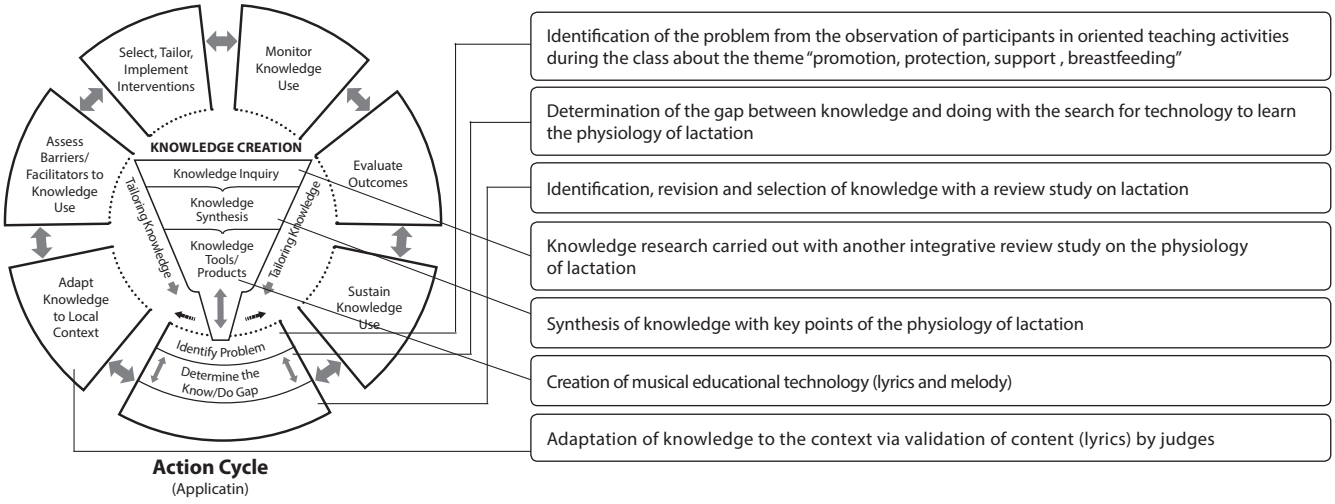
In order to start identifying the research problem (identify problem), participant observation was developed in an oriented teaching activity in the class about the theme "promotion, protection and support to breastfeeding". This step took place in the recognition of the content of lactation physiology as an abstract knowledge and complex understanding, which implied the need for tools to mediate the learning.

Thus, the search for tools for this mediation was carried out, which determined the gap between knowledge and doing (determine the know/do gap). We identified tools to promote and support breastfeeding for the population of professionals, women and students, but not to promote the learning of the content of the physiology of the lactation.

In the step identify, review, select knowledge, identify, review, select knowledge, a study was developed to review the knowledge about lactation, which showed the importance of obtaining knowledge about the physiology of lactation and the need to improve technological support to understand this content[21].

Thus, to start the creation of the ET, in the knowledge inquiry phase, another integrative review study was conducted with the question: what are the key points of the physiology of lactation for the creation of the ET? The results of this review culminated in the product of the knowledge synthesis phase and this synthesis generated the product of the knowledge tools/products phase: musical ET. The objective of this technology is to introduce the content of the physiology of lactation in the learning process of undergraduate students in the health area, mediated by the teacher, combining traditional teaching with the musical ET. The creation included the elaboration of the lyrics and melody of the song with the key points of the synthesis, organized from pregnancy to the process of delivery and birth.

At the end of the creation cycle, at the beginning of the action cycle, in the phase of adapting the knowledge to the context (adapt knowledge to local context), the content (lyrics) of the musical component of the ET was submitted to validation by judges (health professional experts in the subject of breastfeeding). Validating content is a process that consists in developing a careful assessment of the content of an instrument or product in order to judge whether the proposed items are consistent with the subject to be shaped. Thus, the judge invited to evaluate the product may suggest, add, correct or even modify the items if necessary[22].



Source: Adapted from Graham, Straus and Tetroe [15].

Figure 2 - Application of knowledge translation for the creation and validation of educational music technology about the physiology of lactation for learning in professional health training, Santa Maria, Rio Grande do Sul, Brazil, 2017

We used the Likert-type questionnaire to assess the degree of relevance in order to answer the following question: Is the content of the musical ET adequate to introduce the content of the physiology of lactation in the learning process, mediated by the teacher, to undergraduate students in the health area? This questionnaire, composed of seven items evaluating content, language and motivation, was available in the Google Forms platform to the judges who participated in the research.

The validation of the ET developed in this study was performed through the Content Validity Index (CVI), recommended by Waltz and Bausell[23], which consists in the level of agreement of the positive responses. Constantly used in the health area, the CVI measures the proportion or percentage of agreement of the judges in relation to the topics to be analyzed by using the instrument developed for the study. It uses the Likert-type scale with scores from one to four: 1 - unrepresentative; 2 - requires an extensive revision to be representative; 3 - requires a small revision to be representative; 4 - representative. Thus, the CVI score is calculated by summing the agreement of items with score 3 and 4, marked by the judges. Items with score 1 and 2 should be reviewed or excluded, according to the contributions made by the judges[23-25].

Analysis of results and statistics

The results were analyzed through descriptive statistics, observing the absolute and relative frequencies. For this study, we considered as a valid CVI the score of items that was equal to or higher than 0.80, and the level of agreement higher or equal to 80% in the answers 3 and 4 of the instrument[24-26].

RESULTS

Definition of music content

Since the translation of knowledge (Figure 2) should be based on scientific evidence, a literature search (textbooks and ministerial manuals) was developed in the National Digital Library of Brazil, Virtual Health Library and SciELO Books, with selection of materials that contained the content of lactation physiology.

The synthesis of this knowledge listed key points, such as organs and hormones related to the physiology of lactation. The result is the following synthesis: the production of breast milk is performed physiologically by the action of some hormones and reflexes, the main ones are prolactin and oxytocin. During pregnancy, the process of lactogenesis begins, in which the hormones estrogen and progesterone act in the development of the ducts and formation of lobes. After birth, the levels of estrogen and progesterone decrease, generating an increase in prolactin, the hormone responsible for milk production. By stimulating the suckling of the baby or milking, the hypothalamus sends hormones that activate the production of prolactin by the pituitary gland, which consequently stimulates the production of milk. Thus, the more stimulation (suckling or milking), the higher the milk production. Oxytocin, from the neurohypophysis, helps in milk ejection during breastfeeding. Therefore, lactogenesis is a process that begins during pregnancy and extends over the breastfeeding period, depending on the physiology of the woman and the conditions of the child.

Elaboration of the melody

The melody was elaborated in partnership with the Music Course of the Arts and Languages Center of the same educational institution to which the project is linked, and was considered as a product of the subject of Musical Creation. The protection of the score was registered in a notary's office and the musical ET will be registered in the National Library as didactic material.

Music content validation

Regarding the characterization of the group of specialists, according to the Fehring classification[20] adopted for the selection of judges, those who obtained between 6 and 15 points were selected. Among the 18 selected, two obtained between 6 and 7 points; six obtained from 8 to 9 points; four from 10 to 11 points; four from 12 to 13 points; and two from 14 to 15 points. The judges were predominantly female (83%), aged between 36 and 68 years (M = 53 years), with training time between 9 and 43 years (M = 29 years). The areas represented were nursing (n = 12), medicine (n = 3) and nutrition (n = 3), and most of the professionals had a doctoral level education (n = 10). In relation to the area of work, we obtained the representation of the area of education (n = 9), assistance (n = 5) and research (n = 4). According to the region of employment, in which a certain national representation was requested, we obtained professional judges from the south (n = 6), southeast (n = 5), northeast (n = 5), north (n = 1) and midwest (n = 1) regions.

In the validation procedure, the answers given to the items of the evaluation instrument were quantitatively analyzed (Table 1) by the CVI score. During the single round of evaluation, the judges' reports about the song expressed that the proposal is interesting and appropriate for the target audience. The instrument was composed of seven questions, in which the evaluation items achieved varied scores, with the overall CVI of 0.94.

It is significant that the answers of the validation instrument regarding assertions 3 (small review to be representative) and 4 (representative) obtained 80% in the level of agreement among the judges (Figure 3).

Chart 1 presents the questions with suggestions from the judges and the amendments or justification.

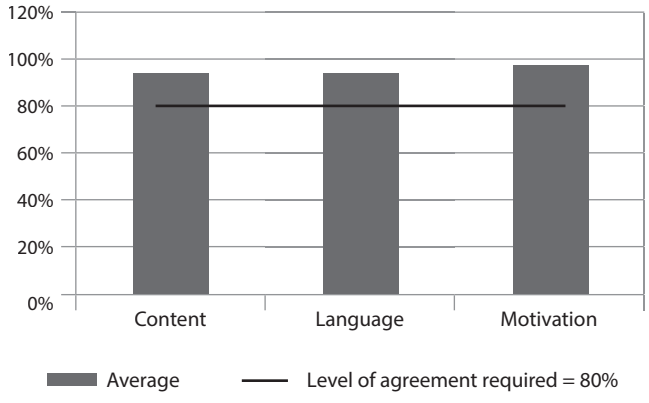


Figure 3 - Level of agreement between the judges in assertions 3 and 4 of the instrument of validation of musical educational technology, Santa Maria, Rio Grande do Sul, Brazil, 2017

Table 1 - General evaluation of the judges about the musical educational technology, Santa Maria, Rio Grande do Sul, Brazil, 2017

Question	4- representative n (%)	3- requires a small revision n (%)	2- requires an extensive revision n (%)	1- not representative n (%)	CVI
1. Is the content of the song appropriate to teach?	8 (44.4)	9 (50)	1 (5.6)	—	0.94
2. Does the content of the song present key points about the physiology of lactation?	12 (66.6)	5 (27.8)	1 (5.6)	—	0.94
3. Are the lyrics clear, understandable and appropriate for health students?	10 (55.6)	7 (38.8)	1 (5.6)	—	0.94
4. Is the content of the song motivating, can it promote learning among health students?	10 (55.6)	8 (44.4)	—	—	1.00
5. Does the content of the song arouse interest in the theme of the physiology of lactation?	10 (55.6)	7 (38.8)	1 (5.6)	—	0.94
6. Does the content of the song provide evidence for student practice in supporting breastfeeding?*	—	—	—	—	—
7. Does the content of the song include the essential aspects of the physiology of lactation?	6 (33.3)	10 (55.6)	2 (11.1)	—	0.89
Calculation of the Global CVI					0.94

*Note: CVI-Content Validation Index. * Question annulled, since it did not coincide with the objective of educational technology.*

Chart 1 – Suggestions from judges about music education technology, Santa Maria, Rio Grande do Sul, Brazil, 2017

Question	Suggestions from judges	Alteration/Justification
1. Is the content of the song appropriate for teachers to use with students?	Remove the word "simple" from the passage "the physiology of lactation is very simple".	"The physiology of lactation is important".
4. Is the content of the song motivating, can it promote learning among health students?	Indication of combining musical content with visual content.	Implicated in the proposal of another research subproject.
7. Does the content of the song include the essential aspects of the physiology of lactation?	Add: lactation inhibitors; intercurrences; women's desire and confidence to breastfeed; stress; and support.	Recognize the importance of factors that interfere with lactation, but emphasize that educational technology includes introductory content to learning physiology.

DISCUSSION

Regarding the success of breastfeeding (BF), a professional with skills and scientific knowledge about the topic is important, so that they feel competent in guiding this practice to users of health services (in breastfeeding) and their families. The content of physiology of lactation, administered in undergraduate classes, is an introductory content and important for the student to understand, including the possibility of complications that may hinder this practice [27]. The musical ET was created to interfere positively in the learning process of professionals in training in the health area. During the creation and validation of this tool, its educational potential was demonstrated.

The proposition to develop a song permeates the evidence that this allows the approach between teacher, student and scientific content, sensitizing and developing a critical-reflective thinking. In this way, the insertion of music in the learning process can make this moment more significant[28].

When using resources from other areas, it was necessary to have the help of an expert professional in the creation of the tool[29-30]. In the situation on screen, the stage of creation of the ET occurred in line with the principles dictated by teachers with training in music and by their students. The experience and the exchange of experience among the participants in this moment were considered of shared learning between such different areas of knowledge. Producing a technology in a multiprofessional way has positive potential, because the knowledge is articulated and can be used together, approaching different areas. This interdisciplinary articulation favors the quality of ET creation.

The judges had significant experience in the subject of breastfeeding, working in teaching, research or extension. The analysis performed by experts on the topic contributed to the approximation and awareness of them with the possibility of using this ET in the academic field, believing in the benefits of using the ET in teaching[31].

It is noteworthy that the ET was validated with a CVI of 0.94 in most assertions, with one assertive with a maximum CVI (1.00) and one with a CVI of 0.89, resulting in a global CVI of 0.94. Validation studies generally point to a valid item with a CVI ≥ 0.80, and level of agreement between the positive responses of the judges ≥ 80%[32-33]. These values were found in this study, corroborating the indication of their validation and implementation in the reality of teaching.

It is interesting to note the importance of developing studies about the production of ET for the academic environment, based on theoretical reference in the area of education. For this study, the Significant Learning Theory proposed by David Ausubel was used[1]. It proposes educational tools, called subsunters, that enhance learning, since they are linked to the cognitive development of the student. This theory is already explored in the health area, as pointed out in a review study, through the construction of conceptual maps, platforms and virtual learning environments[1,34].

It is worth mentioning that in order to develop a quality ET, the methodological journey must be rigorously designed so that the product is useful and valid in the context in which it will be inserted. Thus, studies aimed at translating knowledge to a given reality can use the Knowledge Translation. Studies developed in light of this model bring benefits to the health area, implying the quality of care, teaching and research, and bringing the participants of the study closer to the scientific context[14,35].

Studies about the incorporation of ET in teaching highlight the need that, in addition to developing the technology, the researcher assumes the social commitment, so that its use is sustained, evaluated and monitored[35-36].

Study limitations

Among the limitations of this study, even before the sample of judges, composed of health professionals from different sub-areas and activities, we emphasize that other sub-areas were invited, but did not make up the final sample due to lack of response to the invitation. This fact points to the need for a broader selection process of judges from a quantitative point of view, in order to minimize the possibility of small samples. Another limitation refers to the need to complete the action cycle, adding the indication of combining the musical content with a visual content, and the validation of this material by the target population, implying the proposal of other research subprojects linked to the matrix project, called FISIOLAC in the research group.

Contributions to nursing

The translation of knowledge contributed to the creation and validation of musical ET about the physiology of lactation, which was configured as a facilitating tool for teaching in the health area. The learning process triggered by music may bring students and teachers closer together, make the moment playful and develop critical-reflective thinking. The application of this tool will make students aware about the use of this knowledge to improve their practice, reducing the distance between what they know and what they will do. Additionally, the research will provide subsidies to students who, by linking this content to others of breastfeeding management, will develop enlightening guidelines for users of health services and their families.

CONCLUSION

The musical ET elaborated and submitted to validation obtained scores above 0.80 and agreement level higher than 80%. Thus, it was validated for teachers to use with students in undergraduate classes in the health area, showing its educational potential. As the next step of the study, it is going to be submitted to validation by technical judges in the area of music, and applied to undergraduate students in the health area.

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