ABSTRACT

Objectives: this study aims to develop and analyze an educational technology, through a learning virtual environment, regarding sexually transmitted infections for school-aged teenagers. Method: a quasi-experimental study, pretest-posttest designed, in which an educational intervention was developed and used through a learning virtual environment in a vocational public school, located in a municipality in the northern region of Ceará, Brazil. Participants were teenage high-school freshmen students aged from 15 to 18 years old. We used the survey of knowledge, attitudes and practice (CAP), publicly licensed by the Brazilian Ministry of Health. Results: the virtual environment development provided an open space for discussions about sexuality, confirming knowledge, attitudes, and practice, in addition, analyzing challenges and potentialities of using digital technologies in teenage daily practice. Conclusion: inserting interactive content and technology for health education encouraged autonomy, critical thinking, active participation, and collaborative learning among the participants through a simple and dynamic interface, with simultaneous access in any place with the internet network and easy understanding for users.

Descriptors: Health Education; Adolescent Health; Sexually Transmitted Diseases; Social Media; Health Promotion.
RESUMEN

Objetivos: desarrollar y analizar una tecnología educativa, mediada en un ambiente virtual de aprendizaje, sobre la prevención de infecciones sexualmente transmisibles para adolescentes escolares. Método: estudio cuasiexperimental, del tipo antes y después, en el que se desarrolló y llevó a cabo una intervención educativa mediada por un ambiente virtual de aprendizaje en una escuela pública profesional, ubicada en un municipio de la región norte de Ceará, Brasil. Los participantes fueron adolescentes escolares con edades comprendidas entre 15 y 18 años, cursando el primer año de secundaria. Se utilizó como instrumento de evaluación la encuesta CAP - Saberes, Actitudes y Prácticas, de disposición pública del Ministerio de Salud. Resultados: el desarrollo del ambiente virtual brindó un espacio abierto para la discusión de temas sobre sexualidad, verificando conocimientos, actitudes y práctica, además de analizar los desafíos y potencialidades del uso de las tecnologías digitales en la práctica diaria de los adolescentes. Conclusión: la inserción de contenidos interactivos y el uso de tecnología para la educación en salud estimuló la autonomía, el pensamiento crítico, la participación activa y el aprendizaje colaborativo entre los participantes.
del curso, en una interfaz sencilla y dinámica, con acceso simultáneo en cualquier lugar con red y de fácil comprensión. para los que accedieron.

**Descriptores:** Educación en Salud; Salud del Adolescente; Enfermedades de Tranmisión Sexual; Medios de Comunicación Sociales; Promoción de la Salud.

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**INTRODUCTION**

Adolescence is a complex period in the life of each individual because at this stage the young person experiences significant discoveries and undergoes intense transformations, including behavioral experiences which can jeopardize their health and require better attention from health services to recognize the demands and intervene in a specific and timely way to this audience.1,2

In this perspective, health education stands out as a process that, through communication, aims to empower people with both objective and subjective knowledge and skills so that they are able to make choices regarding their own health, awakening critical awareness, and autonomy towards their conditions.3

The Brazilian Policy for Adolescent Health Care states that this population segment health is important to be included in the sanitary situational analysis of the health regionals to guide the construction of strategies among different sectors with actions, programs, and policies under development in the country, mainly for health promotion; disease prevention; prevention of sexually transmitted infections (STIs), sexual and reproductive health.4
In Brazil, for instance, data point to the fact that, although adolescents have increased knowledge about STIs prevention, there is still a tendency towards increased risk behavior for this public. It is estimated that, each year, four million adolescents become sexually active and that there are approximately 12 million cases of STIs per year, of which one third are in individuals under 24 years of age\textsuperscript{5}.

In this context, inserting health education through educational technologies is an educational strategy that tends to create new favorable scenarios for learning, in order to stimulate promotion, prevention, and monitoring of conditions related to adolescent health. Such insertion of technologies in education, as the case of Information and Communication Technologies (ICT), with emphasis on a computer with Internet access, becomes fundamental, once adolescents already explore the numerous possibilities in their daily lives made available through new technologies\textsuperscript{6-7}.

The ICTs mentioned here may be important allies in this process, since they can make the presented content more attractive, using digital tools and having daily access to the adolescent public. The interest that young people have in technologies produces co-responsibility for the content they consume and it can have a positive impact on their learning, which justifies the need for technology incorporation in different scenarios of use, such as health\textsuperscript{6}.

Therefore, effective and accessible strategies for adolescents are needed, seeking ways to associate health promotion and use of new technologies to expand access to information and guarantee comprehensive care quality for this public, still characterized as distant when it comes to issues related to their health and access to services\textsuperscript{8,9}.

Thus, associating health technologies in the school environment can be advantageous and a scenario to be explored, since these are pedagogical spaces that favor educational actions and are in direct contact with the daily life of adolescents, with an important role in the formation of knowledge and individual behaviors\textsuperscript{10}.

Having said that, the guiding question emerged as “What are the effects of an educational intervention, through a virtual learning environment, on the knowledge, attitude and practice of teenage students about sexually transmitted infections and sexual and reproductive behavior?”.

**OBJECTIVES**

Develop and analyze an educational technology, through a learning virtual environment, regarding sexually transmitted infections for teenage students.

**METHOD**

This is a quasi-experimental study, pretest-posttest designed, with a quantitative approach\textsuperscript{11}. We developed and carried out an educational intervention, through an online course in a virtual learn-
ing environment, and we analyzed its effects on the outcome of: Knowledge, Attitude, and Practice on STI/HIV/AIDS in school-aged adolescents.

The study was carried out in a public vocational school located in a municipality in the northern region of Ceará, Brazil from May to August 2017.

The selection of participants obeyed the following inclusion criteria: being enrolled in the aforementioned school, attending the first year of high school, aged between 14 and 18 years old, and accepting to participate in the research. Discontinuation criteria were: giving up participating in the study after the start of data collection.

This study population consisted of 36 students who were interested in the course proposal, attending the first year of high school and aged between 14 and 18 years.

Before and after the course, we applied an instrument adapted from the Brazilian Ministry of Health (MS) questionnaire, publicly available in free access, based on the dimensions of the CAP (Conhecimento, Atitudes e Práticas) survey - Knowledge, Attitudes, and Practices on STIs.

We used this instrument to assess knowledge, attitude and practice, as appropriate and inappropriate terms, on sexually transmitted infections and sexual and reproductive health, before and after the action developed, also including sociodemographic information. It is worth mentioning that a pilot test was carried out with a sample of 10 individuals from the target audience, in order to adapt the instrument and validate its applicability to a greater number of students.

The assessment levels were considered, according to the Ministry of Health instrument, as Knowledge - Appropriate: when the participant has some knowledge about STD/HIV prevention; knowing that condom use prevents an STD/AIDS and knowing the importance of treating the partner when there is one infected. Inappropriate: when the participant has no knowledge about STD/HIV prevention, or what a condom is for; Attitude - Appropriate: when the participant mentions that condom use is the best way to prevent STD/AIDS in all sexual practices; they know the importance of looking for a health professional. Inappropriate: when the participant does not understand that the best way to avoid an STD/AIDS is to use a condom. Not knowing the importance of looking for a health professional. Practice - Appropriate: when the participant mentions always using condoms, from beginning to end of the sexual practices performed. They have sought a health professional in case of suspicion. Inappropriate: when the participant mentions not using condoms as a way of preventing STD/AIDS.

We carried out this study in five phases: construction of the online course; a face-to-face moment presenting the research and a playful activity with the students; application of the pre-course CAP survey; execution of the course via the online virtual platform; and application of the post-course survey, as appropriate and inappropriate, according to the adolescents' responses.
We analyzed the data and compared them in each category (knowledge, attitude, and practice - appropriate and inappropriate) according to pre-course and post-course responses and presented in simple statistical frequencies to analyze the intervention effects on adolescents' behavior.

We submitted this study to the Research Ethics Committee and it was approved under registration CAAE: 52255215.3.0000.5053 and approval number: 1,408,003. It is worth mentioning that it complied with the requirements recommended by Resolution 466/2012, of the Brazilian National Health Council, in which participants were invited to participate in the research by signing the free informed consent term and post-informed consent form14.

RESULTS

The construction and development of the virtual learning environment provided a space to discuss topics on sexuality and health, verifying the knowledge, attitude, and practice of the 36 study participants on this subject, as well as evaluating the challenges and potentialities of technology use, knowing the availability of these means to the adolescent public.

Development of the Virtual Learning Environment

The process of building the course “Adolescents of the 21st Century: Talking about Sexuality in the Digital Age” (Figure 1) took place through an initiative of the Social Research, Transformative Education, and Collective Health Laboratory - LabSUS, from the State University of Vale do Acaraú (UVA), in using a Virtual Learning Environment (VLE) for adolescents.

![Figure 1. Logo/Visual Identity of the Course. Sobral (CE), Brazil, 2017.](image)

The course objective was to provide adolescents with a space, not only for learning but for interaction based on the modules studied so that they could express their doubts and clarify matters about sexuality and so forth. In addition, a space where they could exercise their autonomy and protagonism in self-care, promoting thus, co-responsibility for good life quality.
We followed literature review steps when developing the course in order to build content to be used and programming to create the online virtual platform. This process had support from the Pro-Rectory of Extension and Culture of the proposing university for matters of certification of participants, and from the Distance Education Center for opening and configuring the platform, inserting the units, and other resources utilized.

The course had a workload of 32 hours, 28 hours of which were distance learning, using the virtual environment, and four hours of face-to-face meetings with adolescents to apply the Knowledge, Attitude, and Practice Survey.

The accessible environment has interactive resources and allows simultaneous access for subscribers along with available reading materials, discussion forums, and other visual resources that can be provided by the facilitators, such as images, videos, websites, games, and supporting materials to be placed in each thematic learning unit (Figure 2).

We elaborated five thematic units, based on literature review, with materials grouped according to adolescents demands in which they have the greatest fragility when it comes to their health, focusing on sexual and reproductive health and promoting their autonomy with subjects related to STIs.

![Figure 2. Homepage of the learning virtual environment. Sobral (CE) Brazil, 2017.](image)

We made the course available to this research’s participants so that they had access to the platform and all the activities and reading materials offered. During this period, we encouraged adolescents to participate in discussion forums, through direct messages to participants via telephone and we gave assistance in discussions within the platform itself (Figure 3).
Moreover, other recreational activities were used to encourage young people to learn what was being discussed in each unit, such as games and videos that reinforced previous and acquired knowledge and did not allow each unit in the platform to be focused only on in the theoretical material.

In order to oversee adolescents access, through a resource available to page administrators, we were able to oversee especially the regularity of access, making it possible to identify the number of adolescents who were participating and in which activities they were more active. Also, we were able to know of those who were showing some resistance to study the units, evidenced by lack of access to the materials of the platform.

Profile of participants

Table 01 describes the sociodemographic characterization of the 36 adolescents participating in the research, according to gender, age, marital status, education level, monthly family income, color or race, and religion.
Table 01. Sociodemographic characterization of teenagers participating in the study (n=36). Sobral, Ceará State, Brazil, 2017.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 years old</td>
<td>17</td>
<td>47.22%</td>
</tr>
<tr>
<td>15 years old</td>
<td>15</td>
<td>41.67%</td>
</tr>
<tr>
<td>16 years old</td>
<td>04</td>
<td>11.11%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>47.22%</td>
</tr>
<tr>
<td>Male</td>
<td>19</td>
<td>52.78%</td>
</tr>
<tr>
<td><strong>Martial Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>30</td>
<td>83.33%</td>
</tr>
<tr>
<td>Living with a partner</td>
<td>02</td>
<td>5.56%</td>
</tr>
<tr>
<td>Separated</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td>No answer</td>
<td>03</td>
<td>8.33%</td>
</tr>
<tr>
<td><strong>Education Degree</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomplete High School</td>
<td>36</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Monthly Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than one minimum wage</td>
<td>12</td>
<td>33.33%</td>
</tr>
<tr>
<td>01 to 02 minimum wages</td>
<td>22</td>
<td>61.11%</td>
</tr>
<tr>
<td>03 to 06 minimum wages</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td>No answer</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td><strong>Skin Color</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td>White</td>
<td>02</td>
<td>5.56%</td>
</tr>
<tr>
<td>Indigenous color</td>
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<td>2.78%</td>
</tr>
<tr>
<td>Brownish</td>
<td>25</td>
<td>71.42%</td>
</tr>
<tr>
<td>Black</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
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<td></td>
</tr>
<tr>
<td>Catholic</td>
<td>24</td>
<td>66.67%</td>
</tr>
<tr>
<td>Spiritualists</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td>Evangelical</td>
<td>09</td>
<td>25%</td>
</tr>
<tr>
<td>Others</td>
<td>01</td>
<td>2.78%</td>
</tr>
<tr>
<td>No answer</td>
<td>01</td>
<td>2.78%</td>
</tr>
</tbody>
</table>

Male adolescents prevailed with 52.78% (19). Regarding age, 47.22% (17) correspond to 14 years old, followed by 41.67% (15) with 15 years, and 11.11% (4) with 16 years old. As for marital status, 83.33% (30) said they had never been married, but 5.56% (2) lived with a partner, and 2.78% (1) said they were separated. Analyzing family’s monthly income, 61.11% (22) earn from 1 to 2 minimum wages. As for color or race, 71.42% (25) identified themselves as brownish. Regarding religion, 66.67% (24) described themselves as Catholics, 25% (9) Evangelicals, 2.78% (1) as Spiritualists, 2.78% (1) as other religions and 2.78% (1) did not respond.

In table 02 it is possible to monitor the internet usage by the study participants.
It is possible to see that 58.33% (21) of participants have a computer at home and 41.66% (15) do not. But all participants said they had access to the internet, with the most common access place being at home, 83.33% (30); followed by school, house of friends, relatives, and a lan house. The mean most used to access internet is the cellphone, being used by 94.44% (34) of participants.

Out of the 36 registered participants who agreed to participate in the survey, only 50% (18) completed the five thematic units, which was verified through the number of accesses to handouts and complementary materials by each registered adolescent, as well as the number of responses to the forums actively and interactively. Hence, the analysis of the CAP survey was only possible to be compared with the 18 participants who were included in the final access to the course.

**Knowledge, attitude and practice of school adolescents about STI/HIV/Aids**

As shown in table 3, 66.66% (12) of the adolescents in the course had adequate knowledge regarding HIV/AIDS prevention and the importance of treating the partner when one of the two is infected. That same number, in the pre-course survey, believe that STI treatment is necessary for
the partner of someone who is infected. After the course, the number increased, in which 77.78% (14) of the participants declared this statement as true, 5.55% (1) as false and 16.67% (3) did not know.

As for the statement that to avoid a sexually transmitted infection, condoms must be used from the beginning of sexual intercourse, all participants marked it as true. In the pre-course survey, 77.78% (14) considered false the statement which said condoms should only be used with HIV carriers in order to prevent AIDS. In the post-course, all participants marked this statement as false.

Regarding the participants who marked as false the possibility of saying that a person has AIDS just by looking at them, in the pre-course it was 77.78% (14). After the course, the number rose to 94.44% (17) who declared this statement to be false and 5.56% (1) who did not know. In the pre-course, 88.88% (16) considered the affirmation of the existence of a cure for AIDS false and in the post-course, the number of participants who considered it false rose to 94.44% (17).

We observed that 88.88% (16) of the participants showed, before the course, an adequate attitude towards prevention of HIV/AIDS through condoms and towards the importance of looking for a health professional if there is any suspicion of a STI contamination, while 11.11% (2) had an inappropriate attitude.
After the course, all participants presented an adequate attitude evaluation. We noted that there was an increase in the number of adolescents with an appropriate attitude, which suggests that through the course, adolescents acquired new knowledge regarding prevention measures and the importance of seeking qualified help.

As to the best way to prevent the transmission of the AIDS virus, 88.88% (16) of adolescents agreed that it would be using condoms. This number turned to 100% after the course was applied. Prior to the course 77.78% (14) agreed that transmission risk is reduced if one has sex only with a faithful and uninfected partner, and the same result was found after the course was completed.

All agreed before and after the course that the HIV test is important for the disease diagnosis (AIDS) and that it is important to look for a health professional to do the test and follow-up in case of suspicion of STI/AIDS.

Regarding practice before the course, only 11.11% (2) showed adequate results regarding condoms usage from beginning to end of sexual intercourse and in seeking care with a health professional in the case of suspected STIs. After the course, there was a slight increase to 16.66% (3). 83.32% (15) did not answer, both before and after the course, due to the non-initiation of sexual relations, which was reported verbally or in writing by adolescents.

As for the use of condoms during sexual intercourse, 11.11% (2) of adolescents answered yes and 5.55% (1) answered no. This participant who did not use a condom had an episode of genital discharge, but sought care with a health professional and underwent treatment. After the course, all of them claimed to use condoms during sexual intercourse, but one of them also reported to have had a genital discharge and sought care with a health professional. Adolescents who answered that they had never done an HIV test before the course corresponded to 88.88% (16).

**DISCUSSION**

The inequality that characterizes the country is also reflected in access to the internet, excluding some groups, such as people who live in rural areas or in the north and northeast, with low education, classes D/E, and with an income of up to one minimum wage, among others, depending on characteristics related to their place of residence, income, color, and race. Consequently, it became essential to know the participants’ profiles in this study.

Research by the United Nations Children's Fund (UNICEF) states that the lower a family income is, the less frequent is the use of the internet among teenagers. In Brazil, there is greater inclusion of internet among adolescents who declare themselves white, compared to blacks and brownish.
In order to know the challenges and potential of access, it is important to know these means’ availability for the participants of this research. The computer is still a high-value device in Brazil, being inaccessible to most students, even though it is important for modern education16,17.

According to some surveys, 71.3% of adolescents, in their statements, make use of cell phones, which they use most of their time, especially with regard to internet use, which is high18,19.

Faced with the reality of adolescents distancing themselves from issues related to their health, the course development, using an easily accessible digital technology, through a virtual learning environment, favored the exchange of knowledge and ease of adherence to their participation, since technologies are part of adolescents’ daily lives and can be allies in the process of cognition and construction of learning20.

ICTs, as pedagogical teaching strategies, have been advancing and causing significant changes in how to educate children and young people. Thus, its use takes into consideration playful and interactive aspects, which brings not only new use possibilities of the new media created but also new ways to stimulate learning of the targeted group21.

Regarding the survey analysis, the knowledge of the participating adolescents on the subject showed a significant result related to the pre-course and post-course test application. Adolescence comprises several events, among them, sexual initiation that many of them experience, and when it happens without guidance, there can be complex consequences for their lives, such as sexually transmitted infections22,23.

As to the main method of preventing sexual transmission, the survey showed good results, with an increase of correct answers after the course, but it should be noted that even with the knowledge about how important condoms are, there is no guarantee that they will use them regularly. Among the justifications for non-prevention, lack of condoms at the time of the act, decreased sensation of pleasure, complete trust in the partner, believing that there is no risk of contracting HIV/AIDS, and resistance, especially from females, to request a condom from her partner.

Results of the Health Behavior in School-aged Children (HSBC) study, in Portugal, pointed to risk behaviors in adolescents, including not using condoms during sexual intercourse, and highlighted health education as the most effective response to the creation of actions that promote personal and social skills in adolescents’ development, as well as preventive strategies instead of being limited to risk prevention, involving not only the individual but all structures that can be identified as support and support network24.

Results showed that adolescents consider it important to seek care with a health professional. Such recognition is relevant, considering the low frequency of adolescents in health services, such as in primary care, and the need for activities aimed at reaching this audience, not being restricted
to only physical healing actions. Given this scenario, it is essential that adolescents know who to look for to guide them about their health care, helping to overcome weaknesses related to capturing and continuing care for this public.\textsuperscript{2,25,26}

In this scenario, nursing stands out in research that refers to the health promotion of adolescents with digital technology usage in health care settings. The nurse, as an educational agent, can make the health environment a welcoming place for active listening, acting in the construction of open and safe spaces for dialogue among the adolescent, the health system, and its available support network.\textsuperscript{27}

Results also showed that although adolescents believe that HIV test is important for the diagnosis of AIDS, they never did it. Literature addresses some reasons that make it difficult for adolescents to access this test, such as shame and fear of discrimination if someone finds out they did it. However, it reinforces health education as the main trigger for providing information about the importance of doing the test.\textsuperscript{28}

As a limitation, we observed low adherence of adolescents to participate in the course and withdrawal of participants by not completing the activities. This situation may be due to the double workload of high school and technical level studies which they were subjected to and also the need to adapt themselves to a course modality that they were not used to, and this requires greater discipline and self-control to follow up and complete the course. However, spaces for dialogue were offered through the website and app to encourage, monitor, solve doubts and make learning easier through the VLE.

CONCLUSION

Inserting interactive content and technology for health education encouraged autonomy, critical thinking, active participation, and collaborative learning among the participants through a simple and dynamic interface, with simultaneous access in any place with the internet network and easy understanding for users.

Most of the adolescents already had knowledge about STIs and sexual and reproductive health before we carried out the intervention, but it was still possible to provide relevant information on the subject to some of them and reinforce it for the others. Regarding attitude and practice, we noticed that most participants had not initiated sexual intercourse, being a strategic moment to develop promotion actions related to sexual and reproductive health and STI prevention.

We suggest further studies using the CAP survey as a way of measuring the behavior of adolescents on these subjects, allowing a more in-depth comparison with the results of this research.

We also reinforce the importance of creating environments that provide subsidies for the realization of collaborative learning in health, through interaction with the public, since professionals still
see the insertion of new technologies in the educational scope as a revolution in educational methods for people. However, it is necessary to understand that updating and training on these teaching and learning strategies comprise a pedagogical field reconfiguration, expanding the possibilities in the context of constant educational renewal, where expression, critical-reflective thinking, and protagonism associated with autonomy must be side by side with the social context in which subject finds themselves.

CONTRIBUTIONS
All authors contributed equally in the design of the research project, collection, analysis and discussion of data, as well as in writing and critically reviewing the content with an intellectual contribution and in approving the final version of the study.

CONFLICTS OF INTERESTS
The authors declare no conflict of interest.

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REFERENCES


