






Evaluation of a prenatal virtual learning object for pregnant adolescents in primary care

Avaliação de objeto virtual de aprendizagem sobre pré-natal para adolescentes grávidas na atenção básica
Evaluación de objeto virtual de aprendizaje sobre prenatal para adolescentes embarazadas en la atención básica

Roberta Fortes Santiago¹  <https://orcid.org/0000-0002-3642-9648>
Elaine Maria Leite Rangel Andrade¹  <https://orcid.org/0000-0002-1772-7439>
Isabel Amélia Costa Mendes²  <https://orcid.org/0000-0002-0704-4319>
Maria Corina Amaral Viana³  <https://orcid.org/0000-0002-6890-9400>
Inez Sampaio Nery¹  <https://orcid.org/0000-0001-7820-0991>

How to cite:

Santiago RF, Andrade EM, Mendes IA, Viana MC, Nery IS. Evaluation of a prenatal virtual learning object for pregnant adolescents in primary care. Acta Paul Enferm. 2020; eAPE20190063.

DOI

<http://dx.doi.org/10.37689/acta-ape/2020A00063>



Keywords

Pregnancy in adolescence; Health education; Education technology; Education, distance; Teaching materials

Descritores

Gravidez na adolescência; Educação em saúde; Tecnologia educacional; Educação à distância; Materiais de ensino

Descriptores

Embarazo en adolescência; Educación en salud; Tecnología educacional; Educación a distancia; Materiales de enseñanza

Submitted

March 19, 2019

Accepted

October 8, 2019

Corresponding author

Roberta Fortes Santiago
Email: betafortes@yahoo.com.br

Abstract

Objective: Describe the construction and evaluation process for a prenatal virtual learning object for pregnant adolescents within the primary care context.

Methods: This is methodological, technological study with a quantitative approach carried out in five stages: analysis, design, development, implementation and assessment of the quality of a virtual object by five judges from the field of nursing in women's health, using the Learning Object Review Instrument, and in terms of ergonomics by five judges from the field of informatics, according to variables related to functionality, usability and efficiency.

Results: The virtual object was entitled GESTAQ. In the evaluation of the judges from nursing in women's health, with the exception of interactive usability, the other items related to the quality of the virtual learning object obtained scores greater than or equal to 80%. In turn, in the evaluation of the judges in informatics, all the variables related to functionality, usability and efficiency obtained scores greater than or equal to 80%. There was a suggestion by these judges to improve the layout, which was implemented.

Conclusion: The virtual learning object was evaluated satisfactorily by judges in the fields of nursing in women's health and informatics, in regard to quality and ergonomics. Therefore, it is considered that GESTAQ may be used as a supplementary digital resource for the educational process of pregnant adolescents within the primary care context to provide prenatal guidance.

Resumo

Objetivo: Descrever o processo de construção e avaliação de um Objeto Virtual de Aprendizagem sobre pré-natal para adolescentes grávidas no contexto da atenção básica.

Métodos: Trata-se de um estudo metodológico, tecnológico de abordagem quantitativa realizado em cinco fases: análise, *design*, desenvolvimento, implementação e avaliação da qualidade do Objeto Virtual por cinco juízes em Enfermagem em Saúde da Mulher usando o *Learning Object Review Instrument* e ergonomia por cinco juízes em Informática de acordo com variáveis relacionadas a funcionalidade, usabilidade e eficiência.

Resultados: O Objeto Virtual foi intitulado GESTAQ. Na avaliação dos juízes em Enfermagem em Saúde da Mulher, com exceção da usabilidade interativa, os outros itens relativos à qualidade do Objeto Virtual de Aprendizagem obtiveram percentual igual ou superior a 80%. Enquanto, na avaliação dos juízes em Informática, todas as variáveis relacionadas a funcionalidade, usabilidade e eficiência obtiveram percentual igual ou superior a 80%. Destacou-se como sugestão apontada por estes juízes a melhoria do *layout*, que foi atendida.

¹Universidade Estadual do Piauí, Teresina, PI, Brazil.

²Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP, Brazil.

³Universidade Regional do Cariri, Crato, CE, Brazil.

Conflicts of interest: none to declare.

Conclusão: O Objeto Virtual de Aprendizagem foi avaliado de forma satisfatória por juízes em Enfermagem em Saúde da Mulher e Informática, quanto a qualidade e ergonomia. Desta forma, acredita-se que o GESTAQ possa ser usado como recurso digital complementar ao processo educativo de adolescentes grávidas no contexto da atenção básica para fornecer orientações sobre pré-natal.

Resumen

Objetivo: Describir el proceso de construcción y evaluación de un Objeto Virtual de Aprendizaje sobre prenatal para adolescentes embarazadas en el contexto de la atención básica.

Métodos: Se trata de un estudio metodológico, tecnológico de enfoque cuantitativo realizado en cinco fases: análisis, diseño, desarrollo, implementación y evaluación de calidad del Objeto Virtual por cinco jueces de Enfermería en Salud de la Mujer, utilizando el *Learning Object Review Instrument*, y ergonomía por cinco jueces de Informática de acuerdo con variables relacionadas con funcionalidad, usabilidad y eficiencia.

Resultados: El Objeto Virtual fue titulado GESTAQ. En la evaluación de los jueces de Enfermería en Salud de la Mujer, a excepción de la usabilidad interactiva, los otros ítems relativos a la calidad del Objeto Virtual de Aprendizaje obtuvieron un porcentaje igual o superior a 80%. Mientras que en la evaluación de los jueces de Informática, todas las variables relacionadas con funcionalidad, usabilidad y eficiencia obtuvieron un porcentaje igual o superior a 80%. Se destacó como sugerencia señalada por estos jueces la mejora del diseño, la cual fue atendida.

Conclusión: El Objeto Virtual de Aprendizaje fue evaluado de forma satisfactoria por jueces de Enfermería en Salud de la Mujer e Informática, respecto a la calidad y ergonomía. De esta forma, se cree que el GESTAQ puede ser usado como recurso digital complementario en el proceso educativo de adolescentes embarazadas en el contexto de la atención básica para ofrecer instrucciones sobre prenatal.

Introduction

A growing number of interventions use information and communication technologies (ICT) for disseminating information on health promotion, prevention and monitoring of diseases.⁽¹⁻³⁾

Through increased use of ICT, virtual learning objects (VLO), which are defined as any digital resource that can be used to support the teaching-learning process, enable reusability, interactivity, interoperability, durability and accessibility.⁽⁴⁻⁵⁾

This is conducive to the production of VLOs in the field to health to bolster the teaching-learning process in relation to various topics and target audiences⁽⁶⁻¹⁰⁾ and make them collaborative, attractive and autonomous for students.⁽¹¹⁾

In the case of prenatal care, the construction of VLOs still needs to be explored as a technological resource to support educational activities on this topic among pregnant adolescents within the primary care context. Educational activities in the prenatal period of pregnant adolescents with only face-to-face strategies do not gain much traction in this target audience, due to lack of interest in the issues addressed and embarrassment to pose their questions and share their difficulties with other participants.⁽¹²⁾ On the other hand, the use of strategies (manuals, pamphlets, slides and CDs) which can be reviewed by pregnant adolescents without the need to be physically present in health services outlets is more effective at the pre- and postpartum adaptation levels.⁽¹³⁾

The use of VLOs can be a valuable resource for supporting educational activities in the prenatal care of pregnant adolescents in the primary care context, in view of the fact that this audience obtains health information using ICT. A study conducted in France noted that almost all the study participants from 15 to 30 years old were ICT users and half of them used the Internet to obtain health information. This increases significantly the higher the age group: 39.3%, 50.4% and 55.4% for the age groups of 15 to 19 years old, 20 to 25 years old and 26 to 30 years old, respectively ($p=0.002$).⁽¹⁴⁾ Another study conducted in Spain found that, out of the 405 adolescents who participated, 53.8% sought information about health on the Internet, 21.5% were interested in the topic of pregnancy and birth control, and 70.7% reported a change of behavior due to health information found on the Internet.⁽¹⁵⁾ However, inaccurate health information may expose people to risk. Therefore, the quality of the pedagogical and technical aspects of VLO need to be evaluated.⁽¹⁶⁾

It is considered that the prenatal VLO for pregnant adolescents in the primary care context may represent an alternative digital resource for carrying out educational activities with this target audience, aimed at improving results in relation to maternal and child health promotion and reducing biopsychosocial risks.

The question posed in this study was: What is the evaluation of judges in the fields of nursing

in women's health and informatics in relation to a prenatal virtual learning object for pregnant adolescents in the primary care context? To answer this question, the study sought to describe the construction and evaluation process of a prenatal virtual learning object for pregnant adolescents in the primary care context.

Methods

This is a methodological, technological study of a quantitative nature, conducted between July 2017 and March 2018, after receiving approval from the Research Ethics Committee, under Protocol No. 1.837.209 and Ethical Consideration Presentation Certificate – CAAE: 59795616.0.0000.5214. Methodological studies refer to investigations of methods for obtaining, organizing and analyzing data so that research instruments and techniques can be created, validated and assessed, with the goal of constructing an instrument that is reliable, accurate and usable.⁽¹⁷⁾

To construct and validate the prenatal VLO for pregnant adolescents in the primary care context, the stages corresponding to the Contextualized Instructional Design (CID) model were used: analysis, design, development, implementation and evaluation. What differentiates the CID from the conventional model for building online educational programs is that the stages are not progressive, but interactive.⁽¹⁸⁾

In the analysis stage, to determine the educational content and objectives of the VLO, the researcher approached 149 pregnant adolescents registered in primary care units in Teresina, in order to identify the main prenatal learning needs of this target audience. Of these, 88 were selected by convenience, based on the following inclusion criteria: receive prenatal care in the one of Family Health Strategy teams linked to primary care units in Teresina and have computer or mobile phone Internet access. The exclusion criteria were: failure to show up at the primary care unit on the day of the prenatal consultation.

For the sociodemographic characterization, ICT use and identification of learning needs of the

pregnant adolescents, two instruments were used. The first, for characterization and use of ICT, was adapted from the literature⁽¹⁹⁾ and the second on prenatal care was created from the protocol of the Ministry of Health on the subject.⁽²⁰⁾ The data collection took place after formal authorization by the pregnant adolescents through signing a free and informed consent form or a similar form in the case of pregnant adolescents under 18 years of age, after the first form was signed by the parents or legal guardian.

The educational objectives were formulated with support from Bloom's taxonomy, which seeks to ensure acquisition of competencies, knowledge and skills in the educational process, through the development of cognitive, affective and sensory domains.⁽²¹⁾ The content considered the prenatal learning needs of the target audience (pregnant adolescents) and the Prenatal Care Manual of the Ministry of Health.⁽²⁰⁾

In the design stage, a work team was formed to create the VLO (researcher and web designer) and the navigation map, screen sequence and each teaching unit, interaction tools, media and schedule of the VLO.

In the development stage, the researcher and web designer produced the print media scripts (texts created by the content developer), images (visual representation of a pregnant adolescent and objects produced by the web designer), audios, videos and discussion forums of the teaching units through a storyboard script. The script tells the story of a teenager who got pregnant and experienced the anguish of telling her parents and the discoveries and transformations resulting from the gestation. However, the adolescent was referred for a prenatal consultation in a primary care unit and received information that answered her questions. The story of the adolescent was transformed into print media produced in the text editor Microsoft Office PowerPoint (Microsoft®, Redmond, Washington DC, United States). The images were in Photoshop CS2 9 software (Adobe® Inc., San Jose, CA, USA). The audios were recorded through Final Cut Pro version 10.4.6 (Apple® Computer, Inc., Cupertino, CA, USA). The forum discussions, an asynchronous interac-

tion tool, were created to foment interaction between the researcher and pregnant adolescents and enable the latter to present, discuss, share and get answers to questions they might have in relation to the prenatal experience. The print media, images and audios were used in the videos of the teaching units which were divided into five weeks and shared on YouTube.

In the implementation stage, the VLO was hosted on the Word Press virtual learning environment (VLE) This environment has two types of users: administrators and participants. The web designer and researcher were the administrators of the VLE. The judges from women's health and informatics were the first participants who evaluated the VLO before its implementation with pregnant adolescents. The web designer was responsible for the architecture and weekly launch of the teaching units and the researcher for user registration and VLE management. The VLO could be accessed by registered users at the electronic address: <http://gestaq.saude.ws/courses/gestaq>. In this stage, the four tutors encouraged access and interactivity and offered technical support to the VLO users. WhatsApp was also used to facilitate and increase the interaction between the researcher and pregnant adolescents.

The VLO was assessed to ensure its reliability and effectiveness. The quality evaluation was performed by judges from the field of nursing in women's health and the ergonomics evaluation by judges from the area of informatics. To this end, there was a convenience sample composed of ten judges – five from nursing in women's health and five from informatics – selected through the snowball technique,⁽¹⁷⁾ based on the inclusion criteria defined by two adapted instruments,⁽²²⁾ one for each professional area. In relation to these criteria, a minimum of five points were established for judges from nursing in women's health and three points for judges from informatics, in order to participate in the study. The literature recommends between six and 20 judges, with at least three judges from nursing in women's health and three from informatics to validate the informational and educational technology on prena-

tal care and instruction for pregnant adolescents within the primary care context.⁽²³⁾

For the judges from nursing in women's health, responsible for evaluating the quality of the prenatal virtual learning object for pregnant adolescents within the primary care context, the Learning Object Review Instrument was used. This instrument seeks to standardize the quality evaluation of educational software and is comprised of nine criteria: content quality, learning goal alignment, feedback and adaptation, motivation, presentation design, interaction usability, accessibility, reusability and standards compliance.⁽²⁴⁾ Each criterion is evaluated using a Likert-type scale, with scores ranging from 1 to 5 (1=low quality and 5=high quality).

For the ergonomics evaluation, the judges from informatics used an instrument with three variables: functionality (ability of the VLE to provide the functions to meet the educational needs of pregnant adolescents); usability (ability of the VLE to be understood, learned and operated by the pregnant adolescents, as well as be appealing); and efficiency (ability of the VLE to perform appropriately in terms of the number of resources used under specific conditions). Each variable is evaluated using a Likert-type scale, with scores that range from 1 to 4 (1=inadequate, 2=not very adequate, 3=adequate, 4=very adequate). At the end of each instrument, there is a space for inserting criticisms, suggestions and/or recommendations.⁽²⁵⁾

For the data collection, an invitation letter, which explained the objectives, was sent by email to the judges to participate in the validation process. A free and informed consent form and the instrument to be validated were also sent. No response to the email invitation, after three sends, in a period of 15 days, was considered as a refusal to participate in the study. Eleven judges from nursing and nine from informatics were contacted by email and, of these, only one from each field responded, at which time the snowball technique was used. Those who agreed to participate in the study signed the free and informed consent form and sent it back to the researcher by email.

Following this, the judges were registered by the researcher and received a user name and password to access the prenatal VLO for pregnant adolescents within the primary care context. After navigation and analysis, they responded to the validation instrument and sent it back by email.

The data obtained was codified by creating a data dictionary and then transcribed, through a double-entry process, using spreadsheets from Microsoft Excel 2010. Once the errors were corrected, the data was exported and analyzed using the Statistical Package for the Social Sciences, version 20, for Windows (IBM SPSS®, New York, United States). A descriptive statistical analysis was performed for the sociodemographic and obstetrics characteristics, ICT use and learning needs of the pregnant adolescents, wherein the qualitative variables were described by absolute and relative frequencies, and the quantitative variables by mean, standard deviation and minimum and maximum.

In the characterization of the judges, frequencies (absolute and relative) were used for the qualitative variables and mean, standard deviation and minimum and maximum for the quantitative variables. In the evaluation of the judges' responses for validation of the informational and educational technology on prenatal care, the scale adapted by Sperandio was used, which recommends that the compliance of each requirement (variable) be more than 70% positive responses from the judges.⁽²⁶⁾ The variables related to this evaluation underwent a descriptive statistical analysis (absolute and relative frequencies).

Results

Characterization of the pregnant adolescents, identification of learning needs and definition of the educational objectives and content

The mean age of the target audience (88 pregnant adolescents) was 16.6 years ($SD \pm 1.6$). The majority were in a conjugal relationship (41 – 46.6%) and brown (67 – 76.1%). Elementary education predominated (45 – 55.1%) and a large number

of the pregnant adolescents were studying (48 – 54.5%). Of those who had stopped studying (13 – 14.8%), the main reason was the gestation. Most had monthly family income of less than two minimum wages, 45.5% (40) lived on income of less than one minimum wage, and 48.9% (43) earned between one and less than two minimum wages. Those who did not work (85 – 96.6%) and counted on support from their families (84 – 95.5%) predominated.

Most had a technological device (73 – 83%) and mobile phones were the main device (70 – 79.5%). A small number used computers (12 – 13.6%) and tablets (2 – 2.3%). Almost all of them used a technological device daily (76 – 86.4%), mainly at home (85 – 96.6%). In relation to the Internet, most accessed it daily (66 – 75%) and primarily at home (81 – 92%). The means of information used the most for getting answers to their questions on pregnancy was the Internet (60 – 68.2%), followed by family, neighbors and/or friends (51 – 58%), community health clinics (31 – 35.2%) and health professionals (29 – 33%).

Most had never participated in any prenatal educational activity (68 – 77.3%). A total of 564 learning needs were identified (100%). The learning needs about pregnancy, birth and the postpartum period mentioned the most by the pregnant adolescents, responsible for causing uncertainties and the desire to receive guidance, were: newborn care (60 – 10.6%); childbirth warning signs (50 – 8.9%); preparation for childbirth (48 – 8.5%); fears and myths regarding gestation and childbirth (46 – 8.2%); hygiene care in pregnancy (44 – 7.8%); types of deliveries (43 – 7.6%); importance of prenatal care (40 – 7.1%); and stages of pregnancy (40 – 7.1%).

The educational objectives and content were organized as follows:

Overall objective: improve the quality of life of the pregnant adolescents.

Teaching units/Specific objectives:

Week 1: introduction of the pregnant adolescents to the prenatal virtual learning object within the primary care context

- Introduce the pregnant adolescents to the prenatal virtual learning object.

Week 2: importance of the prenatal period and stages of pregnancy

- Learn about the importance of the prenatal period and the changes brought about by the gestation;
- Reflect on the biopsychosocial modifications of gestations in adolescence;
- Critically assess the need for consultations with health professionals during the prenatal period;
- Interact with health professionals, family members and other pregnant women.

Week 3: questions, fears and myths regarding pregnancy and hygiene care during the pregnancy.

- Answer questions, address fears and debunk myths that are common and may affect women during the gestation;
- Adopt adequate hygiene habits during the gestational period;
- Interact with health professionals, family members and other pregnant women.

Week 4: preparation for childbirth; warnings signs of childbirth and types of deliveries

- Understand preparation for childbirth;
- Know the difference between and the advantages and disadvantages of natural and C-section births;
- Identify the onset of labor;
- Adopt measures to ensure a healthy delivery and birth;
- Interact with health professionals, family members and other pregnant women.

Week 5: newborn care

- Understand the care to be given to the newborn;
- Identify the newborn's needs;
- Providing care to ensure the newborn's needs are met;
- Interact with health professionals, family members and other pregnant women.

Prenatal virtual learning object for pregnant adolescents within the primary care context

The prenatal VLO for pregnant adolescents in a primary care context was named GESTAQ and, on the

home screen, the researcher's name briefly appears. The user starts navigating by clicking on the "Enter" icon, found in the upper right corner of the page of the course. The person is then instructed to register a user name and password. After inserting the data, the user is taken to GESTAQ which is comprised of five weeks, as shown in Figure 1.

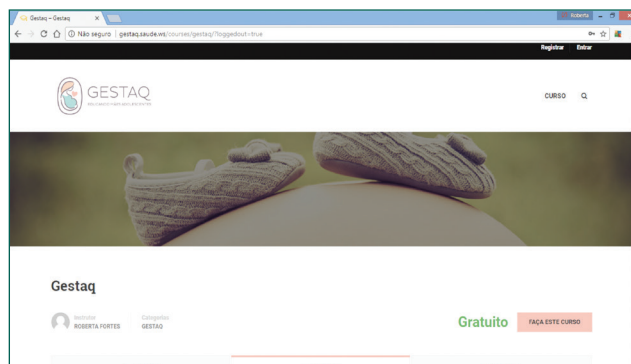


Figure 1. GESTAQ home screen

Week 1 was entitled "Let's start here" and corresponded to the introduction of GESTAQ. During this week, information was provided about: objectives, content, duration of the teaching unit (one week) and how to access it. There was also a video that told the story of a teenager who found out she was pregnant, and in the end the users were invited to interact in the introduction forum. To access the forum, it was only necessary to click on the "discussion forum" tool, located immediately below the video.

In the weeks to follow, users would watch a video on the home screen of each teaching unit with a brief description of the activities that would take place and participate in the discussion forum.

Assessment of the prenatal virtual learning object for pregnant adolescents within the primary care context

In relation to the judges from the field of nursing in women's health, most were women (4 – 80%), with a prenatal research project (4 – 80%) and all (5 – 100%) provided guidance for academic papers, had published articles and participated in assessment committees in that field. The mean number of years of education was 23.6 (SD±9.3); most had a master's degree (3 – 60%) and a specialization in wom-

en's health (4 – 80%). The mean length of teaching time in the prenatal area was 13.4 years (SD±3.2) and length of time working in the field was 15.6 years (SD±10.3). The mean score in the selection criteria of the judges was 22 points (SD±10,1), with a minimum of 10.3 points and a maximum of 38.

As for the judges from the field of informatics, all (5 – 100%) were men, with experience in website development, and most (4 – 80%) had a specialization in the area of web development and professional experience developing virtual learning environments. The judges achieved a mean score of 3.8 points (SD±1.8) in the criteria, with a minimum score of three points and a maximum of seven.

The data obtained from the quality validation by the judges from nursing in women's health are presented in Table 1.

Table 1. Evaluation of the prenatal virtual learning object by judges from nursing in women's health (n=5)

Items assessed	Score on Likert scale	Total 5 (100) n(%)	%*
Content quality	1	-	100
	2	-	
	3	-	
	4	2 (40)	
	5	3 (60)	
	NA	-	
Learning goal alignment	1	-	80
	2	-	
	3	1 (20)	
	4	1 (20)	
	5	3 (60)	
	NA	-	
Feedback and adaptation	1	-	80
	2	-	
	3	1 (20)	
	4	2 (40)	
	5	2 (40)	
	NA	-	
Motivation	1	-	80
	2	-	
	3	1 (20)	
	4	2 (40)	
	5	2 (40)	
	NA	-	

Continue...

Continuation.

Items assessed	Score on Likert scale	Total 5 (100) n(%)	%*
Presentation design	1	-	100
	2	-	
	3	-	
	4	3 (60)	
	5	2 (40)	
	NA	-	
Interactive usability	1	-	60
	2	-	
	3	2 (40)	
	4	1 (20)	
	5	2 (40)	
	NA	-	
Accessibility	1	-	80
	2	-	
	3	1 (20)	
	4	2 (40)	
	5	2 (40)	
	NA	-	
Reusability	1	-	100
	2	-	
	3	-	
	4	2 (40)	
	5	3 (60)	
	NA	-	
Standards compliance	1	-	100
	2	-	
	3	-	
	4	1 (20)	
	5	4 (80)	
	NA	-	

*4 - good quality and 5 - excellent quality

It was observed in Table 1 that, except for interactive usability, the mean for scores 4 and 5 was 80% or higher, as indicated by the responses of the women's health judges. In terms of interactive usability, 60% of the responses were for scores 4 and 5. The data obtained in the ergonomics evaluation by the informatics judges are presented in Table 2.

It was noted in Table 2 that the sub-variables of functionality, usability and efficiency were greater than or equal to 80% of the responses, with scores 3 or 4, by the informatics judges. They suggested improving the layout of the educational intervention by replacing the terms in English with Portuguese equivalents, as well as differentiating the colors between the topics and subtopics. These recommendations were implemented.

Table 2. Evaluation of the prenatal virtual learning object by judges from informatics (n=5)

Variable	Sub-variable	Score on Likert scale	Total 5 (100) n(%)	%*	
Functionality	The VLE uses resources efficiently.	1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	1 (20)		
		4 – Very adequate	4 (80)		
	The support functions are implemented.	1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	1 (20)		
		4 – Very adequate	4 (80)		
	It has interaction and communication mechanisms.	1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	3 (60)		
		4 – Very adequate	2 (40)		
	The content can be accessed nonlinearly.	1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	2 (40)		
		4 – Very adequate	3 (60)		
	It has synchronous and asynchronous tools.	1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	4 (80)		
		4 – Very adequate	1 (20)		
	Usability	The VLE is easy to use.	1 – Inadequate	-	100
			2 – Not very adequate	-	
			3 – Adequate	-	
			4 – Very adequate	5 (100)	
The help information is clear and easy to understand.		1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	3 (60)		
		4 – Very adequate	2 (40)		
The amount of information contained on each screen is adequate.		1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	1 (20)		
		4 – Very adequate	4		
The size and font type of the content are adequate.		1 – Inadequate	-	100	
		2 – Not very adequate	-		
		3 – Adequate	-		
		4 – Very adequate	5 (100)		
The choice of colors in the environment and the contrasts between them are adequate.		1 – Inadequate	-	80	
		2 – Not very adequate	1 (20)		
		3 – Adequate	1 (20)		
		4 – Very adequate	3 (60)		
The audiovisual resources have good quality.		1 – Inadequate	-	80	
		2 – Not very adequate	1 (20)		
		3 – Adequate	1 (20)		
		4 – Very adequate	3 (60)		
The language is interactive.	1 – Inadequate	-	100		
	2 – Not very adequate	-			
	3 – Adequate	1 (20)			
	4 – Very adequate	4 (80)			

Continue...

Continuation.

Efficiency	The proposed time is compatible with the amount of content presented.	1 – Inadequate	-	100
		2 – Not very adequate	-	
		3 – Adequate	1 (20)	
		4 – Very adequate	4 (80)	
	The number of classes and topics is consistent with the proposed time.	1 – Inadequate	-	100
		2 – Not very adequate	-	
		3 – Adequate	2 (40)	
		4 – Very adequate	3 (60)	
	The resources are used in an adequate and understandable way.	1 – Inadequate	-	100
		2 – Not very adequate	-	
		3 – Adequate	1 (20)	
		4 – Very adequate	4 (80)	
	The navigation instructions in the classes are adequate.	1 – Inadequate	-	80
		2 – Not very adequate	1 (20)	
		3 – Adequate	1 (20)	
		4 – Very adequate	3 (60)	
	The amount of resources used is adequate.	1 – Inadequate	-	100
		2 – Not very adequate	-	
		3 – Adequate	2 (40)	
		4 – Very adequate	3 (60)	

*4 - good quality and 5 - excellent quality

Discussion

A limitation of the study is that the prenatal VLO evaluation was only done by content and technical judges, but its clinical evaluation by pregnant adolescents who will use the VLO is likewise important.

Another aspect is the fact that the content of the VLO does not include: reproductive rights, postpartum birth control, violence against women, mental health and sexually transmitted diseases, even though its construction was based on the Prenatal Care Manual of the Ministry of Health,⁽²⁰⁾ a survey of the prenatal learning needs of the pregnant adolescents and the opinion of the nursing in women's health judges who did not suggest the inclusion of these topics.

It is believed that the prenatal VLO will assist the work of nurses and other health professionals who carry out educational activities on this topic, since it is an innovative, accessible and important digital resource for health promotion and prevention of maternal and child complications in pregnant adolescents within the primary care context.

Prenatal virtual learning object for pregnant adolescents within the primary care context

In the characterization of the target audience (pregnant adolescents), the rate of mobile phone use by the pregnant adolescents and home Internet use was high, consistent with the National Households Sample Survey (PNAD) done by IBGE.⁽⁶⁾ According to this survey, 78.3% of the population has a mobile phone and 80% of the Brazilian population between the ages of 15 and 19 years use the Internet.

The Internet was the primary means of information used by the adolescents to clear up uncertainties and get answers related to pregnancy. Various learning needs were detected, since most had never participated in an educational activity during the prenatal period. The Ministry of Health considers it necessary and important for health professionals to carry out educational activities with pregnant women during the prenatal period, in order to answer their questions and address fears and anxieties. However, in practice, it was noted that these activities are lacking.⁽²⁰⁾

In addition, searching for information online should be done with caution because the information is not always reliable. A study conducted by the French National Institute for Prevention and Health Education with young people from ages 15 to 30 years found that most of the participants, particularly adolescents, used and trusted in information on the Internet. Among the topics searched the most were those in relation to maternity.⁽¹⁴⁾ The study pointed out that although this medium is an important source of information, previous guidance from health professionals is necessary, as well as access to reliable information.

The most frequent questions and uncertainties of the pregnant adolescents were used as content for the prenatal VLO. The data obtained from the pregnant adolescents enabled planning the OVA and was crucial, since the topic of pregnancy is vast and, when it occurs during adolescence, is vaster still, since there are various important sub-themes.

The Ministry of Health recommends addressing various aspects during the prenatal period through educational activities.⁽²⁰⁾ Due to this, it was decided that it would be relevant for building the VLO to

determine more specifically the characteristics and needs of the pregnant adolescents, so that it would be possible to include the points that generated the most questions, insecurity and fear and that directly affected in their quality of life.

The educational objectives, based on Bloom's taxonomy, were organized, as recommended by the literature, from the simplest to the most complex, so that the previous objective would be a prerequisite for proceeding to the following one.⁽²¹⁾

Afterwards, the design was elaborated. In this stage, it was essential to create environments that would enable efficient learning and require the use of the various different strategies available, in view of the reality lived by those who would use it.⁽¹⁸⁾ For this reason, the selected content was developed through reference material of the Ministry of Health, which had a technical manual aimed at caring for pregnant women.⁽²⁰⁾ The classes were created and, together with the web designer, the storyboard was planned and developed, which used text, images, sound, animation and forums for interaction.

The VLO was developed using WordPress. The choice of this software as the VLE was based on various aspects: be easy to access regardless of the technological device used, enable the use of integrated tools that are flexible in terms of access, and provide teacher-user interaction and interactivity. These aspects were considered based on a preliminary analysis of the pregnant adolescents' needs, which must be taken into account, since, to ensure the quality of the VLE knowledge construction process and achieve the educational objectives, it is necessary to consider environment, content, interactivity and people.⁽²⁷⁾

In the implementation of the VLO, different tools available in the VLE were used and it was also decided to use the application WhatsApp, in order to increase interaction and encourage access to the prenatal VLO.

The resources provided by WhatsApp (text, video, audio, image, expression of emotion through figures and animations) are responsible for its appeal and intense use, especially among teenagers. Studies have shown that it is able to strengthen the educational process.⁽²⁸⁻³⁰⁾ Therefore, the researcher

created a group on this application, which included all the pregnant adolescents who participated in the prenatal VLO, aimed at avoiding them from missing the classes or dropping out.

Evaluation of the prenatal virtual learning object for pregnant adolescents within the primary care context

The judges from the fields of nursing in women's health and informatics were found to be experienced and capable of evaluating the VLO, since they achieved a higher average than required in the scoring system adopting for selecting them.

Studies that have elaborated learning environments have confirmed the importance of doing a quality and ergonomics evaluation after the construction of an online educational intervention, as pointed out in a study that developed educational hypermedia on sexually transmitted diseases (STD) for nursing academics,⁽³¹⁾ as well as another that evaluated a VLO for intestinal ostomies (elimination).⁽³²⁾

A VLO on the systematization of nursing care was evaluated by professional judges (experts) in the field, regarding aspects related to the available didactic material, to enable an adequate pedagogical approach with good quality.⁽³³⁾ Therefore, evaluations are necessary to ensure that users have access to contextualized content that is consistent with their previous experiences.⁽²⁵⁾

In the evaluation of the quality of the prenatal VLO by nursing in women's health judges, the only item that scored less than 70% was interactive usability, which had 60% positive responses. The other 40% of the judges deemed it as good. However, this result does not invalidate the item since the evaluation was good overall. Furthermore, there is a study which considers that the target is that each item achieves a minimum score of "good".⁽³⁴⁾ Such evaluations of interactive usability occur since they were the first tests with the informational and educational technology.⁽³⁵⁾

Similar results for a quality evaluation were found in a study which used the same items for validating a mobile application which assesses the level of consciousness of critically-ill patients, as well as

another which used the items to validate a VLO to measure acute pain.^(33,35) In view of the results obtained from the women's health judges, it can be concluded that the content of the VLO has adequate quality for the teaching-learning process of pregnant adolescents.

In the ergonomic evaluation of the prenatal VLO by the five informatics judges, the variables of functionality, usability and efficiency, which also have sub-variables, were evaluated. The five sub-variables that make up functionality received a higher score than expected (70%) since the positive responses achieved 100% agreement among the judges. This finding indicates that the VLO used the available resources efficiently to meet the educational needs of the pregnant adolescents.

The seven sub-variables which compose usability were also evaluated by the judges. Only the one related to the use of colors and the audiovisual resources of the educational intervention achieved a level of agreement of 80%. For the other sub-variables, the level of agreement was 100%. The suggestion to create color contrasts between the topics and subtopics was implemented, but the use of light colors was maintained. The use of light colors in the program's layout was important to avoid distracting users.^(31,32) The evaluation of usability and the adjustment made ensured that the informational and educational technology has the ability to be understood, learned and operated by pregnant adolescents, as well as be appealing.

Of the five sub-variables that compose efficiency, four obtained a level of agreement of 100% among the judges. Only the one that evaluated navigation instructions had an 80% level of agreement, which demonstrates the power of informational and educational technology to provide appropriate performance in relation to the resources used.

In light of the content and technical evaluation of the VLO, it is believed that it can contribute to the teaching-learning process of pregnant adolescent and supply knowledge that could have an impact on aspects related to their quality of life.

Conclusion

The development of the prenatal VLO for pregnant adolescents, called GESTAQ, required a systematized and flexible process, based on identification of the learning needs of the target audience. GESTAQ received a good evaluation in terms of quality and ergonomics. It is a digital resource that could be used by nurses and other health professionals to complement the educational process, especially in primary care, providing support to the guidelines imparted in prenatal consultations.

Acknowledgments

To the Federal University of Piauí (opportunity to do the PhD) and to the judges who participated in the validation and evaluation of the educational primer.

Collaborations

Santiago RF contributed with conception of the design, execution of the study, writing of the article, relevant critical review of the intellectual content and final approval of the version to be published. Nery IS and Andrade EMLR contributed with conception of the design, writing of the article, relevant critical review of the intellectual content and approval of the final version to be published. Mendes IAC and Viana MCA contributed with the relevant critical review of the intellectual content and final approval of the version to be published.

References

1. Lee M, Lee H, Kim Y, Kim J, Cho M, Jang J, Jang H. Mobile app-based health promotion programs: a systematic review of the literature. *Int J Environ Res Public Health*. 2018; 13;15(12). doi.org/10.3390/ijerph15122838.
2. Marcolino MS, Oliveira JA, Ribeiro AL. Text messaging for prevention and treatment of cardiovascular disease: time to move on. *Heart*. 2017;103(12):893–4.
3. Dorje T, Zhao G, Scheer A, Tsokey L, Wang J, Chen Y, Tso K, Tan BK, Ge J, Maiorana A. SMARTphone and social media-based Cardiac Rehabilitation and Secondary Prevention (SMART-CR/SP) for patients with coronary heart disease in China: a randomised controlled trial protocol. *BMJ Open*. 2018;8(6):e021908.
4. Wiley DA, editor. The instructional use of learning objects. Logan (UT): Utah State University; 2002. Connecting learning objects to instructional design theory: a definition, a metaphor, and a taxonomy; p. 6.
5. Fabre MC, Tamusiunas F, Tarouco LM. Reusabilidade de objetos educacionais. *Rev Novas Tecnol Educ*. 2003;1(1):1–11.
6. Pacheco KC, Azambuja MS, Bonamigo AW. The construction of learning objects on communicable diseases for community health agents. *Rev Gaucha Enferm*. 2018;38(4):e20170073.
7. Salvador PT, Mariz CM, Vitor AF, Ferreira Júnior MA, Fernandes MI, Martins JC, et al. Validação de Objeto Virtual de Aprendizagem para apoio ao ensino da sistematização da assistência de enfermagem. *Rev Bras Enferm*. 2018;71(1):11–9.
8. Warmling CM, Pires FS, Baldisserotto J, Levesque M. Ensino da bioética: avaliação de um Objeto Virtual de Aprendizagem. *Rev Bioética*. 2016;24(3):503–14.
9. Lara MV, Borges S, Welter M, Mello-Carpes PB. Objetos de aprendizagem como coadjuvantes do processo de ensino-aprendizagem de Fisiologia humana. *Rev Ensino Bioquím*. 2014;12(1):34–47.
10. Gadioli B, Fulquini FL, Kusumota L, Gimenes FR, Carvalho EC. Construção e validação de um Objeto Virtual de Aprendizagem para o ensino da semiologia vascular venosa periférica. *Esc Anna Nery*. 2018;22(4):e20180043.
11. Salvador PT, Bezerril MS, Mariz CM, Fernandes MI, Martins JC, Santos VE. Objeto e ambiente virtual de aprendizagem: análise de conceito. *Rev Bras Enferm*. 2017;70(3):572–9.
12. Queiroz MV, Menezes GM, Silva TJ, Brasil EG, Silva RM. Grupo de gestantes adolescentes: contribuições para o cuidado no pré-natal. *Rev Gaúcha Enferm*. 2016; 37(Esp):e2016-0029.
13. Aba YA, Kömürçü N. Antenatal education on pregnant adolescents in Turkey: prenatal adaptation, postpartum adaptation, and newborn perceptions [Korean Soc Nurs Sci]. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2017;11(1):42–9.
14. Beck F, Richard JB, Nguyen-Thanh V, Montagni I, Parizot I, Renahy E. Use of the internet as a health information resource among French young adults: results from a nationally representative survey. *J Med Internet Res*. 2014;16(5):e128.
15. Blázquez Barba M, Gómez Romero D, Frontaura Fernández I, Camacho Ojeda A, Rodríguez Salas FM, Toriz Cano H. [Use of new technologies by adolescents in the search for health information]. *Aten Primaria*. 2018;50(9):547–52.
16. Akhavan P, Arefi MF. Quality development of learning objects: comparison, adaptation and analysis of learning object evaluation frameworks for online courses. *J Inform Technol Applic Educ*. 2014;3(2):57–66.
17. Polit DF, Beck CT. Fundamentos de pesquisa em Enfermagem: avaliação de evidências para a prática da enfermagem. 7a ed. Porto Alegre: ArtMed; 2011.
18. Filatro. A. Design instrucional contextualizado: educação e tecnologia. 2a ed. São Paulo: Senac; 2007. p.70.
19. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostras de Domicílios – Acesso à internet e a televisão e posse de telefone móvel celular para uso pessoal 2013 [Internet]. [citado 2018 Set 3]. Disponível e : <http://biblioteca.ibge.gov.br/visualizacao/livros/liv93373.pdf>

20. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Atenção ao pré-natal de baixo risco. Brasília: Ministério da Saúde; 2012.
21. Ferraz AP, Belhot RV. Taxonomia de Bloom: revisão teórica e apresentação das adequações do instrumento para definição de objetivos instrucionais. *Gest Prod*. 2010;17(2):421–31.
22. Freitas LV, Teles LM, Lima TM, Vieira NF, Barbosa RC, Pinheiro AK, et al. Exame físico no pré-natal: construção e validação de hiperídia educativa para a enfermagem. *Acta Paul Enferm*. 2012; 25(4):581-8.
23. Pasquali L. Instrumentação psicológica: fundamentos e práticas. Porto Alegre: ArtMed; 2010.
24. Nesbit J, Belfer K, Leacock T. Learning Object Instrument Review (LORI). User Manual. E-Learning Research and Assessment Network (eLera) - Portal for Online Objects in Learning (POOL) [Internet]. 2009 [cited 2018 Jun 10]. Available from: http://www.academia.edu/7927907/Learning_Object_Review_Instrument_LORI_
25. Trindade CS, Dahmer A, Reppold CT. Objetos de aprendizagem: uma revisão integrativa na área da saúde. *J Health Inform*. 2014;6(1):209.
26. Sperandio DJ. A tecnologia computacional móvel na sistematização da assistência de enfermagem: avaliação de um *software* protótipo [tese]. Ribeirão Preto (SP): Universidade de São Paulo; 2008.
27. Miranda GS. Tecnologia, interação e interatividade: desafios para o docente em ambientes virtuais de aprendizagem [dissertação]. Pouso Alegre (MG): Universidade do Vale do Sapucaí; 2015.
28. Araújo PC, Bottentuit Júnior JB. O aplicativo de comunicação WhatsApp como estratégia no ensino de filosofia. *Temática*. 2015;11(2):11–23.
29. Kirchner K, Razmerita L. Collaborative Learning in the Cloud – A Cross-Cultural Perspective of Collaboration. *Proceedings of the 26th ACM Conference on Hypertext & Social Media*. Guzelyurt, Northern Cyprus — September 01 - 04, 2015. p.333-6. [cited 2018 Sep 2]. Available from: <https://dl.acm.org/citation.cfm?id=2700171.2804452>
30. Leite NC, Silva MO. WhatsApp: caracterização do gênero chat em contexto de ensino de línguas estrangeiras. *Texto Livre*. 2015; 8(1): 85-97.
31. Holanda VR, Pinheiro AK. Technology for education of sexually transmitted diseases: hypermedia validation. *Rev Enferm UFPE Online*. 2016; 10(6) 2082-90.
32. Braga CS, Andrade EM, Luz MH, Monteiro AK, Campos MO, Silva FM, et al. Construção e validação de um Objeto Virtual de Aprendizagem sobre estomias intestinais de eliminação. *Invest Educ Enferm*. 2016;34(1):120–7.
33. Salvador PT, Mariz CM, Vítor AF, Ferreira Júnior MA, Fernandes MI, Martins JC, et al. Validação de objeto virtual de aprendizagem para apoio ao ensino da sistematização da assistência de enfermagem. *Rev Bras Enferm*. 2018; 71(1):16-24.
34. Alvarez AG. Tecnologia persuasiva na aprendizagem da avaliação da dor aguda em enfermagem [tese]. Florianópolis (SC): Universidade Federal de Santa Catarina; 2014.
35. Barros WC. Aplicativo móvel para aprendizagem da avaliação do nível de consciência em adultos (OMAC) [tese]. Florianópolis (SC): Universidade Federal de Santa Catarina; 2015.