

Serious game e-Baby: nursing students' perception on learning about preterm newborn clinical assessment

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ABSTRACT

Objective: to evaluate students opinion regarding e-Baby educational technology. **Methodology:** exploratory descriptive study in which participated a sample composed of 14 nursing Portuguese students that used e-Baby digital educational technology in an extracurricular course. To achieve the aim of the study, the data collection was realized through an opinion instrument in Likert scale including the possibility of commentaries by students. It was also collected data of participants' characterization. **Results:** students made very satisfactory evaluations regarding the game e-Baby, varying since usability acceptance through suggestions of expansion of the game to other nursing themes. **Conclusion:** serious game e-Baby can be considered a didactic innovation and motivator tool of learning. Besides, it demonstrates have adequate interface in design and educative function aspects, evocating intense interaction between user and computational tool.

Key words: Neonatal Nursing; Educational Technology; Students Nursing.

INTRODUCTION

Nowadays, there are many educational tools that have incorporated digital technologies. We highlight virtual learning environments (VLE), digital learning objects, social networks and educational games - also called serious games.

Serious games are, by definition, games used for training, simulation or education that can be run on computing devices⁽¹⁾. The aim of these games is to practice daily situations and promote training of children and adults to make decisions in the field of education on specific topics for which they are developed. They also make the everyday simulations more attractive⁽²⁾.

Regarding the term serious games, there is an ongoing discussion between the experts who are separated, some believe that the term "serious" disqualifies the rigor of the game/simulation while others believe the term reinforces the seriousness of it in its educational character⁽³⁾. We have adopted the concept of serious game as a game used in education and making use of virtual simulation to mimic reality, this is what represents our interest: the clinical practice of nurses when facing premature babies.

The literature suggests important advantages in the use of digital technologies in education, especially when it comes to generation Y, who grew up in the middle of technological advances. In this context, we developed the serious game e-Baby as a proposal for a post-doctoral project by the Ribeirao Preto School of Nursing, in partnership with the Coimbra School of Nursing. E-Baby is a game that has the environment of a virtual incubator in which the user performs the clinical assessment of oxygenation in preterm infants. The game meets the characteristics considered fundamental in educational tools raised at nearly a decade by scholars, including availability of scenario for the student to solve problems experienced in the simulation, hypothesis formulation for decision-making and interaction with an interesting playful tool⁽⁴⁾.

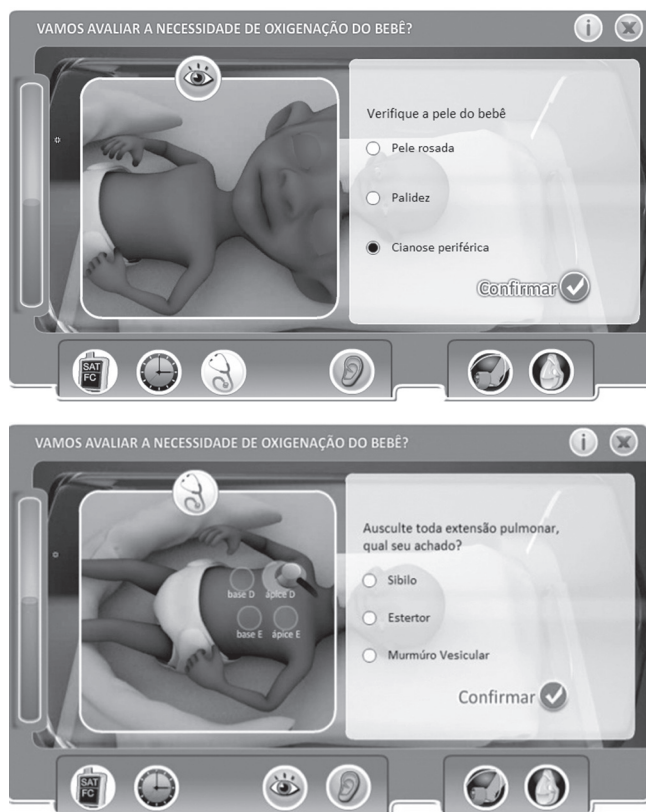
In the e-Baby, the user knows the history of the preterm infant, chooses tools for clinical assessment according to their judgment on the case, answer the question associated with that moment of interaction with the baby and checks if the assessment/answer is appropriate, testing their knowledge and simulating their action with a virtual baby. The virtual baby presents different levels with respiratory impairments, ranging from little to more complex clinical involvement. There are buttons on the interface where the user has the option to film the entire assessment procedure and share their performance on social network. The serious game has the potential to assist in the teaching and learning process representing a more flexible, attractive and interactive way through simulations, approaching the reality found in a neonatal unit, allowing the most appropriate training for students concerning oxygenation clinical assessment of a risk population segment, the newborn preterm infants (NPI)⁽⁵⁾.

Figure 1 shows the serious game two screenshots during clinical assessment performed by the user.

In this digital educational technology of development context, the study aimed to evaluate this technology in view of the opinion of nursing students (target group), as an important

part of the tool for the implementation of impact measurement in the teaching-learning process and success under the perspective of the user.

Figure 1 - Screenshots of e-Baby game



METHOD

This is a descriptive exploratory study, in which an assessment of the educational technology e-Baby was performed based on feedback of nursing students about their use.

This study was submitted to the Research Ethics Committee of the Health Sciences Investigation Unit - Nursing at the Coimbra School of Nursing and approved under the protocol 73-02/2012.

The study population was composed of 14 students in their final year of undergraduate Nursing course at the Coimbra School of Nursing (ESENFC) of Portugal who agreed to participate in this study voluntarily and agreed to attend an extracurricular course of 30 hours divided in two weeks during the university holiday's period.

We performed characterization of the students through a questionnaire containing data on age, sex, computer knowledge, computer access and internet availability and previous access to online games. Data were collected through completion of characterization tools and online feedback. Research participants used e-Baby technology for a period of 15 days, freely choosing the location, time and duration of access according to what they wanted and judged necessary for learning,

they completed the instrument and gave their opinion, their answers were automatically sent to the e-Baby database.

Students' assessment instrument used in the study consists of items that verified: friendly use of the educational game, assessment of the feedback offered, contribution to learning, motivational feature for the user to learn playing, possibility of teaching tool substitution and recommendation of the game's strategy for other topics in nursing, among other aspects described below.

The statistical analysis was descriptive through frequencies for categorical variables and central tendency measures for quantitative variables.

RESULTS

Out of the 14 Portuguese students, 12 (85.7%) were women with age ranging between 21 and 29 years (mean: 22.36 years and standard deviation: 2.06 years) showing strong homogeneity in the categories gender and age among participants. None of the participants reported to be working and studying, regarding computer usage frequency 78.6% (n=11) reported they usually use computers, while others reported regular use (21.4%/n=3). As the preferred location for using computer, 64.3% (n=9) answered at home; 28.6% (n=4) at the university; 7.1% (n=1) at home of relatives and friends. All students reported having a computer, and of these, 28.6% (n=4) have laptops and 71.4% (n=10) have a desktop computer, but regardless of the type of computer, everyone has access to internet.

Table 1 presents data obtained from the students' assessment instrument on serious game e-Baby.

We highlight some feedbacks from students' written answers of the instrument to help us understand the results of this study, presented in Table 1, which also enriched data analysis.

Regarding the interaction of students with the game, which is a critical factor for the success of the instrument usability, a student said:

The fact that this game is interactive makes it much easier to study and absorption of the information it transmits. I think e-Baby helped me to supplement my knowledge on premature babies in the sense that, in this software, I had a direct interaction with the baby. (S1)

Regarding the importance of the e-Baby game for learning the subject, three students said:

This technology was useful for learning about the clinical assessment of premature infants. (S5)

The technology used was very enriching for the evolution of my learning about the clinical assessment in preterm baby subjects. (S11)

Access to educational technology was important to meet the basic human needs of premature baby. I think that it is an optimal way to deepen knowledge (on premature infants). (S13)

The statements below support innovative and simulation qualities of the reality that the game has:

I think that if ESEnc could use this project would be very enriching because it would provide a new way for studying for future nurses. (S1)

Regarding the e-Baby, it helps us a lot because the situation is very real and helped me practicing the assessment of respiratory rate in preterm infants, which sometimes becomes difficult. (S4)

The technology used is very important to integrate new knowledge. It helps us to reflect on practice and facilitates

Table 1 - Frequencies of answers on students' assessment instrument on the serious game e-Baby

e-Baby technology features	Totally agree	Agree	NA/ND*	Disagree	Totally disagree
Easy to use	57.1% (8)	42.9% (6)	0	0	0
Friendly	78.6% (11)	14.3% (2)	7.1% (1)	0	0
Immediate Feedback	42.9% (6)	42.9% (6)	14.3% (2)	0	0
Didactic	64.3% (9)	35.7% (5)	0	0	0
Autonomy	35.7% (5)	57.1% (8)	7.1% (1)	0	0
Enable learning preterm oxygenation needs	64.4% (9)	35.7% (5)	0	0	0
I can choose what I want to learn	71.4% (10)	14.3% (2)	14.3% (2)	0	0
It would be interesting to have such technologies with other topics	85.7% (12)	14.3% (2)	0	0	0
Technologies like this can replace teachers	0	7.1% (1)	21.4% (3)	71.4% (10)	0
The use of e-Baby helped me in my learning process	71.4% (10)	28.6% (4)	0	0	0
I felt motivated to use e-Baby	71.4% (10)	28.6% (4)	0	0	0
I believe that the time of access to e-Baby was satisfactory to enrich my learning	50% (7)	50% (7)	0	0	0

*NA/ND = not agree nor disagree

the acquisition of knowledge. It is undoubtedly essential during this course, due to the ease use and because it provides instant feedback. (S12)

Generally, it is well structured and it is very useful for training, for example, auscultation. (S14)

Students also gave feedback on the educational aspects, ease, flexibility and autonomy that the game offers students:

Regarding the e-Baby, I think it's well developed, it is easy to access and understandable and it promotes learning, because it requires us to be able to apply theoretical knowledge in the game. I think this learning system is very positive because it allows choosing what topics we want to study and do not "force" us to have a schedule, which can make it easier to some people to participate in courses. (S3)

Educational technologies used in this course were a plus because they are easily accessible, it is very well organized. (S4)

I believe that this educational technology covered in this course is didactic and raise students' interest stimulating learning and the pursuit of knowledge autonomously. (S6)

I think this way of learning is very good because it always allows access to information at any time of day and so we can combine our free time for this type of training. It is a logical relevant and organized source of information. (S7)

I believe that its application is very useful and relevant; (N9)

The software is very interesting, since it allows us to develop skills in accordance with the personal characteristics and the possibilities (in terms of time) that each one has. (S10)

For those who, for example, a student who works and has less time to go to school, or to those who are sick and forced to study from home, it seems to have great utility. (S14)

Students also expressed interest that the game could be expanded not only to other basic human needs beyond the oxygenation already addressed in this version, as well as other topics that could simulate nursing care in the digital environment:

I think e-Baby is well developed, but I think it could be adapted to all the basic human needs of prematurity. Thus we would have a didactic learning source for all our needs. (S2)

It would be interesting if it was extended to other subjects, in addition to oxygenation in the case of premature newborn, or even to other areas of knowledge and intervention in nursing. (S5)

I believe that the e-Baby could address the remaining needs of the preterm newborn, thus increasing the level of demand at the level of theoretical knowledge. (S6)

I think it could provide a wider range of situations. (S8)

The e-Baby is useful, it could, however, consider other needs (basic human needs). (S10)

Overall the project is very good and it seems a good idea to be extended to other topics. (S14)

Regarding the professor replacement by the tool or its association with the teaching practice, the feedbacks were:

I think we always need a few hours with the professor to answer questions that may arise and the almost permanent availability of teacher helped a lot. (S7)

[...] I believe that these technologies should be seen as a complementary way of learning and should not replace professors. (S13)

Referring to the replacement of the professor I think that this is not true because this would increase people's isolation at home and it would not promote socialization. Specifically for me, it is a little bit more difficult for my learning compared to the actual classes, because I learn a lot through what I hear from the professor. (S14)

Below, we transcribed the criticism of the students on the study object and improvements of the tool:

I think this technology should be more accessible to all computers, as sometimes it does not work on some computers, making it difficult to access and learn. (S6)

[...] another (suggestion) is due to the fact that there were computerized problems which complicated the learning process as in my case I had to deal with the simulations. (S7)

On some computers I could not access the e-Baby, which limited my use. (S14)

DISCUSSION

Most participants (78.6%/ n=11) had frequent computer access and all of them have computers, whether it is a desktop type (71.4%/ n=10) or a portable laptop (28.6%/ n=4), indicating that the digital world is part of these students' routines.

The positive assessment of students about the usability aspects pointed out in Table 1 underline the motivational advantages that the educational game can give to nursing students. All students (n=14/100%) expressed that the e-Baby game is easy to use, didactic, which allowed learning of the need for oxygenation and kept them motivated to study through the tool. The game had friendly aspects for "totally agree" or

“agree” for most of the sample (92.9%/ n = 13) highlighting an interesting digital environment for studies. Motivation through graphical advantages of computing resources was mentioned by many scholars as one of the main attractions that lead students to feel satisfied with the tool⁽⁶⁻⁷⁾.

In addition, the ease use allows students to develop their tasks with the tool at any location or time, respecting the specificities of each individual and the pace of learning, as two students pointed out in their feedbacks on the lack of mandatory access at predetermined times (S3 and S14)⁽⁶⁻⁸⁾. This facility also refers to the friendly navigation through the digital game, 85.7% of students (n=12) agreed or totally agreed that the game allows free choice of navigation paths, that is, the game format does not prevent students to proceed to a new task without running the previous one, although they have been developed didactically in a graduated scale of complexity and logical sequence based on clinical case of infants studied.

The possibility choice concept of what one wants to learn is complemented with the autonomy given by the game to the student during learning, since the free and atemporal use of the tool is also added to individual or groups possibilities of use. Autonomy was reported by 92.9% of the sample (n = 13) proving it to be a remarkable advantage of the tool and also very important from the perspective of valuing the learner as an active and leading member of the teaching-learning process⁽⁹⁾.

It is important to note that three students reported failures of access to the game on different computers (S6, S7 and S14). We believe that these criticisms are very important for the improvement of the tool and incorporation of the same course at the university as an assisting tool for the professor. The required changes validated by the computer team analysis were subsequently corrected to ensure that the students of the study could access the e-Baby game, instructions were given during the 15 days of access.

The feedback was reported by 85.7% of students (n = 12) with agreement or total agreement, as well as stated by one of them (S12) as one of the advantages of the serious game. The importance of feedback is given by the possibility that the student has, based on the assessment of their simulated actions, to review both correct and wrong answers reflecting on these and building knowledge based on experience⁽¹⁰⁾.

When the feedback indicates an error, they can try again in another simulation to improve their skills and rebuild an old concept or acquire new knowledge.

We emphasize greatly on students' feedback, the satisfaction in being able to conduct a training that simulates reality with property, allowing virtual simulation opportunities and giving more chances to explore the clinical examination of prematurity. This is critical both from the point of view of patient safety as for the learning process, as it leads us to think that due to the fragility of the NPI, there would be no possibility of exhaustive clinical examination in a real environment, while the virtual baby can be treated as often as needed so that students may learn and practice to acquire self-confidence, and enable the student to recall the skills needed to perform the tasks, critically reason and comply with the decision-making based on this process analysis⁽¹¹⁻¹³⁾.

One of the students commented that the game allows the practice of auscultation (S14) and yet another commented on

the measurement of respiratory rate (S4). One study⁽¹⁴⁾ published in Brazil in 2006, conducted with nursing students pointed out and discussed that they often had inability to recognize breath sounds and other difficulties about this health need, confirming the importance of educational tools to facilitate the learning process and enable the creation of environments for training and simulation that explore the topic.

The e-Baby game was developed addressing only oxygenation and the choice of this basic human need is due to its primary and vital importance to humans as well as for being one of the main targets in the premature population. Moreover, it is crucial that future nurses have ability to deal with patient possibilities to the risk in this field and take appropriate attitudes to its professional category.

However, we believe the expansion of the e-Baby game in order to address other topics and incorporate other basic human needs to the case studies is quite valid. Students agreed unanimously with this statement and some represented, through their feedback, desire for new challenges of the game, and other nursing topics. One of the students even stated that by expanding to new needs of preterm infants the level of demand in terms of theoretical knowledge would be increased, which reflects motivation for studying and interest in the tool.

Interest in the educational resource herein should be emphasized as described in many of the feedbacks, encouraging their use and incorporating it into the regular course, as well as expansion of educational opportunities and challenges. Thus, we observed high satisfaction and acceptance of the serious game e-Baby developed to provide students an opportunity to digital simulation before actual contact with premature infants.

Regarding the replacement of professor by tools like this, the results found in this study (71.4% of disagreement/ n = 10) are similar to those found in a previous study with Brazilian students (75% of disagreement/ n = 9)⁽¹⁵⁾. Thus, we conclude that such possibility is remote to the context of education where the interaction between students and professors is valued as a collaboration strategy for the construction of knowledge. It is increasingly reinforced the importance of the professor's role, tutoring or facilitating the learning process, especially when they lead the way with emphasis on students' active role and when they appropriate and incorporate teaching strategies tools for motivating learning⁽¹⁵⁻¹⁶⁾.

The active role of the student and professor as facilitator of learning are incorporated in the model of active learning methodologies and integrated curriculum, which aims to better prepare students for care, management and political spheres through interdisciplinary and differentiated teaching strategies⁽¹⁷⁾. It is believed that the incorporation of educational technologies to active teaching and learning methods can contribute to the construction of knowledge and assist teachers in their practice.

E-Baby game was evaluated by students as very satisfactory in many aspects and proved to be a tool with great potential to assist professors and students during the processes of teaching and learning. We believe that its use can still contribute to the simulated practice focused on nurses working in the labor market while used as continuing education strategy, this may be subjected to future studies. We agree with other researchers⁽¹⁸⁾ that nursing professionals should seek the incorporation

of technology in their work process, which is a strategy that enables the flexibility of working hours and pace of learning.

CONCLUSION

Users showed to be integrated to e-Baby, considering it an important educational tool as a means of didactic innovation and motivating learning. Design and interactivity interfaces of the technology were considered appropriate, making these essentials items for the success of educational technologies.

We believe the results of this study provide improvements to this digital educational technology developed and to be expanded in future actions, as well as instigate researchers to reflect on the development of new technological resources applied to education in order to enhance human-technology interaction. Furthermore, the valuation of educational technologies significantly observed on the feedbacks of the students who participated in this study motivates the development of this line of research and urges the incorporation of reflection of new tools to teaching practice.

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