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USE OF SIMULATORS AND GAMIFICATION IN THE TEACHING OF VETERINARY MEDICINE AS A HELP FOR ACADEMIC PRACTICES

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Abstract: The teaching of health sciences, especially veterinary science, is linked to the use of live models or cadavers for their experiments and classes, which may conflict with the guidelines established by the Animal Use Ethics Commission (CEUA). As a result, higher education institutions are constantly looking for alternatives to the use of animals in classrooms in order to comply with CEUA guidelines, in addition to providing the student with a greater experimental experience of the techniques and theoretically acquired knowledge. In parallel with this, there is a growing trend in the use of simulators, Information and Knowledge Technologies (ICTs) solutions, or even synthetic models, which end up encompassing both the animal welfare aspect and the offer to the user/ student of the possibility of experiencing, in a system of simulated, objective and controlled practice, what would happen in the real world. In Brazil, especially in Ceará, this type of technology is little used in higher education institutions, however, in some universities there are already researches in this sense, apart from commercial software that can be used, but there is still much to be researched, developed and implanted.
Keywords: Veterinary Medicine. Practice. Alternative. simulators. Gamification.

INTRODUCTION

The use of tools that go beyond the traditional limits of the classroom, expanding and consolidating the student's experience in acquiring specific knowledge is something desired in several higher education institutions around the world. In Brazil, this reality is still in its initial stages, with few institutions having this type of resource, but the study on its development and implementation is growing.

To bear in mind that one of the great challenges that the teaching of veterinary medicine courses has is the ethical issue of using animals in the classroom, one can think about the use of simulators, serious games, Information and Knowledge Technology solutions (ICTs), or even synthetic models as an alternative to help in practical academic classes. This type of solution encompasses both the animal welfare aspect and the offer to the user/student the possibility to experience, in a simulated, objective and controlled practice system, what would happen in the real world.

For some authors, the use of playful tools and active learning plays an important role in the formation of individual knowledge. Lewis and Maylor (2007) state that the use of recreational activities provokes empirical learning through concrete experiences that allow the student to explore the theory and apply it in a more critical way.

To converge with this idea, Novak (2010) transcribes Jan Mcwilliams' perception of active learning as the tendency for students to better assimilate the acquired knowledge in a dynamic interactive learning experience, where they can have immediate feedback on their performance in a solution activity. of problems, fostering an environment intrinsic to active learning.

The use of games and simulators for educational purposes has been applied since the 17th century (BARBATO, 2016). In the

19th century, NASA and the US Air Force already trained their pilots and astronauts through simulators (NOVAK, 2010). In the 1950s some applications in the medical field were implemented, and in the 1980s it gained popularity as a teaching and training tool.

Solutions such as simulators, serious games and gamification are increasingly targeted for providing the user with practicality, in a safe and error-prone environment, and their techniques can be reused and reapplied, with low cost when compared to training in equipment and real situations.

Although the concepts and solution models presented above are similar, each framework has its specific characteristics and usability, which can be decisive for the success or failure of learning (BARBATO, 2016).

Serious games are games whose main focus is the transmission of an idea, teaching or brand, not just entertainment. These are games used by companies, the health system and the government to train, inform, recruit or advertise products for players (NOVAK, 2010).

Simulations tend to reproduce systems, machines and experiences using real-world rules. These can be used for entertainment, training and recruitment purposes (NOVAK, 2010), as can be seen in table 1.

According to Capilé et.al. (2015), simulators can vary in levels of complexity. Dos Santos (2010) points out that there are simulators based on physical/synthetic models, computer-based and hybrids.

In the synthetic anatomical models, aspects that are close to reality are simulated on mannequins that can be studied and tested, with greater durability than anatomical parts from euthanized animals and preserved in a chemical environment.

For Capilé (2015), in patient simulators, where mannequins are used, the creation of a "complete simulation environment" – FES (Full Enviroment Simulation) is recommended, which requires a model/mannequin, specific equipment and replication of the clinical environment. realistically.

Gamification has emerged as a tool that, according to Alves (2015), uses mechanics, aesthetics and game-based thinking to engage people, motivate action, promote learning and solve problems. In her book, she states that the game is a system defined by an abstract challenge with rules, interactivity and feedback that generates an emotional reaction and a quantifiable result.

With that, the general objective of this work is to verify the use of the concepts of simulation and gamification in the education of the Veterinary Medicine course, comparing it to the traditional model and exposing qualities, limitations and future perspectives of its implementation. Raising some examples of solutions already on the market with a similar proposal.

METHODOLOGY

We analyzed 10 works that deal with solutions in gamified and/or simulated models to help veterinary practices and/or the health area, raising the positive points and limitations found in each experience. With this, it is intended to evaluate the implementation of these concepts and envision the impact of their use.

They are: canine prostatic palpation simulator (CAPILÉ et.al., 2015), brachial plexus anesthetic simulator (MONTEIRO, 2016), ultrasound-guided epidural anesthesia simulator (MORAES et.al., 2015), interactive system for training and teaching gynecological – SITEG (DOS SANTOS, 2010), simulation of artificial insemination in cattle by virtual reality (SILVA JR, 2012), simulator of clinical health cases with artificial intelligence - SIMDECS (BEZ et.al., 2012), simulator of techniques techniques (ASSOREIRA, 2016), handmade

	Usado como na realidade	Projetado como um game	Possui Elementos de game	Usado como um game	Apenas para diversão
GAMES		É um game propriamente dito			
GAMEFUL DESIGN		Apenas lembra um game			
SIMULADORES VIRTUAIS	Usa conceitos presentes em games, não é para diversão e é usado como na realidade.				
SERIOUS GAMES		É usado como um game (gameplay) mas não é para diversão.			
GAMIFICAÇÃO		Pensado com elementos de games mas não é jogado como game.			

Table 1- Comparison of game-based solutions

Source: ONIRIA (s.d.)

Figure 1 - Haptic devices: a) joystick with force return, b) data glove and c) fixed base haptic device

Source: DOS SANTOS (2010)

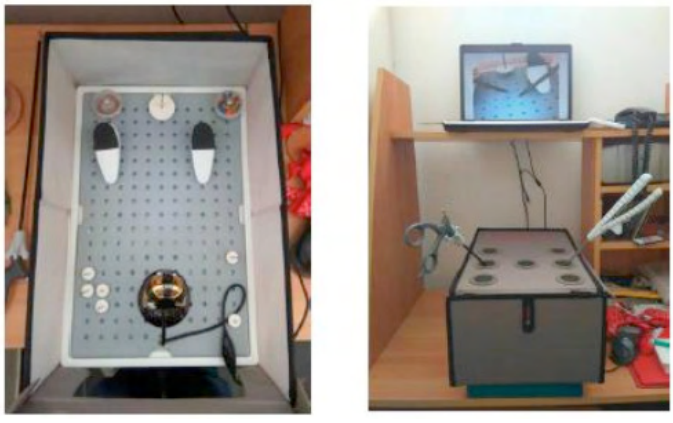

Figure 2 - Laparoscopic training box

Source: ASSOREIRA (2016)

models for diagnostic imaging (HAGE, 2017), Augmented reality teaching material for veterinary anatomy (TEIXEIRA et.al., 2015), and the creation of the Laboratory of practical skills by the Universidade Estadual Paulista de Botucatu (MESQUITA FILHO, 2014).

RESULT AND DISCUSSION

Monteiro (2016) and Moraes (2015) worked with the development of solutions in the anesthetic area, one focused on simulating brachial plexus block in humans and the other on ultrasound-guided epidural training in veterinary medicine using gelatin-based models.

In the model by Monteiro (2016) 3D printing is used to obtain three-dimensional anatomical structures of the human arm, a motor system that allows the control of angle and speed of the same and a software. Moraes (2015) used anatomical pieces of the caudal region of the lumbar and sacral spine of a rabbit immersed in gelatin covering up to the spinal process of the spine so that the students could train with ultrasound and block the epidural in the molds.

Some of these works used virtual reality (VR) to portray the reproductive system in the gynecological area using haptic systems that are systems associated with the generation and tactile rendering of computer-generated three-dimensional objects and environments (DOS SANTOS, 2010).

Dos Santos (2010) presents a general system of human gynecological examination with the purpose of training the student so that he has the perception of modeling, visualization and representation of the biomechanical properties of body structures, through joystick, data glove and fixed base device such as haptic equipment.

To work more specifically, Silva Junior (2012) presents a VR model of the anatomy of the bovine reproductive system to improve the level of training of users and reduce health risks for both the student and the animal. In this project robotic arms that interact with three-dimensional environments are used.

Assoreira (2016) uses a training box connected to a PC and a webcam, as shown in figure 3, where the user will train pin transfer, pattern cutting, loop placement and sutures.

She reports the advantages of using the low cost training box, the possibility of manual construction, good perception, versatility and the existence of programs and exercises with recognized validation. However, it points out as disadvantages the need for an evaluator to instruct and evaluate the user, in addition to spending on training materials.

The SIMDEC environment (health clinical case simulator) described by Bez (2012) aims to develop technical skills of physicians in the analysis of clinical cases. This is a computerized tool where the teacher can create several cases of clinical studies with symptoms and signs that will be made available to students. Studies are being carried out to improve the system in order to implement the time factor that will allow the evaluation of multiple correct decisions.

Focusing on the area of diagnostic imaging, there is the work of Hage (2017) who developed a low-cost prototype for ultrasound-guided pericardiocentesis using materials such as gelatin, rubber balloons, chicken hearts, gouache paint and rubber band. According to her, the answer was satisfactory, being applied in other classes.

Capilé (2015) developed a low-cost model for examination of prostatic palpation using a commercial canine mannequin, normally used as a clothing display in pet stores, three models of prostates representing normal size, hyperplastic and with nodules suggestive of neoplasia molded with propylparaben mass, water, latex and foam. This study was approved by the Ethics Committee on Animal

Use (CEUA) of the Universidade Federal do Paraná.

Still in the south of the country, at the XI Extension, Research and Graduate Week at the Ritter dos Reis University Center in Porto Alegre, an Augmented Reality application was presented for teaching veterinary anatomy. The project by Teixeira (2015) was integrated by veterinary medicine courses and digital games, where a tool was developed in Unity3D and Blender running on Android platform, initially. The first model presented was a cat's liver and its blood circulation. The biggest challenge encountered by the team was to recreate the anatomical parts, maintaining realism and ensuring correct operation in the various portable devices.

Other institutions also resorted to the use of simulators as a learning tool in the health area, but they used tools already on the market, as is the case of the Faculty of Veterinary Medicine and Zootechnics UNESP, in Botucatu.

Mesquita Filho (2014) talks about the creation of the Laboratory of practical skills where it is intended to acquire eight models that allow the practical learning of: thoracentesis, surgical techniques (knot tying, skeletons of small animals, injection in puppies), canine cardiopulmonary resuscitation and feline, cardiac and pulmonary auscultation and first aid. The faculty's expectation with the implementation of this laboratory is that even 1st semester students can benefit from the use of this type of resource.

FINAL CONSIDERATIONS

In general, the authors report good and promising results in learning using simulators and ICT solutions. Some already have improvement projects. The disadvantages raised in the work of Assoreira (2016) were not considered as major obstacles to the implementation of the tool.

Of the projects studied, there were greater challenges in technologies involving virtual and augmented reality, as they need graphic arts professionals trained to recreate anatomical models and more realistic environments.

The use of game concepts, simulators and synthetic models as a didactic resource to help teaching health areas is promising and has a positive impact on academic learning. However, there is a need for more studies, research and, mainly, the involvement of the teachers themselves to use this type of tool.

Figure 3 - Canine model for transrectal palpation with different prostate molds

Source: CAPILÉ et al. (2015)

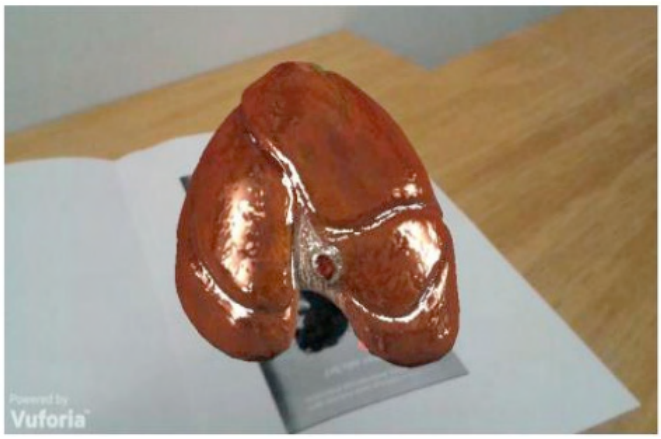

Figure 4 - Feline liver in augmented reality

Source: TEIXEIRA et.al. (2015)

REFERENCES

ALVES, F. (2015). *Gamification. Como Criar Experiências de Aprendizagem Engajadoras.* São Paulo: DVS Editora.

ASSOREIRA, J. (2017). *A importância do uso de simuladores na formação e aquisição de competências cirúrgicas do formando em laparoscopia.* Lisboa: Universidade de Lisboa - Faculdade de Medicina Veterinária.

BARBATO, D. (2016). *Serious Games baseados em Simulações: Frameworks, definições e requisitos.* São Paulo: XV Simpósio Brasileiro de Jogos e Entretenimento Digital.

BEZ et.al, M. (2012). *Técnicas de inteligência artificial amparando o desenvolvimento de um simulador de casos clínicos*. Acesso em 22 de juho de 2018, disponível em https://www.researchgate.net/publication/259640816

CAPILÉ, K. (2015). *Desenvolvimento e avaliação de simuladores como recursos didáticos para o treinamento de habilidades clínico veterinárias. [dissertação] 65f.* Curitiba: Universidade Federal do Paraná.

DE MESQUITA FILHO, J. (2014). *Laboratório de Habilidades Práticas com Simuladores em Medicina Veterinária.* Botucatú: Faculdade de Medicina Veterinária e Zootecnia Unesp - Botucatu.

DE MORAES et.al, A. (2015). *Desenvolvimento de um simulador para treinamento de estudantes e profissionais em anestesia epidural ecoguiada.* Santa Catarina: 25º Seminário de Iniciação Científica – UDESC.

DOS SANTOS, A. (2010). *Simulação médica baseada em realidade virtual para ensino e treinamento em ginecologia.* João Pessoa: Universidade Federal da Paraíba.

HAGE, M. (2017). Simuladores como estratégia de ensino de diagnóstico por imagem para o curso de medicina veterinária da FZEA-USP. *GRAD - Revista de Graduação USP - Volume 7 - n.1*, 95-97.

LEWIS, M., & MAYLOR, H. (2007). Game playing and operations management education. *International Journal of Production Economics*, 134-149.

MONTEIRO, S. (2016). *Desenvolvimento de um protótipo de um simulador de bloqueio do plexo braquial [dissertação].* Bragança: Escola Superior de Tecnologia e Gestão.

NOVAK, J. (2011). *Desenvolvimento de Games.* São Paulo: CENGAGE Learning.

ONIRIA. (s.d.). *Você sabe a diferença entre simuladores virtuais, games e gamificação?* Acesso em 26 de setembro de 2018, disponível em Oniria: https://oniria.com.br/voce-sabe-a-diferenca-entre-simuladores-virtuais-games-e-gamificacao/

SILVA JUNIOR, A. (2012). *Uso de realidade virtual na simulação e treinamento de inseminação artificial em bovinos com dispositivos hápticos [dissertação].* Uberlândia: Universidade Federal de Uberlândia.

TEIXEIRA et.al., H. (2015). *Anatomia Veterinária Com Realidade Aumentada.* XI Semana de Extensão, Pesquisa e PósGraduação.