Achievement of Generic and ProfessionalCompetencies Through Virtual Environments

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Abstract

This study is aimed to prove how Virtual Environments (VE) and Information and Communication Technologies (ICT) can be used as a tool to verify professional competencies. The incursion of virtual environments in education has shown that there is much potential in distance learning development. To find out how it influences the achievement of competencies, there was made an experimental study with a post-test design and control group. Students were divided into two groups; each of them was submitted to a different test. The results demonstrate that with the implementation of VE using ICT, the students who used the VE had a better performance than students who used the traditional evaluations. Confirmed with the 83% of the sample who achieved the highest levels (50% got strategical professional competencies, and 33% got autonomous professional competencies). Considering the study, the authors could notice that students do develop professional competencies along virtual environments, reflected not only in the level of competence achieved by the ones tested on the virtual environment but also in the average time they spend to do the test. Therefore, virtual environments have positives effects in the education field.

Keywords

Virtual education, Virtual environment, Pedagogical tools, Learning process, Self-learning, Competences evaluation

Referencias

1. 1.

Comas-González, Z., Echeverri-Ocampo, I., Zamora-Musa, R., Velez, J., Sarmiento, R., Orellana, M.: Recent trends in virtual education and its strong connection with the immersive environments. Espacios **38**(15), 4–17 (2017)Google Scholar

2. 2.

Picatoste, J., Pérez-Ortiz, L., Ruesga-Benito, S.M.: A new educational pattern in response to new technologies and sustainable development. Enlightening ICT skills for youth employability in the European Union. Telemat. Informat. **35**(4), 1031–1038 (2018). https://doi.org/10.1016/j.tele.2017.09.014

3. 3.

Islam, A.K.M.N.: E-learning system use and its outcomes: moderating role of perceived compatibility. Telemat. Informat. **33**(1), 48–55 (2015). https://doi.org/10.1016/j.tele.2015.06.010CrossRefGoogle Scholar

4. 4.

Yu, H., Zhang, Z.: Research on mobile learning system of colleges and universities. In: El Rhalibi, A., Pan, Z., Jin, H., Ding, D., Navarro-Newball, A.A., Wang, Y. (eds.) Edutainment 2018. LNCS, vol. 11462, pp. 308–312. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-23712-7_42

5. 5.

Deguchi, S.: Case Studies of Developing and Using Learning Systems in a Department of Engineering. In: Zaphiris, P., Ioannou, A. (eds.) HCII 2020. LNCS, vol. 12205, pp. 34–48. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-50513-4_3CrossRefGoogle Scholar

6. 6.

Nuñez, M.E., Rodriguez-Paz, M.X.: A real-time remote courses model for the improvement of the overall learning experience. In: Zaphiris,

P., Ioannou, A. (eds.) HCII 2020. LNCS, vol. 12205, pp. 132–143. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-50513-4_10CrossRefGoogle Scholar

7. 7.

Klímová, B., Pražák, P.: Mobile blended learning and evaluation of its effectiveness on students' learning achievement. In: Cheung, S.K.S., Lee, L.-K., Simonova, I., Kozel, T., Kwok, L.-F (eds.) ICBL 2019. LNCS, vol. 11546, pp. 216–224. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-21562-0_18

8. 8.

Zamora-Musa, R., Velez, J.: Use of data mining to identify trends between variables to improve implementation of an immersive environment. J. Eng. Appl. Sci. **12**(22), 5944–5948 (2017)Google Scholar

9. 9.

Peng, J., Tan, W., Liu, G.: Virtual experiment in distance education: based on 3D virtual learning environment. In: 2015 International Conference of Educational Innovation through Technology (EITT) Wuhan, pp. 81–84 (2015). https://doi.org/10.1109/EITT.2015.24

10. 10.

Meléndez-Pertuz, F., et al.: Design and development of a didactic an innovative dashboard for home automation teaching using labview programming environment. ARPN J. Eng. Appl. Sci. **13**(2), 523–528 (2018). http://www.arpnjournals.org/jeas/research_papers/rp_2018/jeas_0118_6699.pdf

11. 11.

Chen, X., et al.: ImmerTai: immersive motion learning in VR environments. J. Vis. Commun. Image Represent. **58**, 416–427 (2019). https://doi.org/10.1016/j.jvcir.2018.11.039CrossRefGoogle Scholar

12. 12.

Cabero-Almenara, J., Fernández-Batanero, J., Barroso-Osuna, J.: Adoption of augmented reality technology by university students. Heliyon **5**(5), e01597 (2019)CrossRefGoogle Scholar

13. 13.

Talib, M., Einea, O., Nasir, Q., Mowakeh, M., Eltawil, M.: Enhancing computing studies in high schools: a systematic literature review & UAE case study. Heliyon **5**(2), e01235 (2019). https://doi.org/10.1016/j.heliyon.2019.e01235CrossRefGoogle Scholar

14. 14.

Apuke, O., Iyendo, T.: University students' usage of the internet resources for research and learning: forms of access and perceptions of utility. Heliyon **4**(12), e01052 (2018). https://doi.org/10.1016/j.heliyon.2018.e01052CrossRefGoogle Scholar

15. 15.

Hamari, J., Shernoff, D., Rowe, E., Coller, B., Asbell-Clarke, J., Edwards, T.: Challenging games help students learn: an empirical study on engagement, flow and immersion in game-based learning. Comput. Hum. Behav. **54**, 170–179 (2016)CrossRefGoogle Scholar

16. 16.

Arantes, E., Stadler, A., Del Corso, J., Catapan, A.: Contribuições da educação profissional na modalidade a distância para a gestão e valorização da diversidade. Espacios **37**(22), E-1 (2016)Google Scholar

17. 17.

Zamora-Musa, R., Vélez, J., Paez-Logreira, H.: Evaluating learnability in a 3D heritage tour. Presence Teleoper. Vir. Environ. **26**(4), 366–377 (2018). https://doi.org/10.1162/pres_a_00305

18. 18.

Heradio, R., de la Torre, L., Galan, D., Cabrerizo, F., Herrera-Viedma, E., Dormido, S.: Virtual and remote labs in education: a

bibliometric analysis. Comput. Educ. **98**, 14–38 (2016). https://doi.org/10.1016/j.compedu.2016.03.010CrossRefGoogle Scholar

19. 19.

Garcia-Zubia, J., Irurzun, J., Orduna, P., Angulo, I., Hernandez, U., Ruiz, J. et al.: SecondLab: a remote laboratory under second life. Int. J. Online Eng. (IJOE) **6**(4) (2010). https://doi.org/10.3991/ijoe.v6i4.1312

20. 20.

Shen, J., Eder, L.B.: Intentions to use virtual worlds for education. J. Inf. Syst. Educ. **20**(2), 225 (2009)Google Scholar

21. 21.

Kemp, J., Livingstone, D., Bloomfield, P.: SLOODLE: connecting VLE tools with emergent teaching practice in second life. Br. J. Educ. Technol. **40**(3), 551–555 (2009). https://doi.org/10.1111/j.1467-8535.2009.00938

22. 22.

Brinson, J.: Learning outcome achievement in non-traditional (virtual and remote) versus traditional (hands-on) laboratories: A review of the empirical research. Comput. Educ. **87**, 218–237 (2015). https://doi.org/10.1016/j.compedu.2015.07.003CrossRefGoogle Scholar

23. 23.

Cruz-Benito, J., Maderuelo, C., Garcia-Penalvo, F., Theron, R., Perez-Blanco, J., Zazo Gomez, H., Martin-Suarez, A.: Usalpharma: a software architecture to support learning in virtual worlds. IEEE Revista Iberoamericana De Tecnologias Del Aprendizaje **11**(3), 194–204 (2016). https://doi.org/10.1109/rita.2016.2589719CrossRefGoogle Scholar

24. 24.

Bawa, P., Lee Watson, S., Watson, W.: Motivation is a game: massively multiplayer online games as agents of motivation in higher

education. Comput. Educ. **123**, 174–194 (2018). https://doi.org/10.1016/j.compedu.2018.05.004CrossRefGoogle Scholar

25. 25.

Zamora-Musa, R., Velez, J., Paez-Logreira, H., Coba, J., Cano-Cano, C., Martinez, O.: Implementación de un recurso educativo abierto a través del modelo del diseño universal para el aprendizaje teniendo en cuenta evaluación de competencias y las necesidades individuales de los estudiantes. Espacios **38**(5), 3 (2017)Google Scholar

26. 26.

Chen, J., Tutwiler, M., Metcalf, S., Kamarainen, A., Grotzer, T., Dede, C.: A multi-user virtual environment to support students' self-efficacy and interest in science: a latent growth model analysis. Learn. Instr. **41**, 11–22 (2016)CrossRefGoogle Scholar

27. 27.

Guerrero-Roldán, A., Noguera, I.: A model for aligning assessment with competences and learning activities in online courses. Internet High. Educ. **38**, 36–46 (2018). https://doi.org/10.1016/j.iheduc.2018.04.005CrossRefGoogle Scholar

28. 28.

Bhattacharjee, D., Paul, A., Kim, J., Karthigaikumar, P.: An immersive learning model using evolutionary learning. Comput. Electr. Eng. **65**, 236–249 (2018). https://doi.org/10.1016/j.compeleceng.2017.08.023CrossRefGoogle Scholar

29. 29.

Cardona, S., Vélez, J., Tobón, S.: Towards a model for the development and assessment of competences through formative projects. In: XXXIX Latin American Computing Conference, vol. 17, no. 3, pp. 1–16 (2013)Google Scholar

30. 30.

Lucas, E., Benito, J., Gonzalo, O.: USALSIM: learning, professional practices and employability in a 3D virtual world. Int. J. Technol. Enhanced Learn. **5**(3/4), 307 (2013). https://doi.org/10.1504/ijtel.2013.059498CrossRefGoogle Scholar

31.31.

Mustami, M., Suryadin and Suardi Wekke, I.: Learning Model Combined with Mind Maps and Cooperative Strategies for Junior High School Student. Journal of Engineering and Applied Sciences, 12(7), pp. 1681 – 1686 (2017)Google Scholar

32.32.

Freire, P., Dandolini, G., De Souza, J., Trierweiller, A., Da Silva, S., Sell, D., et al.: Universidade Corporativa em Rede: Considerações Iniciais para um Novo Modelo de Educação Corporativa. Espacios **37**(5), E-5 (2016)Google Scholar

33.33.

Tawil, N., Zaharim, A., Shaari, I., Ismail, N., Embi, M.: The acceptance of e-learning in engineering mathematics in enhancing engineering education. J. Eng. Appl. Sci. **7**(3), 279–284 (2012)CrossRefGoogle Scholar

34.34.

Hernández, R., Fernández, C., Baptista, P.: Metodología de la investigación. J. Chem. Inform. Model. **53** (2014). https://doi.org/10.1017/CBO9781107415324.004

35.35.

Tsay, L.S., Williamson, A., Im, S.: Framework to build an intelligent RFID system for use in the healthcare industry. In: Proceedings - 2012 Conference on Technologies and Applications of Artificial Intelligence, TAAI 2012, pp. 109–112 (2012). https://doi.org/10.1109/TAAI.2012.58

36.36.

Kovács, P., Murray, N., Gregor, R., Sulema, Y., Rybárová, R.: Application of immersive technologies for education: state of the art.

In: 2015 International Conference on Interactive Mobile Communication Technologies and Learning (IMCL) IEEE, pp. 283–288 (2015). https://doi.org/10.1109/IMCTL.2015.7359604

37.37.

Estriegana, R., Medina-Merodio, J., Barchino, R.: Student acceptance of virtual laboratory and practical work: an extension of the technology acceptance model. Comput. Educ. **135**, 1–14 (2019)CrossRefGoogle Scholar

38.38.

Valverde, J., Ciudad, A.: El uso de e-rúbricas para la evaluación de competencias en estudiantes universitarios. Redu Revista de Docencia Universitaria **12**(1), 49–79 (2014)Google Scholar

39.39.

Banerjee, S., Rao, N.J., Ramanathan, C.: Rubrics for assessment item difficulty in engineering courses. In: Proceedings - Frontiers in Education Conference, FIE, (2014)Google Scholar

40.40.

Kim, G., Lui, S.M.: Impacts of multiple color nominal coding on usefulness of graph reading tasks. In: Proceeding - 5th International Conference on Computer Sciences and Convergence Information Technology, ICCIT 2010, pp. 457–463 (2010). https://doi.org/10.1109/ICCIT.2010.5711101

41.41.

Zhao, H., Sun, B., Wu, H., Hu, X.: Study on building a 3D interactive virtual learning environment based on OpenSim platform. In: 2010 International Conference on Audio Language and Image Processing (ICALIP), pp. 1407–1411 (2010)Google Scholar

42.42.

Sitaram, D., et al.: OpenSim: a simulator of openstack services. In: Proceedings - Asia Modelling Symposium 2014: 8th Asia International Conference on Mathematical Modelling and Computer Simulation, AMS Taipei: IEEE 2014, pp. 90–96 (2014). https://doi.org/10.1109/AMS.2014.28

OpenSimulator (2020). http://opensimulator.org