











#### IV. CONCLUSION

This study aims to help students improve their knowledge capability based on active participation through a gamification approach. The assessment involved in this study is through pre-test and post-test, where instructional intervention by adapting interactive gamification e-learning. Fifty-six respondents participate in this study. The four objectives of this action research are achieved based on the reflection of the research output. 87% of the respondents have increased their percentage of marks. In the pre-test result, 56% of the respondents get marks below 55%. Remarkably in post-test, it reduces to 14%. It can be concluded that this strategy helped to provide respondents with an interesting and successful way to enhance their memory of the facts in this course. Although not all respondents can achieve a high standard, this approach gives them ample space and opportunity to learn in a fun, cheerful mode and build a sense of enthusiasm about the content of the course itself. Consequently, in the subject and other subjects as well, they may enhance their results. The future study enhancement can be done by adopting other gamification applications, a large target group size, and adding computer science or information technology courses.

#### ACKNOWLEDGMENT

The authors are grateful to those who were directly or indirectly involved in finishing this report.

#### REFERENCES

- [1] F. A. Nieto-Escamez and M. D. Roldán-Tapia, "Gamification as Online Teaching Strategy During COVID-19: A Mini-Review," *Frontiers in Psychology*, vol. 12, no. May, pp. 1–9, 2021, doi: 10.3389/fpsyg.2021.648552.
- [2] E. Obrero-Gaitán, F. A. Nieto-Escamez, N. Zagalaz-Anula, and I. Cortés-Pérez, "An Innovative Approach for Online Neuroanatomy and Neurorehabilitation Teaching Based on 3D Virtual Anatomical Models Using Leap Motion Controller During COVID-19 Pandemic," *Frontiers in Psychology*, vol. 12, no. June, pp. 1–12, 2021, doi: 10.3389/fpsyg.2021.590196.
- [3] A. Sánchez-Mena and J. Martí-Parreño, "Drivers and barriers to adopting gamification: Teachers' perspectives," *Electronic Journal of e-Learning*, vol. 15, no. 5, pp. 434–443, 2017.
- [4] D. O. Gökşün and G. Gürsoy, "Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz," *Computers & Education*, vol. 135, pp. 15–29, 2019.
- [5] F. Zhao, "Using Quizizz to Integrate Fun Multiplayer Activity in the Accounting Classroom.," *International Journal of Higher Education*, vol. 8, no. 1, pp. 37–43, 2019.
- [6] S. Deterding, M. Sicart, L. Nacke, K. O'Hara, and D. Dixon, "Gamification. using game-design elements in non-gaming contexts," in *CHI'11 extended abstracts on human factors in computing systems*, 2011, pp. 2425–2428.
- [7] L.-M. Putz and H. Treiblmaier, "Increasing knowledge retention through gamified workshops: Findings from a longitudinal study and identification of moderating variables," 2019.
- [8] J. Majuri, J. Koivisto, and J. Hamari, "Gamification of education and learning: A review of empirical literature," *CEUR Workshop Proceedings*, vol. 2186, no. GamiFIN, pp. 11–19, 2018.
- [9] E. Bakhanova, J. A. Garcia, W. L. Raffe, and A. Voinov, "Targeting social learning and engagement: what serious games and gamification can offer to participatory modeling," *Environmental Modelling & Software*, vol. 134, p. 104846, 2020.
- [10] M. Musa, M. N. Ismail, and M. F. M. Fudzee, "A survey on smart campus implementation in Malaysia," *International Journal on Informatics Visualization*, vol. 5, no. 1, pp. 51–56, 2021, doi: 10.30630/ijoiv.5.1.434.
- [11] M. A. Hassan, U. Habiba, F. Majeed, and M. Shoaib, "Adaptive gamification in e-learning based on students' learning styles," *Interactive Learning Environments*, vol. 29, no. 4, pp. 545–565, 2021.
- [12] R. Smiderle, S. J. Rigo, L. B. Marques, J. A. Peçanha de Miranda Coelho, and P. A. Jaques, "The impact of gamification on students' learning, engagement and behavior based on their personality traits," *Smart Learning Environments*, vol. 7, no. 1, 2020, doi: 10.1186/s40561-019-0098-x.
- [13] A. N. Saleem, N. M. Noori, and F. Ozdamli, "Gamification applications in E-learning: a literature review," *Technology, Knowledge and Learning*, pp. 1–21, 2021.
- [14] L. Facey-Shaw, M. Specht, P. van Rosmalen, and J. Bartley-Bryan, "Do badges affect intrinsic motivation in introductory programming students?," *Simulation & Gaming*, vol. 51, no. 1, pp. 33–54, 2020.
- [15] M. Sanmugam, Z. Abdullah, H. Mohamed, B. Aris, N. M. Zaid, and S. M. Suhadi, "The affiliation between student achievement and elements of gamification in learning science," in *2016 4th International Conference on Information and Communication Technology (ICoICT)*, 2016, pp. 1–4.
- [16] J. B. B. Junior, "Assessment for learning with mobile apps: exploring the potential of quizizz in the educational context," *International Journal of Development Research*, vol. 10, no. 01, pp. 33366–33371, 2020.
- [17] M. Ortiz-Rojas, K. Chiluiza, and M. Valcke, "Gamification through leaderboards: An empirical study in engineering education," *Computer Applications in Engineering Education*, vol. 27, no. 4, pp. 777–788, 2019.
- [18] S. Papadakis, "The use of computer games in classroom environment," *International Journal of Teaching and Case Studies*, vol. 9, no. 1, pp. 1–25, 2018.
- [19] Karakoç, B., Eryılmaz, K., Turan Özpolat, E., & Yıldırım, İ. (2020). The effect of game-based learning on student achievement: A meta-analysis study. *Technology, Knowledge and Learning*, 1-16.
- [20] F. K. M. Arif, N. Z. Zubir, M. Mohamad, and M. M. Yunus, "Benefits and challenges of using game-based formative assessment among undergraduate students," *Humanities & Social Sciences Reviews*, vol. 7, no. 4, pp. 203–213, 2019.
- [21] H. Al-Samarráie, H. Selim, T. Teo, and F. Zaqout, "Isolation and distinctiveness in the design of e-learning systems influence user preferences," *Interactive Learning Environments*, vol. 25, no. 4, pp. 452–466, 2017.
- [22] N. Mazza, "Competition: Motivating or declination of academic success," 2018.
- [23] B. K. Khalaf, M. Zin, and Z. Bt, "Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review.," *International Journal of Instruction*, vol. 11, no. 4, pp. 545–564, 2018.
- [24] Z. Zainuddin, M. Shujahat, H. Haruna, and S. K. W. Chu, "The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system," *Computers & Education*, vol. 145, p. 103729, 2020.
- [25] K. M. Kapp, "Gamification designs for instruction," in *Instructional-Design Theories and Models, Volume IV*, Routledge, 2016, pp. 367–400.
- [26] Y. Chaiyo and R. Nokham, "The effect of Kahoot, Quizizz and Google Forms on the student's perception in the classrooms response system," in *2017 International Conference on Digital Arts, Media and Technology (ICDAMT)*, 2017, pp. 178–182.