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Inspecting the Impact of Students' Academic Backgrounds and Music Perception on the Success of Education Through an Interactive Multimedia Content Experimental Study in the Environment of Higher Education.

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Inspecting the impact of students' Academic Backgrounds and Music Perception on the Success of Education through an Interactive Multimedia Content Experimental Study in The Environment of Higher Education.

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Abstract

In The Environment of Higher Education, the present paper addresses factors that enhance student engagement in online courses using particular multimedia content; games and music. This paper investigates two research axes; the scientific back ground and the appeal of music as fundamental issues that could affect students' motivation toward digital learning. For this purpose, an experimental multimedia content is designed including a serious game that is mixed with several types of music. This study is based on the data collection, analysis and reporting.

In the context of higher education, the principal aim of this study is to evaluate the manner that students could be suitably engaged in a particular learning issue. Thus, a specific course that consists to discovering the university campus in accordance with safety gestures during the pandemic is the challenging item of this study.

Dataset counting quantitative and qualitative information is generated on the basis of two group of students test and control, coming from different university institute. Experiment results indicate that the academic background of students as well as music appeal have effects on students learning effectiveness.

Keywords: Higher education, Multimedia, Serious game, Music, quantitative analysis, qualitative analysis.

1 Introduction:

Interactive multimedia learning can be described as tools that are designed to attract students' attention and simplify their learning process. Game concepts can have explicit educational goals and can be used for teaching at all levels of education. However, those multimedia contents are used the most in primary and secondary education and are almost non-existent in the universities. Earlier, the practice of those tools in the context of higher education was subject to many forms of opposition and criticizers [1] [2]. This may indicate an old perception of games by adult people who may believe that games are ineffective and only adequate for kids. Currently, new generation are more accustomed with playing digital games and run interactive content. Concerning adult student, the concept of serious games has become more significant [3], it allows an enhanced educational understanding throughout the ways of interacting with those interactive video games and also it contributes to more effective performances and pedagogical apprehension. This proposal educational concept aims to propose diverse multimedia contents with the objective to attract students' attention and engage them in their own education process [4]. Games playing and video interacting allow students to become the principal performers of their education progress [5], this can be an active position much distinctive from the passive position they had before, throughout the traditional learning process [6] [7]. This can be specifically helpful when the pedagogic subject is impossible or very difficult to achieve due to many raisons, such as the expansive costs, the dangerous nature of specific disciplines…

In the present study, the aim of this proposal is to evaluate the impact of interactive multimedia content in allowing students to acquire specific learning skills during the pandemic.

The pandemic caused by coronavirus disease 2019 (COVID-19) has forced a shutdown of the educative process in universities, it led Professors to adapt substitute education strategies. Thus, educational policy makers are responsible of introducing new technological tools, for instance serious games, virtual worlds interactive videos… [8][7]. Also, the university environment is a big challenge for students. This period implicates a spirit of personal development [9].

The present paper aims to investigate learning performances and recognize the technology acceptance and students' motivators in the university by proposing a gamified course that consists to visiting the university campus. The experimental multimedia content is published online by the professors to students, from the time

when the online procedures offer freedom of decision, randomness and boost problem solving [10]. This gamified course is included in the learning management system "Moodle" adopted by Ibn Tofail University-Morocco. This transversal module is intended for the first-year students of a bachelor degree class. An interactive and explanatory sonorized game design is integrated to the multimedia elements. Then students' interactions are gathered, investigated and studied using a quantitative and qualitative database. The collected results allow to get conclusion that could make the proposed contents more appealing for students and contribute to the achievement of this course. Several stages with different tasks were designed based on the course specificities. Data set containing quantitative and qualitative information is generated on the basis of two sets of students that are test and control group from different educational specialty. The present manuscript is organized as follow; first section adresses a literature review about the serious game and about the practice of new interactive multimedia contents in the context of higher education in addition to defining the contribution novelty of present research. The second section describes the proposed multimedia content course, then the third part defines the purpose and adopted methodology of this research. Afterwards, the last part of this paper addresses experiment results, analysis discussion, limitation and the conclusion.

1. Interactive multimedia in higher education, literature review.

In the context of higher education, studies about games and interactive videos and music specificities are becoming more and more significant. An appropriate understanding of the manner in which students interrelate with multimedia content provides more efficient education performances [3]. Technological features as well as computer skills, suitable aesthetic presentation and appealing music [34] seems to be fundamental issues for social interaction, and learning production [33] [12] [11]. Some researchers and experts [15], determine that the outcome about the application of the concept of serious play in higher education is proportional, since the assessment of this type of educational interference is linked to the participation and motivation of students. Other recent studies [13] [14] [16] based on meta-data analysis, established that more than 60% of the reviewed findings concerning serious game topics were inconclusive. By another hand, and despite of the predisposition regarding positive conclusions, less enthusiasm, minus gratification was apparent in students when the game course is not adapted to their expectations [17] and is not suitable with the specifics and actual requests of students [14] [16]. Additionally, other researches [2] confirmed that the students gaming profile, gender, ages, and particular stimulations such as music [35] may affect the outcome of student's game-based education. However, throughout numerous case studies, gaming tools must follow to strict guidelines set by the instructors that evaluate the achievement of the proposed gamified course [18] [19]. Concerning music appealing in the context of education, [34] [35] confirmed that the application of sonorized media in college is efficient, the outcome of their proposed model can make this multimedia technology tools more effectively and skillfully. To the best of our knowledge, no former studies has addressed a multimedia content including different sources such as interactive sound track and mute videos besides serious game in order to assess the efficiency of educational resolutions and principal students' motivations factors. A related work can be found in [02], where authors examined diverse factors from those examined in the present research with the aim to practice education by proposing uniquely video games contents. Furthermore, another research [34], where authors conducted a study about examining music perception students' attitudes regarding the apprehension of pedagogical purposes. To this end, they implemented action research which used qualitative method to capture students' perceptions. Nevertheless, no comparison with academic student background was processed also no quantitative method or measurement were used to get more effectiveness regarding the outcomes.
In this proposal, the main objective of the proposed games course is to implicate students in complex issues that reproduce real-world situations such as visiting the university campus without really being there, while respecting safety gestures during the pandemic.

2. Proposed tool description.

2.1 interactive game proposal.

Interactive game learning is a great tool for memorizing [26] [22] and making long-term behavioral changes [27], especially on behalf of young generation [24] [25]. A first version of a proposed interactive game is intended to the test group. The game soundtrack was perfectly mixed, while following the latest trends in music Andalusian rhythms. The Music appeal in addition to the game graphics can be a potential factor that could determines the manner in which interactive content and game process can be perceived by students [33] [34] [35].

Figure 1 Game design screenshot

The subject of the proposed game consists to accompanying the great Arabic Philosopher Ibn Tofail in his journey to search for true knowledge and discover the university institutes and services.
The second proposed game intended to the control group is identical to the first one with a difference in the soundtrack, only a voice over is included that aims to promote Ibn Tofail University.
The proposed game is operated using free tool entitled Edpuzzle [36], it permits to introduce students to self-paced learning space [20] [21] including interactive game courses and it allows professors to integrate their voice narration, music, questions, particular comments, websites…
In addition, Edpuzzle free platform allows to accumulate a dataset as a sheet that let professors to operate accountability and summarize all the resulting information including student's academic background, computer skills, achieved score, students' appreciation and other specific outcomes.
During the game, the university map is designed in old Andalusian graphic innovative style Game's menus and User Interface are designed using 3D Unity Software. Figure 2 describe an overall about game script.

Figure 2: Game script process

As the student advance in game process, new stages are revealed, afterwards new university spaces are explored, and student score is getting improved. this game script, aims to produce a gamified story telling behaviors that enhance the student learning experience [23] though offering them the opportunity to discover the university campus while protecting themselves during pandemic.

2.2 Purpose and methodology

The proposed learning game is designed with the objective to meet several pedagogical criteria. For instance, achieving suitable scores must be more than a stroke of luck, the student should achieve the game levels as a reward for their understanding the subject. Furthermore, the specific features about contents should be easy to apprehend, so students do not lose score for giving inappropriate response, instead, they can be encouraged to reconstruct the given answer. The main query of this study is to examine how the music design can be attractive and appealing for students taking in consideration the type educational background.
Outcomes examination is oriented to execute descriptive analysis of the collected data and conclude whether or not, the usage of the proposed game had been a meaningful variance among a control group and a test group of

university student. The tests and analysis were implemented using One-way ANOVA [28]. The control group consists to students who have played the muted game only, accompanied with the voice over, while the test group, comprise students who played the video game with its soundtrack. During this experience, Students selection has been processed using a Stratified Random Sampling SRS method [29]. The samples were chosen from all the university institutions, including scientific, technology, artistic, literary, economic specialties. With the intention to constitute groups of students and considering the large number of students enrolled at the university, only 3% of students were selected. Those students are enrolled in three distinctive pedagogical disciplines using SRS method [29], this sampling method consists to select similar fraction of each test sample. Designated students are specialized in following disciplines; Sciences and technologies (Hereinafter ST), Art and literature (Hereinafter AL), economics and law (Hereinafter EL). Selected students were allocated into groups in an equitable manner, and were randomly assigned to a control and test group. Table 1 show the samples of all studied case. It should be noted that the students who participated in every case were dissimilar, in other words, no student participated on multiple times.

TABLE 1
Student's group * specialty

Student groups	Art & Literature **AL**	Science & Technology **ST**	Economy & Law **EL**	Total
Test group	33	40	24	97
Control group	34	40	23	97
Total	67	80	47	194

After completing the game stages, instructors have access to the collected dataset which contains and recapitulates all the resultant information including student's data such as, academic specialty, computer skills, accomplished score, motivations toward music, and many other personal feedbacks. The findings are investigated and discussed with the objective of evaluating the multimedia design impact on students' motivation in addition to allowing the improvement of the proposed game design with the aim of a better understanding about the ways in which students interact with learning-games. Overall graphic concerning the experimental design is presented in the figure 3 below.

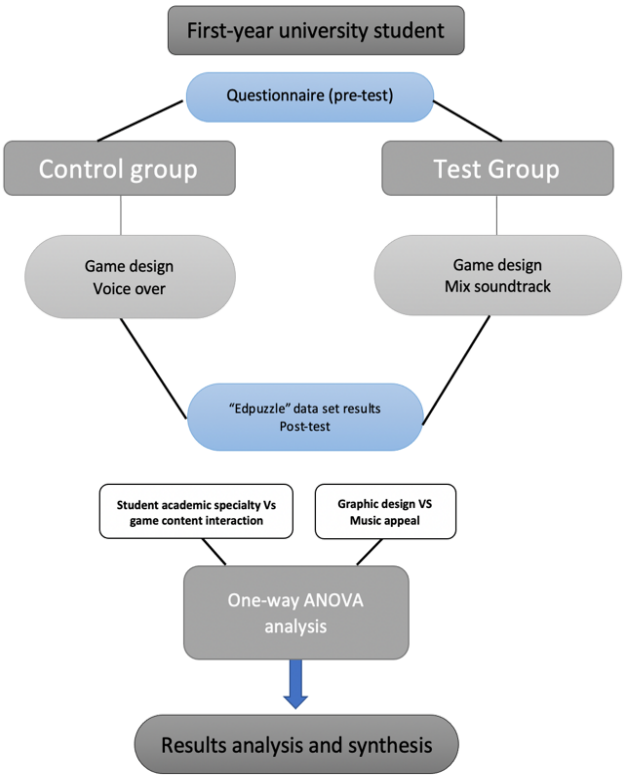

Figure 3. overall scheme of the experimental design

2.3 Dataset Analysis

With the aim to evaluate the equivalence of the applicants in this study, all students completed a pre-test before playing the game. Then independent samples T-tests were implemented with the objective to compare the findings and confirm equivalence between the student groups. Then, after playing game and achieving all the stages, post-test results was analyzed using One-way ANOVA. In order to determine the magnitude of results variations, the Cohen's d effect size [31] was computed. When using Cohen's d, in case if the attained value is equal to 0.2, this implies a small effect size, when the value of 0.5, means a medium one, and a value over 0.8 indicates a large effect size. Collected data from the pretest and posttest is explored and showed in tables and charts bellow in the next section. Experiments are operated using SPSS software, independent samples (t- test) and one-way ANOVA. In order to provide descriptive analysis such as frequency, mean, and standard deviation. It should be noted that before executing the statistical tests, normality of the data was tested by means of the Kolmogorov–Smirnov normality test [32]. Findings indicated that the data was normally distributed in all the reviewed cases.

3. Experimental results and finding.

Experimentations were managed online from July 27/2021 to September 29/2021. A pretest is managed to inspect the student's knowledges about university campus, also to collect information concerning academic specialty and motivation toward contents with appealing music design. The scores of Pretests are shown in Tables 2, for each case study, the mean M and standard deviation (SD) are presented. Next, the significance of the differences in applicant ratings was processed by using the Cohen d effect size that is showed in table 2.

TABLE 2. Pretest Scores

	Student group	N	Mean	Std. Deviation	Std. Error Mean
PRETEST SCORES	Test group	97	2,99	,314	,035
	Control group	97	3,09	,422	,023

Cohen's d effect size

Independent Samples Effect Sizes				
	Standardiz[a]	Point Estimate	95% Confidence Interval	
			Lower	Upper
Cohen's d	,376	-,360	-,688	-,091

a. The denominator used in estimating the effect sizes. Cohen's d uses the pooled standard deviation.

As shown in Table 2, agreed that the Cohen's value (0.376) extracted is lower than 0.5, the test is not meaningful at a scale of 0.5. This approves that there is no significant variance between the control group and test group. That indicates the test and control groups have been equal before the game design playing. Then, after attaining the proposed learning process, post-test scores of students are shown in table 3.

TABLE 3. Post-test Scores

	Student group	N	Mean	Std. Deviation	Std. Error Mean
PRETEST SCORES	Test group	97	5,90	,214	,076
	Control group	97	3,73	,329	,032

Cohen's d effect size

Independent Samples Effect Sizes				
	Standardiz[a]	Point Estimate	95% Confidence Interval	
			Lower	Upper
Cohen's d	,789	-,422	-,590	-,092

a. The denominator used in estimating the effect sizes. Cohen's d uses the pooled standard deviation.

Agreed that the extracted Cohen's value (0. 789) is higher than 0.5 and different from the prior attained value in pretest scores. These important differences shows that an important variance between the two groups of participants is observed in respect with students' comprehension concerning university campus during the courses. Taking this in consideration with the findings, it can be indicated that playing the game content had a significant impact on students' acquisition of the target transversal learning module. Subsequent section bellow explores the sources of this outcome.

3.1 Student academic background Vs game scores

Concerning academic specialty variable, Table 4 presents the results in one-way ANOVA test relative to the students' scores regarding of this variable.

TABLE 4. *One way ANOVA* test

			Sum of Squares	df	Mean Square	F	Sig.
Pretest scores * Academic specialty	Between Groups	(Combined)	,763	2	,367	2,587	,077
		Linearity	,213	1	,203	1,433	,236
		Deviation from Linearity	,540	1	,530	3,742	,065
	Within Groups		36,269	185	,142		
	Total		36,977	187			
Post test scores * Academic specialty	Between Groups	(Combined)	66,917	2	28,459	50,122	<,001
		Linearity	64,207	1	54,267	95,571	<,001
		Deviation from Linearity	3,541	1	2,651	4,671	,033
	Within Groups		201,039	185	,888		
	Total		209,875	187			

As appearing in Table 4, the outcomes reveal clearly important differences in students' scores based on academic specialty variable, given that p value is <0,001 in the post test scores which is fewer than the level needed (0.05). In order to evaluate this aimed factor that impact student's score during pretest and postest, a descriptive enquiry is displayed in Table 5 below.

TABLE 5. *Statistics of academic specialty Vs students' scores*

Academic specialty		Pretest scores	Post test scores
Art & Litterature	Mean	2,81	4,71
	N	75	65
	Std. Deviation	,232	,861
Economy & Low	Mean	4,05	5,64
	N	69	79
	Std. Deviation	,597	,581
Science & Technology	Mean	2,08	6,09
	N	36	46
	Std. Deviation	,159	,848
Total	Mean	2,988	5,43
	N	194	194
	Std. Deviation	,390	,999

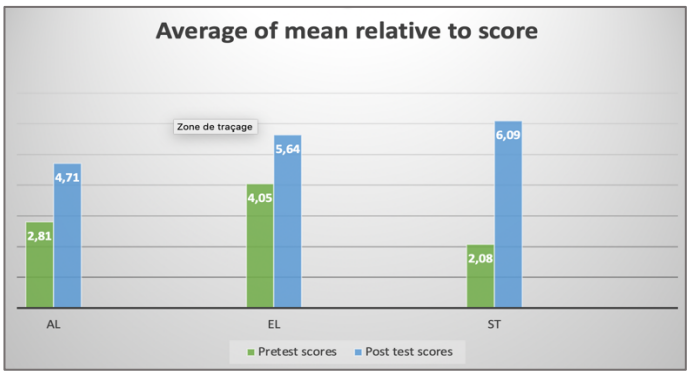

Figure. 4. Average of mean relative to score

It can be seen from table 5 in addition to its corresponding diagram presented figure 4, according to the average of mean and standard deviation values, students with science from technology academic specialty accomplished best results, students from an economic and law specialty comes in second range. Later, fewer scores are obtained by students from profile Art and Literature specialty.

3.2 Study results related to research about graphic design Vs students' motivation

With the objective to evaluate the effect of music perception on the student learning efficiency, one way ANOVA test was achieved. Finding is presented in table 6. The obtained results are based on students' scores considering

three items that students were requested to complete while playing the game. Reliability of items is inspected using Cronbach's alpha as a measure of internal consistency. As shown, the obtained values show a strong level of internal reliability.

TABLE 6. *One way ANOVA test*

		Sum of Squares	df	Mean Square	F	Sig.
Music type appreciation	Between Groups	99,835	1	99,835	209,069	<,001
	Within Groups	88,819	186	,478		
	Total	188,654	187			
Game appreciation	Between Groups	81,787	1	81,787	173,877	<,001
	Within Groups	87,489	186	,470		
	Total	169,277	187			
Game interactivity help you to learn about the university campus	Between Groups	94,090	1	94,090	198,849	<,001
	Within Groups	88,011	186	,473		
	Total	182,101	187			

As showing in Table 6, the one-way ANOVA outcomes of test of students' show significant variances in students' scores, given that p values are <0,001 in the three Items, less than the statistical significance level needed (0.05). In the objective to examine this targeted feature that impact student's score variation, a explanatory investigation and diagrams are exposed in Table 7.

TABLE 7. *Graphic design Vs students' scores*

		Mean	Std. Deviation	Std. Error
Video graohic design appreciation	Test group	4,18	,627	,061
	Control group	2,62	,791	,072
	Total	3,49	1,04	,071
Game graohic design appreciation	Test group	4,16	,720	,075
	Control group	2,74	,698	,061
	Total	3,70	,941	,065
multimedia contents interactivity helps you to learn about the university campus	Test group	4,54	,677	,078
	Control group	2,52	,628	,071
	Total	3,03	,917	,079

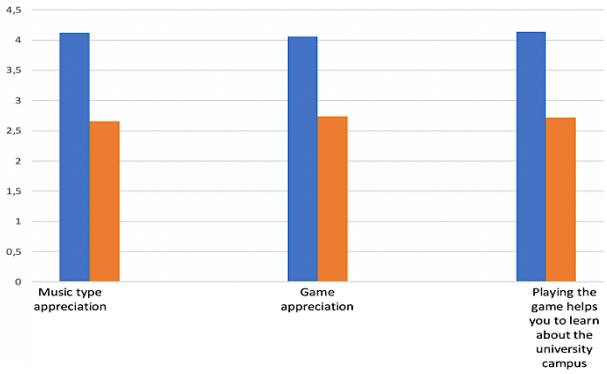

Figure. 5. diagram relative to student appreciation

The results recorded in Table 7, adding to its corresponding diagram in figure 5, confirm that all obtained values concerning the student's scores of the test group are superior than t values concerning the control group. This indicates that the proposed music soundtrack is more appealing and enables greater effectiveness in terms of learning processes.

3.3 Study results related to academic specialty Vs graphic design attractiveness

With the aim to evaluate students' interest and sensibility toward the proposed music soundtrack, several Chi-Square Tests are implemented, with the regard to investigate qualitatively in what way students enrolled at diverse university disciplines perceive the proposed soundtrack in addition to the way that their educational specialty impacts their receptivity and motivation regarding learning process. The Chi-Square Test of Independence describes whether there is a connection between the two variables, respectively designated academic specialty and music appeal appreciation. Table 8 show the qualitive statics plus Chi-Square Tests outcomes.

TABLE 8. *Academic specialty * Multimedia content graphic design appreciation*

		Very Poor	Poor	Acceptable	Good	Very Good
Academic specialty	AL	0	12	21	26	8
	ST	2	18	23	24	13
	EL	2	10	14	16	4

Chi-Square Tests

	Value	df	Asymptotique Significance (2-sided)
Pearson Chi-Square	5,438[a]	8	,408
Likelihood Ratio	6,698	8	,473
Linear-by-Linear Association	1,689	1	,195
N of Valid Cases	194		

a. 3 cells (20,0%) have expected count less than 5. The minimum expected count is ,95.

As displayed in Table 8, obtained measure relative to the test statistic is 5.438. The corresponding p-value of the test statistic is p = 0.408. As the p-value is greater than significance level (α = 0.05) we can state the following; No association was found between academic specialty and sensitivity to the appeal of music type, which means all students become stimulated by the music is appealing as revealed.

4. Conclusion, and work limitation.

The first concern in this study was to investigate the effect of educational specialty and music appeal on students' learning and achievement through interactive game content in the environment of higher education. Conclusions and results confirm that students' learning effectiveness differs depending on their educational specialty, on behalf of students coming from Science and Technology university disciplines, followed by Economics and Law disciplines and ending by Art and Literature studies. However, other assessments remain available with the regard to improve and upgrade analysis about features that could influence students' scores, such as computer skills, technology acceptance, game profile, age, gender.... Numerous studies [02][30][17][33], have been managed regarding these features, although the novelty of this study is to dealt with students' academic specialty as an inclusive and essential criterion that have a direct influence on the effectiveness of student learning.
The second issue of this research, is to explore the effect of appealing music type on the understanding of pedagogical purposes. The findings confirm that since the game is accompanied with music soundtrack, students interact better with the game content and their achieved score becomes best, regardless of their educational specialty.

References

1. Eyster T (2008) Playing game in class, a beginner's guide for higher education. Internal report. University of Kaplan, Kaplan.
2. B. Manero, J. Torrente, C. Fernández-Vara and B. Fernández-Manjón, "Investigating the Impact of Gaming Habits, Gender, and Age on the Effectiveness of an Educational Video Game: An Exploratory Study," in IEEE Transactions on Learning Technologies, vol. 10, no. 2, pp. 236-246, 1 April-June 2017, doi: 10.1109/TLT.2016.2572702.
3. Bachen, C.M., Hernández-Ramos, P., Raphael, C., Waldron, A. (2016). How do presence, flow, and character identification affect players' empathy and interest in learning from a serious computer game. Computers in Human Behavior, 64, 77-87.
4. Dondlinger MJ (2007) Educational video game design: a review of the literature. J Appl Educ Technol 4:21–31
5. Chiang, Y. T., Lin, S. S. J., Cheng, C. Y., & Liu, E. Z. F. (2011). Exploring online game players' flow experiences and positive affect. The Turkish Online Journal of Educational Technology, 10(1), 106–114
6. Yang, J. C., Chien, K. H., & Liu, T. C. (2012). A digital game-based learning system energy for energy education: An energy conservation pet. The Turkish Online Journal of Educational Technology, 11(2), 27–37.
7. Buckless, F. A., Krawczyk, K., & Showalter, D. S. (2014). Using virtual worlds to simulate real-world audit procedures. Issues in Accounting Education, 29(3), 389–417.
8. María Cristina Gómez, International Symposium on Didactics of Social Sciences (25. 2014. Barcelona) . (pp. 257–262). Universitat Autónoma de Barcelona University Association of Teachers of Didactics of Social Sciences
9. Pando-Garcia, J., Periañez-Cañadillas, I., Charterina, J. (2016). Business simulation games with and without supervision: An analysis based on the TAM model. Journal of Business Research, 69, 1731-1736.
10. Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). Gamification: Toward a definition. Vancouver. ACM 978-1-4503- 0268-5/11/05: Proceedings of the CHI 2011. https://doi.org/10.1145/1979742.1979575.

11. Yu, T., & Richardson, J. C. (2015). An exploratory factor analysis and reliability analysis of student online learning readiness (SOLR) intrument. Online Learning, 19(5).
12. Wataluk, S. L. (2012). 'I'm not a computer person': Negotiating participation in academic discourses. British Journal of Educational Technology, 43(1), 109–118.
13. Bovermann, K., Weidlich, J. & Bastiaens, T. Online learning readiness and attitudes towards gaming in gamified online learning – a mixed methods case study. Int J Educ Technol High Educ 15, 27 (2018). https://doi.org/10.1186/s41239-018-0107-0
14. Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed and what remains uncertain: A critical review. International Journal of Educational Technology in Higher Education, 14(9), 1–36.
15. Lee, Y., & Choi, J. (2013). A structural equation model of predictors of online learning retention. The Internet and Higher Education, 16, 36–42. https://doi.org/10.1016/j.iheduc.2012.01.005
16. Nacke, L. E., & Deterding, S. (2017). The maturing of gamification research. Computers in Human Behavior, 71, 450–454 https://doi.org/10.1016/j.chb.2016.11.062.
17. Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longtitudal study on intrinsic motivation, social comparison, effort, and academic performance. Computers & Education, 80, 152–161.
18. Denise McEnroe-Petitte, Cindy Farris, Using Gaming as an Active Teaching Strategy in Nursing EducationTeaching and Learning in Nursing, Volume 15, Issue 1, 2020, Pages 61-65, ISSN 1557-3087, https://doi.org/10.1016/j.teln.2019.09.002.
19. Gomez-Urquiza, J. L., Gomez-Salgado, J., Albendin-Garcia, L., Correa-Rodriguez, M., Gonzalez-Jimenez, & De la Fuente, C. (2019). The impact on nursing students' opinions and motivation of using a "Nursing Escape Room" as a teaching game" A descriptive study.
20. Jeng, Y., Wu, T. Huang, Y., Tan, Q. and Yang, S. J. H. (2010) "The add-on impact of mobile applications in learning strategies: A review study", Educational Technology & Society, Vol. 13, No. 3, pp. 3-11.
21. Huang, O.W.S., Cheng, H.N.H. and Chan, T.W. (2007) "Number Jigsaw Puzzle: A Mathematical Puzzle Game for Facilitating Players' Problem Solving Strategies", In Proceedings of the First IEEE International Workshop on Digital Game and Intelligent Toy Enhanced Learning, Jhongu, Taiwan, March.
22. Santos, P., Pérez-Sanagustín, M., Hernández-Leo, D. and Blat, J. (2011) "QuesTInSitu: From tests to routes for assessment in situ activities", Computers & Education, Vol. 57, No. 4, pp. 2517-2534.
23. Al-absi, Mohammad (2017) "The Effect of Using Puzzles and Games on Students' Mathematical Thinking at the Faculty of Educational Sciences and Arts (UNRWA)," An-Najah University Journal for Research - B (Humanities): Vol. 31 : Iss. 10 , Article 7.
24. Gedera, D. S. P., and Zalipour, A. (2017). Creating interactive video content for your teaching. Learnfest. University of Waikato, New Zealand.
25. Gachago, Daniela et al. "Engagement levels in a graphic design clicker class: Students' perceptions around attention, participation and peer learning." Journal of Information Technology Education 10 (2011): 253-269.
26. Zimmerman, Whitney. (2018). Long Video Lectures: Shifting to an Adult Learning Perspective. Adult Learning. 30. 104515951879798. 10.1177/1045159518797983.
27. Melero, Javier & Santos, Patricia & Davinia, Hernández-Leo & Blat, Josep. (2013). Puzzle-based games as a metaphor for designing in Situ learning activities. Proceedings of the 6th European Conference on Games Based Learning.
28. https://statistics.laerd.com/statistical-guides/one-way-anova-statistical-guide.php
29. Hamed Taherdoost. Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. International Journal of Academic Research in Management (IJARM), 2016, 5. ffhal-02546796
30. J. Högberg, J. Hamari and E. Wästlund, "Gameful experience questionnaire (GAMEFULQUEST): An instrument for measuring the perceived gamefulness of system use", User Model. User-Adapted Interact., vol. 29, no. 3, pp. 619-660, Jul. 2019.
31. J. Cohen, "A power primer," Psychol. Bull., vol. 112, no. 1, pp. 155–159, 1992, doi: 10.1037/0033-2909.112.1.155.
32. A. Lall, "Data streaming algorithms for the Kolmogorov-Smirnov test," 2015 IEEE International Conference on Big Data (Big Data), 2015, pp. 95-104, doi: 10.1109/BigData.2015.7363746.
33. Eshun, Eric & Osei-Poku, Patrick. (2013). Examining Graphic Design Students' Attitudes toward Participative Assessment in Studio-Based Learning. Journal of Arts and Design Studies. 6. 1-14.
34. L. Li and Z. Han, "Design and innovation of audio iot technology using music teaching intelligent mode," Neural Computing & Applications, vol. 34, pp. 1–14, 2022.
35. W. Li, "Multimedia teaching of college musical education based on deep learning," Mobile Information Systems, vol. 2021, no. 2, Article ID 5545470, 10 pages, 2021.
36. https://edpuzzle.com/