

University Students' Learning Experiences in the Virtual Environment

Yersi-Luis Huamán-Romani¹, José-Carlos Juárez-Pulache², Neisser Pino Romero³, Elinar Carrillo-Riveros⁴, Kevin-Arnold De la Cruz-Girón⁵

¹Universidad Nacional de Frontera & Sullana Perú.

^{2,4,5}Universidad Nacional de San Cristóbal de Huamanga & Ayacucho Perú

³Universidad Tecnológica del Perú & Lima Perú

Abstract— The process of Teaching and Learning in times of Covid-19 brought experiences between teachers and students, seeking to improve with some teaching method to obtain satisfaction in their learning, the objective of this research is to validate the instrument of measurement of Teaching and Learning Experience Questionnaire (ETLQ) in the Peruvian context with university students, This instrument consists of three parts, the Teaching and Learning Environment which consists of 19 questions, the Student Learning Approach which consists of 9 questions and the Critical Thinking with 4 questions, each question is composed of 5-point Likert-type scales (1 point = "Strongly disagree" and 5 points = "Strongly agree". A total of 2027 university students participated throughout Peru, including students from national and private universities. Cronbach's Alpha =0.957 with 32 numbers of items was valid for its respective use, with which it will be possible to measure the Learning Experiences in university students, reinforcing this result with different tests whose results were optimal and reliability analysis. Concluding that, the validation instrument is valid in the Peruvian environment, online education is accepted in its highest percentage and that the rejection of this is only in the most vulnerable students and the feedback to students is the most outstanding.

Keywords—Validation, Learning experiences, teaching, online education, Covid-19.

I. INTRODUCTION

The Covid-19 pandemic challenged all educational institutions to offer online courses in their entirety, which is why the quality and satisfaction of online education in students and teachers was investigated, where the dissatisfaction of students in the health area (medicine, nursing and others) predominated with 63.5%, but the greatest influence on students is the situation of the seriousness of Covid-19.

The teachers satisfied with 61.1% is thanks to the distancing (caution not to become infected); in both cases the facilities and mutual support prevailed [1], while the universities provided strategies and competencies in education that is student-centered, ICT competencies were inserted, focusing on blended and team learning modified in order to have good quality graduates [2], there are plenty of methods such as the peer learning method that was innovative for teaching-learning, The same happened when comparing video and lecture-demonstration shared teaching in students to evaluate oral drug tutoring, where no significant changes of major importance were found, but it was recognized that the lecture-demonstration method was more practical than the video method (not superior according to the comparisons made in the study) [4]. The "boom" of ICT is occurring thanks to the Covid-19 pandemic, these experiences of transition from traditional to distance learning with digital tools concluded in three important aspects, such as: digital didactics, technological resources and study environment, but preferring many the traditional education due to the fact that social interactions are missing and a third of students if they prefer the use of digital tools, also homogeneous results were obtained that if they would accept a combined work for the "return" to classes [5] and those who did not agree with online teaching are the medical students of the specialty of surgery, because lecture-based learning was not suitable for clinical ability and thinking, so the step-by-step method was combined with case-based learning obtaining better results for teaching-learning in students [6].

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

In the visits to museums are perceived from the academic point more emotional, since they have better cultural experiences where the objective is to increase knowledge in situ, this sudden change of teaching because of Covid-19 is a challenge that must be faced with the advancement of technology creating new projects according to the needs of students [7], education in the area of medicine has major changes in their teaching-learning, having to adapt to the curriculum design with which they had and using the methods of team-based learning and case-based learning, resulting that team-based learning was highly favourable with respect to the method in comparison because the method solved problems of clinical cases with the knowledge and feedback that was imparted through the facilitator [8], marginalization and poverty gave importance to university education, service-learning was fundamental for health professionals whose commitment addressed and surfaced to support neglected populations, in this new experience significantly influenced health professionals in poverty, communication skills, marginalization, collaborative skills and attitude towards patients; this experience developed human relations [9] and the key to this type of education is the perceived motivation because of many deaths due to Covid-19, even more so in the health sector, where medical dedication is full time. Academic and achievement motivation have their differences, but explore, prepare and new approaches are tested for new curricula in nursing, whose motivational pedagogical effect on university students has educational potential within the aspects of competence and quality in patient care [10].

It has been shown that the influence of teaching-learning has positive effects on undergraduate university students, but there was still a lack of research on graduate students, so the measurement instrument was created: Conceptions of Learning and Teaching (COLT) which allows to have the perception of teachers about online education with different teaching-learning methods, resulting that the perception of teachers of teaching-learning in graduate students is suboptimal for education in the engineering and health sector at the graduate level [11], because of the presence of Covid-19 teaching-learning was suspended at the international level and in the education sector as in other sectors there was also suspension, the students of the health sector careers faced studies in the hospital under pressure, the experiences with the advantages and challenges of virtual education are highly significant, they learned new skills and faced the poor internet connection [12], the communication between student and teacher is very important in academic areas, especially when making use of communicative competence (CC) in students [13].

The teaching-learning experience is not only lived at the undergraduate or graduate level; but also at the research level, thanks to the pandemic many researchers learned to analyze their data with artificial intelligence leaving aside the SPSS package, the key element for their change was motivation [14], the advancement of education in the area of science is focused on scientific experiences such as authentic or open inquiries that lead to improve the development and learning of university students, resulting that authentic inquiry is more significant by understanding, skill and scientific self-perception. In order to link the student with inquiry, inquiry should be experimented with as an approach for science and engineering courses [15].

In the presence of Covid-19 online learning has diversified and expanded, the rapid growth of learning strategies with e-learning method overlaps before traditional experiences and one of the effects of implementation of television programs on medical consultations had satisfactory experiences, television has allied to be part of effective communication for real life learning [16], research has focused on learning to rescue the results and obtain positive changes in academic performance with proposals to be more successful in learning such as: realistic contexts, instructions for stimulations and mental challenges to achieve complete understanding; course contents are designed to: obtain interest, provide better quality in videoconferencing, generate emotions through videoconferencing and permanent functionality to the discussion forum [17], whose skills of thinking development at the higher level are related to the key factors in the learning environment with peer interaction, motivation to learning and combinations of these that improve interaction between university students [18].

Universities despite having implemented communication technologies still have problems such as: network saturation, low video quality and others; mobile learning motivates to have better academic performance, but still remains weak in education [19], social cognitive theory in front of the Covid-19 in online education influenced friends, teachers and relatives that allowed them to have experience with music to teach students the achievements in professional development with social persuasions [20]. Several models of education and online courses were investigated and verified in order not to generate anxiety in students and to know the effect caused by each of them on academic performance at this time of Covid-19 resulting very satisfactory online education [21].

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

As well as there is a growth in the education sector with ICT, several sectors have shortcomings due to lack of implementation to receive classes, affecting many students in their academic achievements [22].

When faced with global health emergency challenges due to Covid-19, academic leaders came forward, trying to provide solutions under educational processes and approaches that included deployments and/or internships to rural sites [23]. The close peer method is new and there is not much scientific literature on its use, the method consists of being older (academically) to exercise tutoring, the impact was received positively in students and influenced their development of their learning [24]. Learning has to be hand in hand with interaction as it plays a very important role, quality learning is obtained through e-learning in these difficult times of Covid-19 and has an excellent relationship of e-learning quality with student satisfaction [25]. Boredom is causal of blocking motivation, attention, achievement and learning; which often happens in science and engineering courses, so the method based on the assumptions of achievement emotions control value theory was used, resulting that, if there is positive and significant effects, always relating the theory and practice of autonomy, mutual support and subjective value among students [26].

II. JUSTIFICATION AND OBJECTIVES OF THE STUDY

The experiences of the teaching process in times of Covid-19 were at first rejected, but with the advance of time and the constant trainings for students and teachers were gradually accepted, so our objective in this research is to validate the measurement instrument of Teaching and Learning Experiences Questionnaire [27] in the Peruvian context with university students from national and private educational universities in times of Covid-19, this measurement instrument used is the adaptation to Spanish and was validated in Spain, the specific objectives for this research are:

- To describe and analyze the Teaching and Learning Environment of university students in Covid-19 epochs.
- To describe and analyze the Learning Approach of university students in Covid-19 times.
- To describe and analyze the Critical Thinking of university students in Covid-19 epochs.

III. METHOD

A. Research design

In this research, a descriptive design was used, with a correlational, cross-sectional and predictive quantitative model [28].

B. Sample

The results of the 2027 surveys show that 56.4% are male and 43.6% are female, the students are within the age group of 15 to 20 years with 56.2%, within the 20 to 25 years with 35.3%, between 25 and 30 years with 5.2% and more than 30 years with 3.3%. Of the 2027 university students, 48.7% are from private universities and 51.3% are from national universities.

C. Instrument

The instrument used for this research is the Teaching and Learning Experiences Questionnaire which consists of three parts, the first part measures the Teaching and Learning Environment which consists of 19 questions (EEA 1: The contents in general, encourage me to relate what I have learned to the real world. EEA 2: I can see the relevance of most of what we are taught. EEA 3: I enjoy this way of learning. EEA 4: The Docent helps us learn how to think and come to conclusions about things. EEA 5: This way of teaching us helps me think about the tests that different teachers hold. EEA 6: This way of teaching and learning has given me an idea of what is going on in my environment. EEA 7: The teacher tries to share his enthusiasm with us. EEA 8: What we are taught seems to match what we were supposed to learn. EEA 9: The teacher is patient in explaining things that seem difficult to understand. EEA 10: The feedback or response given to my work helps me improve the way I learn and study. EEA 11: Feedback on my work helps me clarify things I had not fully understood. EEA 12: Assignments help me relate them to my previous knowledge or experience. EEA 13: I can work comfortably with other colleagues. EEA 14: Peers support each other and help each other when needed. EEA 15: Talking with other colleagues helps me develop my understanding. EEA 16: I am clear about what is expected in the assessment tasks. EEA 17: I can see how the tasks fit with what we are supposed to learn. EEA 18: I am clear about what I am supposed to learn. EEA 19: I usually receive feedback from teachers on my assignments) the second part the one measuring Student Learning Approach which consists of 9 questions (EA 1: In general, I am quite systematic and organized in my studies.

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

EA 2: I generally put effort into my studies. EA 3: I have organized my study time carefully to make the best use of it. EA 4: I look carefully at the evidence before coming to my own conclusion about what I am studying. EA 5: The ideas I encounter in my academic readings often lead me into long chains of thought. EA 6: When I communicate ideas, I think about how well I get my points across. EA 7: If I don't understand things well when studying, I try a different approach. EA 8: I often have trouble making sense of things I have to remember. EA 9: Much of what I learn seems like a bunch of unrelated pieces in my mind) and the third part measures Critical Thinking with 4 questions (PC 1: I have learned to analyze and organize information. PC 2: I have learned to evaluate topics critically. PC 3: I have learned to apply theoretical knowledge to practice. PC 4: I have learned to develop new ideas), each of these questions is composed of 5-point Likert-type answers (1 point ="Strongly agree", 2 points ="Agree", 3 points ="Neither disagree nor agree", 4 points ="Disagree" and 5 points ="Strongly disagree").

D. Data collection and analysis

The data collection was during the month of September 2021, an online survey of the google form was used, the samples were taken with students from national universities and private universities throughout the country of Peru, the sampling was intentional type for ease of access to researchers, always respecting their opinions and those who responded to the surveys. The surveys were conducted online, completely anonymously and voluntarily, and then analyzed the 2027 responses, 56.4% male and 43.6% female.

At the time of conducting the survey, the research informed and requested the corresponding authorization from each student to proceed with the analysis and publication of their answers once the research was completed, the considerations of good practices and ethics of all research, as established in the Declaration of Helsinki, were respected throughout the research.

This "new" and novel instrument to measure teaching and learning in Peruvian university students had a positive approval despite the difficulties that all research has at the beginning of its applicability.

We proceeded to download the information from the Google Forms form and proceeded to its respective analysis and then to interpret it. Once the most relevant information was concluded from all the respective analysis, we proceeded to select the most relevant information for the scientific community and thus answer our research objectives.

When analyzing the 2027 responses of the university students in order to validate them in the Peruvian context, the SPSS version 25 program was used, always checking the assumed linearity, independence, normality, homoscedasticity, residual analysis and non-collinearity.

IV. RESULTS

Table 1 shows values for Cronbach's alpha, Hotelling's t-squared test and ANOVA with Tukey's test for non-additivity for each of the three dimensions studied.

TABLE I
VALUES OF CRONBACH'S ALPHA TEST ACCORDING TO DIMENSIONS

	Teaching and Learning Environment	Student Learning Approach	Critical Thinking
Cronbach's alpha	0,952	0,920	0.884
Number of ítems	19	9	4
Hotelling's t-squared test	1150, 960	793,397	208,941
F	63.406	98,832	69,578
gl	18	8	3
Sig.	0.000	0.000	0.000
ANOVA with Tukey's test for non-additivity			
Overall mean	3.84	3.80	4.03
Coefficient of concordance	W=0,026	W=0,033	W=0.009
Tukey's estimate of power at which observations must be made to achieve additivity.	= 2,802	=2,742	=3.557

The measurement instrument Teaching and Learning Experiences Questionnaire validated in Spain and now validated in the Peruvian context has a Cronbach's Alpha =0.957 with 32 item numbers which means that, if it is valid to use this measurement instrument to measure the Learning Experiences in university students, with a Hotelling's T-square Test with 2094.174, F=66.554, gl=31 and Sig. =0.00. And the ANOVA test with Tukey's test for non-additivity with an overall mean = 3.86 and Tukey's estimate of power in which observations must be made to construct an additivity =0.930.

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

Using factor analysis the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy =0.969, Bartlett's test of sphericity has a Chi-square of 42451.150 with gl 496 and Sig. 0.000 and the goodness-of-fit test given by Chi-square 3601.019; gl=374 and Sig. 0.000. The correlation matrix indicates that each dimension is independent of the others.

Table 2 shows the values of the total variance explained, where there are 4 factor squared loadings of the extraction with 43.844 % the highest loading and with 3.195% the lowest loading.

TABLE II
TOTAL VARIANCE EXPLAINED

Factor	Auto initial values			Sums of squared extraction charges			Sums of loads squared by rotation		
	Total	% of variance	% Cumulative	Total	% of variance	% Cumulative	Total	% of variance	% Cumulative
1	14,469	45,215	45,215	14,030	43,844	43,844	6,730	21,032	21,032
2	2,269	7,091	52,306	1,519	4,746	48,589	6,040	18,876	39,908
3	1,707	5,333	57,640	1,690	5,280	53,869	3,981	12,441	52,349
4	1,420	4,439	62,079	1,022	3,195	57,064	1,509	4,715	57,064
5	,919	2,872	64,950						
6	,797	2,492	67,442						
7	,748	2,338	69,780						
8	,689	2,153	71,933						
9	,669	2,092	74,025						
10	,573	1,792	75,817						
11	,527	1,648	77,465						
12	,483	1,509	78,975						
13	,456	1,425	80,400						
14	,443	1,383	81,783						
15	,431	1,347	83,130						
16	,412	1,288	84,418						
17	,398	1,243	85,661						
18	,370	1,158	86,819						
19	,367	1,148	87,967						
20	,350	1,092	89,059						
21	,349	1,089	90,148						
22	,330	1,031	91,179						
23	,326	1,019	92,198						
24	,315	,983	93,181						
25	,303	,947	94,128						
26	,292	,912	95,040						
27	,287	,897	95,937						
28	,278	,869	96,805						
29	,269	,841	97,646						
30	,261	,817	98,463						
31	,254	,793	99,257						
32	,238	,743	100,000						

Method of extraction: maximum likelihood.

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

Table 3 shows the factor transformation matrix with its 4 maximum likelihood extraction factors and the rotation method which is Varimax with Kaiser normalization.

TABLE III
FACTOR TRANSFORMATION MATRIX

Factor	1	2	3	4
1	,652	,573	,486	,103
2	-,247	,250	-,160	,923
3	-,525	,760	-,114	-,366
4	,489	,178	-,852	-,065

Extraction method: maximum likelihood.
Rotation method: Varimax with Kaiser normalization..

Figure 1 shows the results of the Teaching and Learning Environment where the highest mean was EEA 11 with 4.03 and refers to "the comments on my work help me to clarify things that I had not fully understood" highlighting the work done by the teachers since this point in the classroom version is done personally and "forgetting" the recommendations, but as long as it is "written" on their platform or in the recommendations part of their work they can review as many times as they can and take into account for future work assigned by the teachers and the lowest mean is EEA 3 with 3.39, which refers to "I enjoy this way of learning", meaning that the student is not yet enjoying the way of learning due to his limitations in accessing the internet and others.

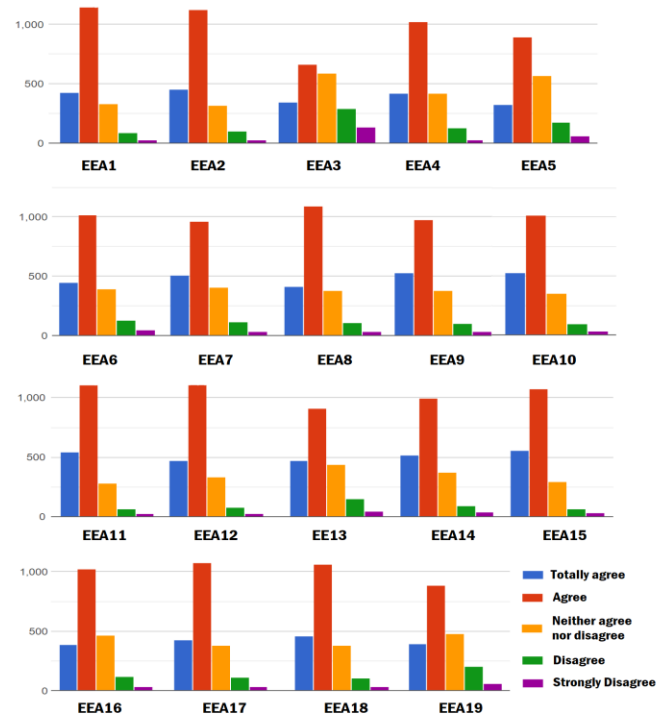


Figura I Histogram of the Teaching and Learning Environment

Figure 2 shows the results of the Student Learning Approach where the highest mean is EA 2 with 4.12 and refers to "I generally put effort into my studies", i.e. every student despite having limitations or difficulties in ICT is always putting effort into their studies; the lowest mean is EA 9 with 3.36 which refers to "Much of what I learn seems like a bunch of unrelated pieces in my mind", that is to say that the student has difficulties to grasp what he/she has learned and has to make bibliographic or other revisions or in another medium.

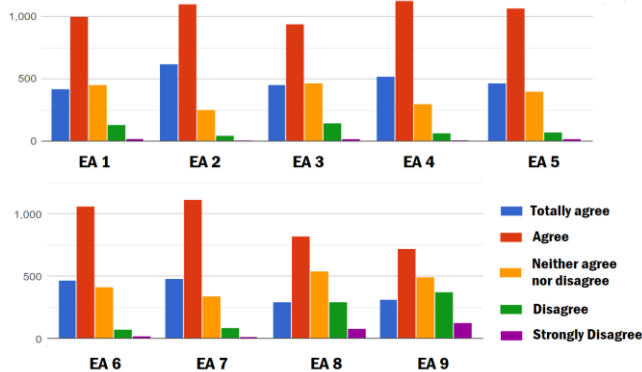


Figure II Histogram of Student's Learning Approach

Figure 3 shows the results of Critical Thinking with the highest mean of PC 4 with 4.11 which refers to "I have learned to develop new ideas" meaning that the student has to face to solve all kinds of problems and especially his studies; and the lowest mean is PC 3 with 3.91 which refers to "I have learned to apply theoretical knowledge to practice" meaning that he still has difficulties in his learning process especially with theory and practice.

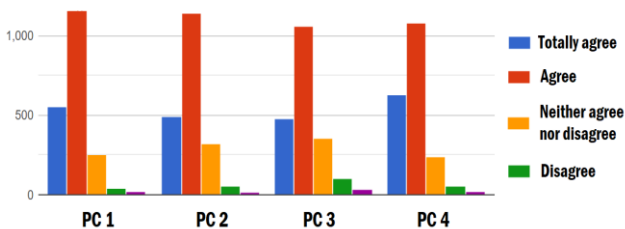


Figure III Histogram of Critical Thinking

V. CONCLUSIONS

It was possible to validate the instrument for measuring the Teaching and Learning Experiences Questionnaire for the Peruvian. In the dimensions of the Teaching and Learning Environment, university students relate everything they learn with their environment, giving importance to what they are really taught, there being a clear position that online education is accepted as well as rejected, there being a mutual division between the enjoyment of this online methodology.

The teacher in these times of online teaching encourages and motivates the reasoning to reach conclusions, even to respond to the different evaluations that are submitted by teachers, the presence of Covid-19 made many people look at their environment and the place where and how we live.

The teachers show enthusiasm so that the students can achieve their objectives in spite of the hard situation in which we live, always explaining with better fluency in subjects of little understanding because the feedback has been and will be fundamental for these teaching processes.

The development of teaching-learning with the e-learning method has significant effects because it helps to understand with better clarity topics of greater difficulty and helps to improve the experience in specific topics, and then share with their peers the experiences of what they have learned, which are then reinforced by the teacher.

The university student in his approach to achieve learning, managed to systematize and organize his time, dedicating more time to do group tasks, research, have purely academic relationships and improve academic performance, focusing on everything he has learned in his learning development with the different virtual environments.

Finally, she developed critical thinking to organize information, evaluate topics, use theory and practice in a more appropriate way and learn to develop her own ideas with informed criteria.

REFERENCES

- [1] Li, W., Gillies, R., He, M., Wu, C., Liu, S., Gong, Z., Sun, H. (2021) Barriers and facilitators to online medical and nursing education during the COVID-19 pandemic: perspectives from international students from low- and middle-income countries and their teaching staff. *Human Resources for Health*, 19 (1), art. no. 64. <https://doi.org/10.1186/s12960-021-00609-9>
- [2] Albarrak, A.I., Zakaria, N., Almulhem, J., Khan, S.A., Karim, N.A. (2021) Modified team-based and blended learning perception: a cohort study among medical students at King Saud University. *BMC Medical Education*, 21 (1). <https://doi.org/10.1186/s12909-021-02639-2>
- [3] Mauliandari, R., Sumarwati, M., Upoyo, A.S. (2021) Peer learning: An effective teaching-learning method for improving ability in arterial blood gases interpretation. *Nurse Media Journal of Nursing*, 10 (3), pp. 329-338. <https://doi.org/10.14710/NMJN.V10I3.28660>
- [4] Riveiro-Rodríguez, T., Domínguez-Almansa, A., López Facal, R., Izquierdo Rus, T. (2021) Place-Based Education and Heritage Education in in-service teacher training: Research on teaching practices in secondary schools in Galicia (NW Spain). *Humanities and Social Sciences Communications*, 8 (1), art. no. 20. <https://doi.org/10.1057/s41599-020-00689-3>
- [5] Langegård, U., Kiani, K., Nielsen, S.J., Svensson, P.-A. (2021) Nursing students' experiences of a pedagogical transition from campus learning to distance learning using digital tolos. *BMC Nursing*, 20 (1), art. no. 23. <https://doi.org/10.1186/s12912-021-00542-1>
- [6] Wei, F., Sun, Q., Qin, Z., Zhuang, H., Jiang, G., Wu, X. (2021) Application and practice of a step-by-step method combined with case-based learning in Chinese otoscopy education. *BMC Medical Education*, 21 (1), art. no. 89. <https://doi.org/10.1186/s12909-021-02513-1>

International Journal of Emerging Technology and Advanced Engineering

Website: www.ijetae.com (E-ISSN 2250-2459, Scopus Indexed, ISO 9001:2008 Certified Journal, Volume 12, Issue 05, May 2022)

- [7] Escribano-Miralles, A., Serrano-Pastor, F.-J., Miralles-Martínez, P. (2021) Perceptions of educational agents regarding the use of school visits to museums for the teaching of history. *Sustainability* (Switzerland), 13 (9), art. no. 4915. <https://doi.org/10.3390/su13094915>
- [8] Burgess, A., Matar, E., Roberts, C., Haq, I., Wynter, L., Singer, J., Kalman, E., Bleasel, J. (2021) Scaffolding medical student knowledge and skills: team-based learning (TBL) and case-based learning (CBL). *BMC Medical Education*, 21 (1), art. no. 238. <https://doi.org/10.1186/s12909-021-02638-3>
- [9] Civitelli, G., Liddo, M., Mutta, I., Maisano, B., Tarsitani, G., Marceca, M., Cedeno, G.C., Geraci, S. (2021) A service-learning experience in a free medical centre for undocumented migrants and homeless people. *Archives of Public Health*, 79 (1), art. no. 7. <https://doi.org/10.1186/s13690-021-00530-6>
- [10] Millanzi, W.C., Kibusi, S.M. (2021) Exploring the effect of problem based facilitatory teaching approach on motivation to learn: a quasi-experimental study of nursing students in Tanzania. *BMC Nursing*, 20 (1), art. no. 3. <https://doi.org/10.1186/s12912-020-00509-8>
- [11] Pacifico, J.L., van Mook, W., Donkers, J., Jacobs, J.C.G., van der Vleuten, C., Heeneman, S. (2021). Extending the use of the conceptions of learning and teaching (COLT) instrument to the postgraduate setting. *BMC Medical Education*, 21 (1), art. no. 32. <https://doi.org/10.1186/s12909-020-02461-2>
- [12] Almohammed, O.A., Alotaibi, L.H., Ibn Malik, S.A. (2021) Student and educator perspectives on virtual institutional introductory pharmacy practice experience (IPPE). *BMC Medical Education*, 21 (1), art. no. 257. <https://doi.org/10.1186/s12909-021-02698-5>
- [13] Gholami, M.J., Pishghadam, R., Shayesteh, S. (2021) Emosensory Competence, as an Undisclosed Construct of Communicative Competence, Predicts L2 Speaking Ability. *Journal of Research in Applied Linguistics*, 12 (1), pp. 33-47. <https://doi.org/10.22055/RALS.2021.16723>
- [14] Pourtousi, Z., Khalijian, S., Ghanizadeh, A., Babanezhad, M., Nakhjiri, A.T., Marjani, A., Shirazian, S. (2021) Ability of neural network cells in learning teacher motivation scale and prediction of motivation with fuzzy logic system. *Scientific Reports*, 11 (1), art. no. 9721. <https://doi.org/10.1038/s41598-021-89005-w>
- [15] Wu, X.B., Sandoval, C., Knight, S., Jaime, X., Macik, M., Schielack, J.F. (2021) Web-based authentic inquiry experiences in large introductory classes consistently associated with significant learning gains for all students. *International Journal of STEM Education*, 8 (1), art. no. 31. <https://doi.org/10.1186/s40594-021-00290-3>
- [16] Osborne, F., Harrison, M., Fisher, J., Bateman, B. (2021) Using medical reality television as a technology-enhanced learning strategy to provide authentic patient care experiences during clinical placements: a case study research investigation. *BMC Medical Education*, 21 (1), art. no. 15. <https://doi.org/10.1186/s12909-020-02432-7>
- [17] Deng, R., Benckendorff, P. (2021) What are the key themes associated with the positive learning experience in MOOCs? An empirical investigation of learners' ratings and reviews. *International Journal of Educational Technology in Higher Education*, 18 (1), art. no. 9. <https://doi.org/10.1186/s41239-021-00244-3>
- [18] Lu, K., Yang, H.H., Shi, Y., Wang, X. (2021) Examining the key influencing factors on college students' higher-order thinking skills in the smart classroom environment *International Journal of Educational Technology in Higher Education*, 18 (1), art. no. 1. <https://doi.org/10.1186/s41239-020-00238-7>
- [19] Mergany, N.N., Dafalla, A.-E., Awooda, E. Effect of mobile learning on academic achievement and attitude of Sudanese dental students: a preliminary study (2021) *BMC Medical Education*, 21 (1), art. no. 121. <https://doi.org/10.1186/s12909-021-02509-x>
- [20] Bulgren, C.W. The characteristics and career influences of male elementary general music teachers (2021) *Bulletin of the Council for Research in Music Education*, (227), pp. 45-65. <https://doi.org/10.5406/BULCOURESMUSEDU.227.0045>
- [21] Lakhali, S., Khechine, H., Mukamurera, J. (2021) Explaining persistence in online courses in higher education: a difference-in-differences analysis. *International Journal of Educational Technology in Higher Education*, 18 (1), art. no. 19. <https://doi.org/10.1186/s41239-021-00251-4>
- [22] Byrne, M.H.V., Ashcroft, J., Alexander, L., Wan, J.C.M., Arora, A., Brown, M.E.L., Harvey, A., Clelland, A., Schindler, N., Brassett, C., Allan, R., Burford, B., Vance, G., Raj, V., Bandyopadhyay, S., Dominic, C., Hayes, S., Dawidziuk, A., Kinder, F., Sravanam, S., Kawka, M., Vaughan, A., Devine, O.P., Asif, A., Mogg, J., on behalf of the MedEd Collaborative. (2021) COVIDReady2 study protocol: cross-sectional survey of medical student volunteering and education during the COVID-19 pandemic in the United Kingdom. *BMC Medical Education*, 21 (1), art. no. 211. <https://doi.org/10.1186/s12909-021-02629-4>
- [23] Ali, M.M., Haskins, L., John, V., Hatløy, A., Luthuli, S., Mapumulo, S., Engebretsen, I.M.S., Tylleskär, T., Mutombo, P., Horwood, C. (2021) Establishing a postgraduate programme in nutritional epidemiology to strengthen resource capacity, academic leadership and research in the democratic republic of Congo. *BMC Medical Education*, 21 (1), art. no. 136. <https://doi.org/10.1186/s12909-021-02557>
- [24] Pintér, Z., Kardos, D., Varga, P., Kopjár, E., Kovács, A., Than, P., Rendeki, S., Czopf, L., Füzesi, Z., Schlégl, Á.T. (2021) Effectivity of near-peer teaching in training of basic surgical skills – a randomized controlled trial. *BMC Medical Education*, 21 (1), art. no. 156. <https://doi.org/10.1186/s12909-021-02590-2>
- [25] Kumar, P., Saxena, C., Baber, H. (2021) Learner-content interaction in e-learning- the moderating role of perceived harm of COVID-19 in assessing the satisfaction of learners. *Smart Learning Environments*, 8 (1), art. no. 5. <https://doi.org/10.1186/s40561-021-00149-8>
- [26] Ekatushabe, M., Kwarikunda, D., Muwonge, C.M., Ssenyonga, J., Schiefele, U. (2021) Relations between perceived teacher's autonomy support, cognitive appraisals and boredom in physics learning among lower secondary school students. *International Journal of STEM Education*, 8 (1), art. no. 8. <https://doi.org/10.1186/s40594-021-00272-5>
- [27] Parra-González, M.-E., López-Belmonte, J., Segura-Robles, A., Moreno-Guerrero, A.-J. (2021) Spanish adaptation and validation of the teaching and learning experiences questionnaire. *International Journal of Environmental Research and Public Health*, 18 (7), art. no. 3518. <https://doi.org/10.3390/ijerph18073518>
- [28] Hernández, R.; Fernández, C.; Baptista, P. *Metodología de la Investigación*, 6th Ed.; MC Graw Hill Education: Mexico, 2016.