Motivation through a gamified experience

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Abstract

Teachers must utilize the pedagogical potential of the various gamification technologies that can support learning achievement when derived from the ARCS motivational paradigm. The goal of the current pre-experimental study is to determine how students' ARCS motivation is affected when gamified online resources are used. There was a population of 457 Peruvian secondary school students, and a statistical sample of a probabilistic nature, made up of 209 students. The Motivation Survey on Didactic Materials (IMMS) was used as an instrument, based on the ARCS motivational model approach; with the dimensions of attention, relevance, trust, and satisfaction, this instrument was adapted and validated. After the intervention, it was found that the majority of students managed to reach a high motivational level in the post-test. In addition, positive results were found in all dimensions of the ARCS motivational design because they all reached an increase in their levels. However, the satisfaction and relevance dimensions achieved further development, reaching a high level.

Keywords: ARCS motivation; gamification tools; IMMS; Keller model.

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1. INTRODUCTION

The panorama experienced in the Covid-19 pandemic hindered the self-regulation capacity of students to develop learning activities, intrinsic motivation was impaired and extrinsic motivation was affected, making it difficult to achieve learning (Christopoulos & Sprangers, 2021; Li & Keller, 2018); Recognizing how to motivate students will make it possible to have resources, strategies, didactic materials, as well as procedures that favor their development. In this scenario, ARCS is a motivational design model that proposes a scheme of four dimensions, which are attention, relevance, trust, and satisfaction (Keller, 1987) that proposes how to guide motivation as well as provide proposals for the teacher in the design and management of information (Herianto & Wilujeng, 2021; Romero & López, 2021).

The incorporation of gamification in the educational field has allowed for raising motivation levels in addition to favoring feedback at the individual level (Metwally et al., 2024; Bahauddin & Setyaningrum, 2019; De Soto, 2018; Jedel & Palmquist, 2021; Kasinathan et al., 2018; Asiri, 2019) thereby promoting improvements in learning development (Aguilos & Fuchs 2022; Alajaji & Alshwiah, 2021; Colomo-Magaña et al., 2020; Malkawi et al., 2021; Romero & López 2021; Salvador-García, 2021). Recent investigations have used gamification tools with online features such as Quizizz, Kahoot, and Socrative, concluding that they have in common a simple language and dynamic interface, which is why they are considered student-friendly. Various studies indicate that gamification tools are attractive and stimulate learning (Llorente-Cejudo, 2024; Basuki & Hidayati, 2019; Lestari, 2019; Mendoza Batista, 2020; Quispe Maraza et al., 2019; Fuertes et al., 2016; Vallet-Bellmunt et al., 2019), there are also opposing positions that state that the use of online gamification tools and the use of the conventional method of instruction maintain the same learning results (Göksün & Gürsoy, 2019; Sainz de Abajo et al., 2019) are also not related to motivation, as they can increase student anxiety (Aras & Çiftçi, 2021; Mee Çift et al., 2020; Villarroel et al., 2021; Yaşar et al., 2020). Regarding the ARCS motivational design, different studies indicate that the management of digital didactic material under the Keller model helps to increase motivation (Herianto & Wilujeng, 2021; Hsu, 2020; Khan et al., 2019; Turel & Sanal, 2018).

1.1. Literature review

1.1.1. Gamification

According to Díaz Cruzado & Troyano Rodríguez (2013), gamification aims to modify student behavior through experiences that foster autonomy (Dichev et al., 2020; Sánchez i Peris, 2015; Kam & Umar 2024). It permits the use of game elements, such as rewards, gains, and challenges, as extrinsic motivation to increase intrinsic motivation in educational environments. Teachers are responsible for planning gamification-based activities that enliven and promote greater student involvement (Yang et al., 2023; Sánchez-Pacheco et al., 2020; Villalustre Martínez & Del Moral Perez, 2015). The gamification tools used in this research (Kahoot, Quizizz, and Socrative) are online and allow the creation of virtual activities that can be carried out synchronously and asynchronously, this characteristic being what makes them an appropriate option for educational needs in different virtual environments.

1.1.2. ARCS motivational design

Motivation is used as a factor to stimulate learning (Li & Keller, 2018); for this, resources, strategies, didactic materials, and procedures must be used intentionally and pertinently. The ARCS motivational design model proposed by John Keller recognizes the importance of attention, relevance, trust, and satisfaction (Keller, 1987) as key factors in promoting learning, providing the teacher with guidance for planning and ensuring motivation. Keller's motivational model is related to cognitive theory because it promotes learning by discovery. Likewise, it is related to constructivist theory because of the interaction it promotes through technology, and even more so, it is linked to humanist theories because it is the student who is responsible for learning from their initiative and use of potentialities (Galicia-Alarcón et al., 2014). About the dimensions of this model, attention seeks to maintain curiosity and interest based on perception and inquiry, so the resources, materials, and tools used by the teacher must be striking and attractive to the student. Relevance

on its side is linked to the learning needs of each student, therefore intrinsic motivation and beliefs predispose participation in the learning experience. Confidence, in addition, is related to the expectations of achievement and success of the students, the security of achieving results and the understanding of the learning activity must be stimulated. Finally, satisfaction has to do with the state of well-being and sense of achievement that the student reaches by receiving rewards for her involvement in a learning activity.

1.2. Purpose of study

The problem of motivation in students is clear due to the impact of the situation that, in addition to the health sector, affected the education sector. For this reason, there is a need for new studies that link gamification and ARCS motivational design to demonstrate its effect on learning and even more so, to identify its influence on the attention, relevance, trust, and satisfaction dimensions; the findings based on this will allow promoting the application of technological innovations in the field of virtual education. The study aimed to measure the impact of the application of gamified online tools on the ARCS motivation of students.

Research hypothesis

-Null hypothesis: The application of gamification tools does not significantly impact the development of ARCS motivation in students

-Alternate hypothesis: The application of gamification tools significantly impacts the development of ARCS motivation in students

2. MATERIALS AND METHODS

2.1. Research design

The study had a pre-experimental design. The intervention took place during the development of a learning experience that lasted a month. Eight virtual learning activities were carried out taking into account the management of gamified online tools, which were Kahoot, Quizizz, and Socrative, the ARCS motivational model was also used regarding resources and materials.

2.2. Participants

The population consisted of 457 Peruvian secondary school students and a probabilistic sample of 209 students.

2.3. Data collection instrument

Keller's (2010), Motivation Survey on Instructional Materials known as IMMS (Instructional Materials Survey for Motivation) based on the ARCS model approach, measures students' motivation towards self-directed instructional materials, therefore it is adapted. fits into the context of virtual education. The questionnaire included 36 items with alternatives on a five-point Likert scale, from 1 "Not true" to 5 "Very true", to measure the reliability of the instrument. Cronbach's alpha was used with a value of 0.971, and the review by the judgment of experts in which doctors from local universities participated. The questionnaire was administered electronically to the participants.

2.4. Ethical considerations

To implement the intervention, an authorization request was handled by the educational institutions that served the population. After that, the parents received the informed consent form via WhatsApp groups, and the students' received links to Google Forms-prepared questionnaires from the institutional groups. The questionnaires were then distributed in Word and PDF formats to guarantee data collection in a variety of modalities based on the students' availability. A guarantee of confidentiality of the information provided is provided.

3. RESULTS

The results of the ARCS motivation variable were analyzed, considering the levels reached in the pretest and posttest about their dimensions; the normality tests showed values less than $p < 0.05$, so it was determined that there was a normal distribution and parametric of the data (table 1).

Table 1

Normality test

	Kolmogorov-Smirnov[a]		
	Statistical	gl	Sig.
initial test A	,083	209	,001
initial test R	,075	209	,006
initial test C	,107	209	,000
initial test S	,108	209	,000
initial test Motivation	,049	209	,002
final test A	,144	209	,000
final test R	,163	209	,000
final test C	,169	209	,000
final test S	,175	209	,000
final test Motivation	,129	209	,000

The student's t-test (table 2) was used to verify the hypothesis. The results of the pretest and posttest were compared, and it was found that there were significant differences in the ARCS motivation variable. This was because the results showed positive changes towards the found value of 13,1999, which was higher than the limit parameter (1,645), indicating that there are evolutionary differences. After the intervention, the p-value of $0.00 < 0.05$ was found in Table 3, demonstrating the significant impact of the use of gamified online tools on the development of the students' ARCS motivation.

Table 2

Paired samples test

	Paired differences					you	gl	bilateral continuation
	Half	Dev. Deviation	Dev. average error	95% confidence interval of the difference				
				lower	Superior			
Motivation pre-test - post-test	38.03828	39.28102	2.71712	32.68164	43.39491	13,999	208	,000

Table 3

Hypothesis verification

Degrees of freedom	0.25	0.1	0.05	0.025	0.01
207	1,063	1,323	1.6924	2,080	2,518
208	1,061	1,321	**1.6451**	2,074	2,518
209	1,060	1,319	1.6696	2,069	2,518

The results of the pre-test and post-test were compared to measure the impact of the intervention on the ARCS motivation variable, the change was positive about the motivational level, with 44% of the sample with a low level, 37.8% with a regular level and 18.2 % with a high level in the pre-test went to 69.4% of the sample with a high level, 16.7% with a regular level and 13.9% with a low level in the post-test, demonstrating that the use of gamified tools is effective in increasing the level of student motivation (figure 1).

Figure 1
Comparison of the pre-test and post-test results
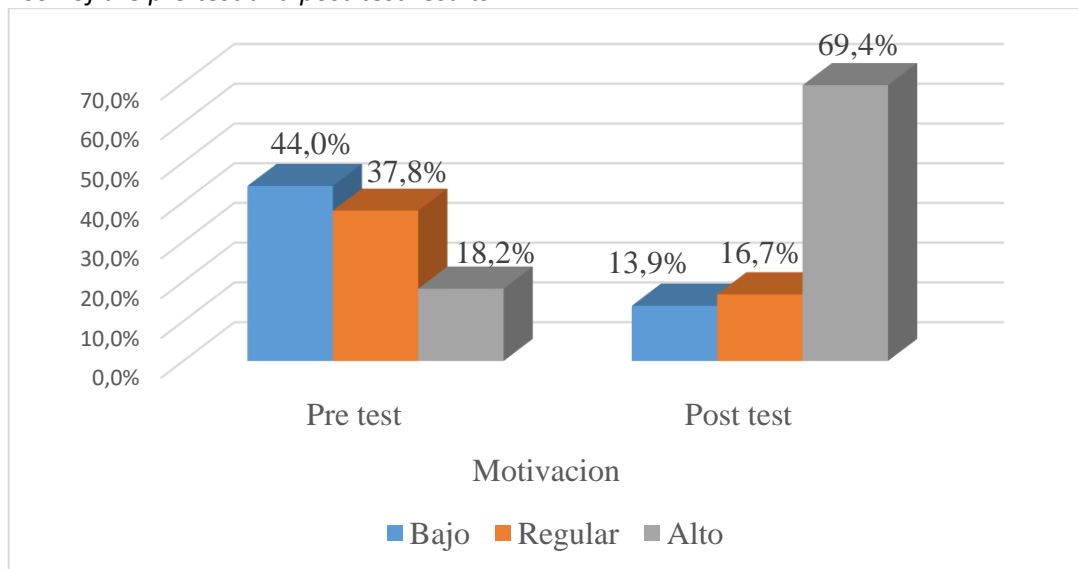
The values found allow us to recognize that the satisfaction and relevance dimensions reached a higher level of development, reaching 79.4% at a high level, in contrast to the attention and trust dimensions which achieved 73.7% at a high level (table 4). The pretest and post-test results for the ARCS motivation variable were compared according to dimensions, and all dimensions such as trust, attention, satisfaction, and relevance achieved significant changes. Students reached a high level in each of them as evidence of the positive impact of the intervention with the use of gamification tools to promote motivation.

Table 4
ARCS dimensions

Pre care		aftercare	
Low	40.7%	Low	9.6%
Regular	31.1%	Regular	16.7%
High	28.2%	High	73.7%
pre-relevance		post relevance	
Low	38.3%	Low	10.0%
Regular	32.5%	Regular	10.5%
High	29.2%	High	79.4%
pre confidence		post confidence	
Low	40.2%	Low	6.2%
Regular	35.9%	Regular	20.1%
High	23.9%	High	73.7%
Pre-satisfaction		Post-satisfaction	
Low	40.7%	Low	6.7%
Regular	35.9%	Regular	13.9%
High	23.4%	High	79.4%

4. DISCUSSION

The verification of hypotheses according to the student's t-test about the pretest and post-test showed positive changes due to the reached value of 13.1999. Also, of the 209 students who participated in the sample, 69.4% reached a high level of motivation, 16.7% regular level and 13.9% expressed a low level, which shows that the intervention mediated by gamified online tools has a significant impact on ARCS motivation; In addition, it was found that the dimensions of attention, relevance, trust, and satisfaction reached high levels, with satisfaction and relevance being the dimensions that obtained the highest results, with 79.4% students stating that they had a high level of motivation.

What was mentioned in the previous paragraph is corroborated by various studies that show that gamification tools allow the creation of a fun environment and encourage motivation, with students preferring to use environments with digital support (De Soto, 2018; Kasinathan et al., 2018). These approaches coincide with the results of the study since the gamification tools used were virtual and allowed the creation of synchronous and asynchronous activities, favoring motivation. As stated by Bahauddin & Setyaningrum (2019), the mediation of technology is needed to increase the pleasure of learning in students. In this view, this pre-experimental study indicates that student motivation can be influenced extrinsically and intrinsically by gamification tools.

Likewise, several researchers found that gamification allows activities to be carried out with fun and enjoyment with the peculiarity of allowing the student to advance at their own learning pace (Basuki & Hidayati, 2019b; Hanafiah et al., 2019; Lestari, 2019; Mendoza Batista, 2020; Quispe Maraza et al., 2019); these approaches are linked to the results of this study on ARCS motivation, with the satisfaction and relevance dimensions, since 79.4% of students reached a high level, while concerning the dimensions of attention and trust reached 73.7% at the high level. This is due to the use of incentives that increase the motivation, participation, and satisfaction of the students (Sainz de Abajo et al., 2019). The intervention allowed the students to get involved in gamified activities aimed at meeting their needs and solving problems based on the objective use of resources and materials under Keller's ARCS motivational design, they also favored corrective feedback.

However, studies conducted by Mee Hananiah et al. (2020), Yasar et al. (2020), and Villarroel et al. (2021) discovered that gamification causes students to become more anxious and experience difficulties when they don't achieve rewards, which lowers their motivation. Additionally, Aras & Çiftçi (2021) concluded that there are no differences between gamification and conventional education.

Regarding the ARCS motivational design, the investigations establish that after using technological resources, the ARCS motivation of the students is strengthened in all its dimensions (Khan & Yangın Ersanlı 2022; Hsu, 2020; Khan et al., 2019; Turel & Ozer Sanal, 2018). Likewise, the use of interactive technology determined significant improvements in student motivation, especially in the Attention dimension which increased by 10.83% and confidence by 13.60% (Herianto & Wilujeng, 2021).

The aforementioned results support the findings of this study and show that the use of gamification tools has a positive and significant impact on ARCS motivation and its dimensions.

5. CONCLUSION

The use of gamification tools in educational activities is effective for the development of ARCS motivation. The intervention mediated by the use of gamified online tools has a positive impact on the development of ARCS motivation and its dimensions, with satisfaction and relevance being the dimensions that reached the highest level of development since 79.4% of students stated that they had a high level of motivation in said dimensions.

This study's lack of a control group stems from the fact that it was pre-experimental. Research is necessary to determine and comprehend the variables that can affect ARCS motivation in a way that supports student learning. Given the limitations, it is advised that future studies pinpoint the elements influencing the ARCS dimensions, and more specifically the trust and attention dimensions, to ascertain whether using activities in

virtual learning environments has an impact on the development of these dimensions or if they are better suited for use in conventional physical learning environments.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study adheres to the ethical guidelines for conducting research.

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