Google Classroom as a digital environment for promoting autonomous learning in university students

La plataforma Google Classroom como entorno digital en la promoción del aprendizaje autónomo en estudiantes universitarios

Salomón Marcos Berrocal Villegas
https://orcid.org/0000-0002-6320-2342
sberrocalv@unmsm.edu.pe
Universidad Nacional Mayor de San Marcos. Lima-Peru

Willner Montalvo Fritas
https://orcid.org/0000-0002-5028-9354
wmontalvo@une.edu.pe
Universidad Nacional de Educación Enrique Guzmán y Valle. Lima-Peru

Carmen Rosa Berrocal Villegas
https://orcid.org/0000-0002-7964-7581
berrocalcarmenrosa1@gmail.com
Universidad Nacional de Educación Enrique Guzmán y Valle. Lima-Peru

María Yissel Flores-Fuentes-Rivera
https://orcid.org/0000-0001-6358-9885
mflores@une.edu.pe
Universidad Nacional de Educación Enrique Guzmán y Valle. Lima-Peru

Fredy Armando Jaimes Yabar
https://orcid.org/0000-0001-8167-8881
fjaimes@une.edu.pe
Universidad Nacional de Educación Enrique Guzmán y Valle. Lima-Peru

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Abstract

The increasing technological development of the knowledge society has substantially transformed the ways in which we access information and knowledge, giving rise to new ways of appropriating knowledge, mediated by virtual environments. These environments require new generations to independently manage their learning processes. In this context, this study aimed to evaluate the Google Classroom platform as a digital environment for promoting autonomous learning. To this end, 635 students from three public universities in Lima, Peru, were surveyed. A quantitative methodology with a non-experimental, causal-correlational design was adopted. Data collection was conducted using two questionnaires that previously met validity and reliability criteria. The results, based on logistic regression analysis and supported by pseudo R^2 values (Cox and Snell = 0.470; Nagelkerke = 0.521), show that the use of virtual environments represents a significant opportunity to promote independent learning. In conclusion, it was determined that the Google Classroom platform is a necessary, though not sufficient, condition for promoting independent learning.

Keywords: online learning; self-learning; digital platform.

Resumen

La creciente tecnologización en la sociedad del conocimiento ha transformado de manera sustancial las formas de acceso a la información y al conocimiento, dando lugar a nuevas maneras de apropiarse del saber, mediadas por entornos virtuales. Estos entornos demandan de las nuevas generaciones la capacidad de gestionar de forma autónoma sus procesos de aprendizaje. En este contexto, el presente estudio tuvo como objetivo evaluar la plataforma Google Classroom como un entorno digital para la promoción del aprendizaje autónomo. Para ello, se encuestó a 635 discentes pertenecientes a tres universidades públicas de Lima, Perú. Se adoptó una metodología cuantitativa con un diseño no experimental, correlacional-causal. La recolección de datos se realizó mediante dos cuestionarios que previamente cumplieron con los criterios de validez y confiabilidad. Los resultados, basados en el análisis de regresión logística y respaldados por los valores de pseudo R^2 (Cox y Snell = 0,470; Nagelkerke = 0,521), evidencian que el uso de entornos virtuales representa una oportunidad significativa para fomentar el aprendizaje autónomo. En conclusión, se determinó que la plataforma Google Classroom constituye una condición necesaria, aunque no suficiente, para promover el aprendizaje autónomo.

Palabras clave: aprendizaje en línea; autoaprendizaje; plataforma digital.

Introduction

The primary function of academia is to equip future professionals with the necessary tools to productively integrate into society. This entails developing a professional profile that aligns with social demands (Sánchez et al., 2011; Capote et al., 2017) in a context where all spheres of society are highly technologized. This technologization shapes a style of communication and interaction that fosters new behaviors, values, and lifestyles, resulting from the emergence of a new culture (Cosi et al., 2020).

In this context, within the educational sphere, the use of educational digital tools and resources creates a favorable technological niche for the implementation of various technological mediation scenarios (Araya-Muñoz & Majano-Benavides, 2022). For instance, as a result of the recent COVID-19 pandemic, Peru implemented non-presential education through the use of technological tools and educational platforms such as Google Classroom, Microsoft Teams, Moodle, and Chamilo, among others. This allowed for a response to educational needs at both the basic and university levels (Tapia, 2022).

“This migration confronted us with a new process: that of a new remote teaching, in which students were compelled to adapt to a context foreign to their prior training. New demands were created for the actors in the educational field” (Armesto-Céspedes et al., 2021, p. 3). Thus, both teachers and students needed to adapt to new learning experiences mediated by virtually distributed scenarios, where teachers faced the challenge of transitioning from in-person to virtual environments, while students had to manage their learning autonomously (Hernández et al., 2021).

This process required students to intentionally mobilize a set of knowledge, techniques, skills, and attitudes to meet the demands of academic activities (Cabrera, 2009; Madrigal, 2022). This meant actively managing learning activities at their own pace (Henríquez, 2022). Furthermore, teachers had to recognize their role as mediators of the process, experts in educational planning, and strategists in the design and implementation of learning experiences through distributed learning environments to achieve the proposed outcomes (García et al., 2017).

However, some research conducted in Latin American countries like Ecuador on autonomous learning through the use of mobile technologies has shown that there are prerequisites for the implementation of virtual learning scenarios; these are related to the decision, motivation, and preparedness of the teacher themselves (Zamora, 2019). This is complemented by the contributions of Manrique (2004) and Espinoza-Freire et al. (2017), who assert that for effective learning management, it is essential for students to first appropriate the tools, as only then can they successfully meet the demands posed by each learning experience.

In this same vein, Chica-Cañas (2010) and González et al. (2017) highlight that self-management of learning requires the use of a set of tools for learning how to learn, specifically cognitive and metacognitive tools that enable self-regulation of one's own learning. Similarly, León et al. (2022) emphasize that self-management of learning necessitates an appropriate organization of time based on the demands of a problematic situation, the explicit identification of strategies and resources available for execution, as well as the identification of difficulties and successes for correction.

Likewise, Castro et al. (2021) conducted research at a public university in Chile on the use of self-regulation strategies by undergraduate students in virtual contexts during the pandemic. The results indicated that 50% of students did not achieve optimal management of these tools, revealing difficulties in learning

autonomously. Additionally, Vázquez & Daura (2018) identified, in their study on self-regulated learning with middle-cycle students at a university in Buenos Aires, that students face challenges in employing learning strategies. In this context, the strategies most highlighted by students were highlighting and searching for main ideas, which received the highest scores.

Regarding Peruvian institutions, Maldonado-Sánchez et al. (2019) conducted research with basic education students on the learning strategies used to develop autonomy. The results showed that 64% of students face difficulties in applying cognitive procedures such as acquiring, coding, and retrieving information. At the higher education level, Berrocal et al. (2022) carried out a study at a public university in Lima with undergraduate and graduate students. This study revealed that students at both levels have become unconscious consumers of information available on the internet, due to limitations in developing their informational skills. This situation limits their ability to manage information and knowledge in virtual environments and to manage their learning in digital learning contexts.

Terry & Tucto (2021) conducted research on self-regulated learning through study habits among undergraduate students at a private university in Lima. The results showed that only 14.4% of students exhibited optimal self-regulation of their learning. This situation was associated with poor study habits, a negative attitude toward studying, and insufficient development of metacognitive awareness.

The issues described regarding students' limitations in autonomously managing their learning are also reflected in the university institutions addressed in this research. For example, in the case of the Universidad de San Marcos, Quispe (2019) reveals the academic shortcomings of education students in developing their cognitive learning skills. 76.6% of surveyed students acknowledge difficulties in managing their learning through the application of logical and intellectual cognitive processes. This situation is not exclusive to education students, as Rojas & Campana (2020) found that 60% of physical education students limit themselves to exploring and fragmenting the texts and bibliographies consulted, impeding the optimal retrieval of analyzed information.

In a similar tone, Marcelo & Santos (2023) conducted research with education students at the Universidad Pública Federico Villarreal, finding that 77.7% acknowledged limitations in evaluating, controlling, and regulating their learning competently. According to the researchers, this situation is linked to inadequate development of intellectual skills, which affects the ability of the surveyed university students to learn. At the Universidad de Educación, Reyes (2023) found that 54.7% of students face difficulties in managing their learning autonomously through virtual platforms, which may be related to the communicative interferences characteristic of virtual learning environments.

In light of the above, the following objectives are proposed: to evaluate the influence of the Google Classroom platform as a digital environment in promoting autonomous learning, to analyze its relationship with autonomous learning, and to assess the influence of the components of Google Classroom on the promotion of autonomous learning.

Methodology

This study adopts a quantitative perspective, utilizing mathematical techniques and procedures to measure, quantify, and relate the study variables within a methodological framework of problem, objective, and hypothesis (Salgado, 2018). This is a basic type of study, as it prioritizes the definition, characterization, and typification of the variables, specifically the Google Classroom platform and autonomous learning (Valderrama, 2013).

Regarding the design, a non-experimental, correlational-causal approach was taken, as it aimed to explain variations in autonomous learning as a result of the application of the Google Classroom platform as a digital environment during the pandemic, when educational activities were conducted remotely (Carrasco, 2016).

For the sample formation, support was obtained from 635 students belonging to the academic semester 2023-I. Of this total, 307 (48.3%) are students from the Universidad de Educación Enrique Guzmán y Valle, 220 (34.6%) are from the Universidad Nacional Mayor de San Marcos, and 108 (17%) are studying at the Universidad Nacional Federico Villarreal. Additionally, 338 (53.2%) are in their third year of the Education program, 165 (26%) are in their fourth year, and 132 (20.8%) are in their fifth year. In terms of gender, 190 (29.9%) participants are male and 445 (70.1%) are female.

The sample selection was conducted using a non-random inclusion procedure, which was contingent upon the conditions for the development of academic activities, as well as the characteristics of the study (Hernández et al., 2014).

Regarding the design of the questionnaires, the procedure established by Berrocal et al. (2023) was followed, which proposes a seven-step route: identification of the methodological purpose, methodological

definition of the construct, establishment of the reference framework, percentage of the components of the construct, drafting of the items, and development of psychometric processes. As a result, the questionnaire on the Google Classroom platform consisted of 27 questions distributed across 3 dimensions and 9 indicators, while the autonomous learning questionnaire included 36 questions organized into 4 dimensions and 12 indicators.

For the validity and reliability of the instruments, the methodology established for content validity was applied using the individual aggregate strategy. Eight expert methodology reviewers in university teaching assessed the instruments and provided ratings of 0.89 and 0.91, indicating a very good level of validity (Ñaupas et al., 2014). For reliability, a pilot sample of 30 individuals was used, yielding a Cronbach's Alpha coefficient of 0.90 and 0.92, respectively (Palella & Martins, 2012).

Data collection followed a standard procedure. A virtual format was distributed via WhatsApp for voluntary and anonymous responses. The necessary permissions were obtained from the participating institutions, as well as from the teachers and students, who actively collaborated in the study after being informed about the conditions and objectives set forth.

The systematization of information was carried out using data matrices in Microsoft Excel spreadsheets and the SPSS 22 statistical program to perform the necessary calculations. The Kolmogorov-Smirnov test indicated an absence of normality, leading to the use of non-parametric distribution-free formulas.

Results and discussion

Table 1

Summary of scores for the Google Classroom platform variable

Levels	Digital Resources	Digital Content	Learning Activities	Google Platform
Deficient	10,2%	9,8%	12,1%	7,7%
Intermediate	24,6%	20,9%	24,7%	24,4%
Good	43,9%	47,7%	44,3%	46,3%
Excellent	21,3%	21,6%	18,9%	21,6%
Me%/S	**82%/6,79**	**80%/6,28**	**82%/6,41**	**80%/18,32**

Table 1 summarizes the scores given by the 635 participants from three Peruvian universities regarding the Google Classroom platform. 67.9% of respondents showed a positive perception (46.3% rated it as good and 21.6% as excellent), while 7.7% considered it deficient and 24.4% placed themselves in an intermediate position. The percentage score of the median confirmed that 50% of the values fall below the excellent condition (median = 80%, standard deviation = 18.32).

In terms of digital resources, the Google Classroom platform incorporates a set of tools, resources, and applications that encourage active student participation in their learning activities. The contents hosted on the platform are available in advance and organized sequentially, allowing students to form a comprehensive understanding of the subject. Furthermore, the learning activities are designed to strengthen group relationships and interactions, as well as to promote inquiry and expand the curriculum content.

Table 2

Summary of scores for the autonomous learning variable

Levels	Motivation	Planning	Self-Regulation	Self-assessment	Autonomous learning
Basic	6,6%	8,2%	9,6%	7,2%	5,2%
Regular	19,7%	21,6%	20,9%	16,5%	19,2%
Good	50,9%	47,6%	50,2%	51,7%	51,2%
Optimal	22,8%	22,7%	19,2%	24,6%	24,4%
Me%/S	**82/5,73**	**80/5,95**	**80/5,90**	**82/5,82**	**81,1%/22,19**

Table 2 summarizes the scores from 635 participants across three Peruvian universities regarding autonomous learning. The data reveal that 75.6% of respondents have a positive perception (51.2% rated it as good and 24.4% as optimal), while 5.2% considered it deficient and 19.2% positioned themselves in an

intermediate category. The percentage score of the median confirmed that 50% of the values fall below the excellent condition (median = 81.1%, standard deviation = 22.19).

Motivation, as a component of autonomous learning through the Google Classroom platform, represents a learning opportunity that, being new, enhances academic attitudes toward novel learning situations, thereby strengthening students' engagement and commitment. In terms of planning, it establishes an academic work route, improving learning conditions where each student can set their own pace in completing assigned activities. Regarding self-regulation, it allows students to monitor their own progress and identify difficulties to overcome. Finally, concerning self-assessment, students have the opportunity to evaluate their academic development, even identifying the procedures, techniques, and strategies that are most useful when completing their activities through digital platforms.

Table 3

Logistic regression parameters based on the influence of Google Classroom dimensions on autonomous learning

Model: x2 = 411.351; Sig = 0.00	**Model fit information and Pseudo R^2**			
Cox and Snell = 0.477 Nagelkerke = 0.529	**Model fit**	**Chi-square**	**df**	**Sig.**
Intercept	1358.626	358.592	0	
Digital resources	1013.566	13.533	3	0.004
Digital content	1021.152	21.119	3	0.000
Learning activities	1027.690	27.657	3	0.000

Dependent variable: Autonomous learning

Table 3 presents a summary of the logistic regression results, where the likelihood ratio test indicates that the identified model is significant ($x^2 = 402.898$; $p < 0.00$). From this, it can be inferred that the Google Classroom platform has a positive influence on the autonomous learning of students at the surveyed Peruvian universities. Furthermore, the Pseudo R^2 score (Cox and Snell = 0.470 and Nagelkerke = 0.521) suggests that 52.1% of the changes observed in autonomous learning can be explained by the implementation of the Google Classroom platform.

Consequently, in alignment with the first proposed objective, it is evident that the use of the Google Classroom platform as a digital environment presents an opportunity for promoting autonomous learning among university students at the surveyed institutions. In this sense, Google Classroom enhances engagement and commitment in learning situations developed through digital environments.

Armesto-Céspedes et al. (2021) emphasize the importance of teachers' responsibility in guiding learning in non-presential academic environments in Latin American universities. They also highlight that teachers' mastery of disciplinary content and technological resources enriches interaction among education participants, thereby strengthening their capacity to self-regulate their learning. This perspective is supported by subsequent studies, such as that of Flores et al. (2023), which also underscore the relevance of the teacher's role in promoting autonomous learning.

Table 4

Correlation between scores of the Google Classroom platform variable and the autonomous learning variable using Spearman's Rho

Analysis categories	**1**	**2**	**3**	**4**	**5**
1. Digital resources	1				
2. Digital content	0.817**	1			
3. Learning activities	0.769**	0.821**	1		
4. Google Classroom platform	0.932**	0.934**	0.916**	1	
5. Autonomous learning	0.659**	0.697**	0.707**	0.739**	1

Table 4 presents the correlation analysis between the scores of the Google Classroom platform and autonomous learning, with a correlation coefficient Rho of 0.739 and a p-value less than 0.01. This indicates that the correlation between the variables is positive and statistically significant. Moreover, significant correlations were

found between digital resources and autonomous learning (Rho = 0.659; p < 0.01), digital content and autonomous learning (Rho = 0.697; p < 0.01), and learning activities and autonomous learning (Rho = 0.707; p < 0.01).

These results validate the second objective by demonstrating that the Google Classroom platform as a digital environment is strongly associated with the promotion of autonomous learning. It can be inferred that high or low scores in the Google Classroom platform variable correspond to high or low scores in the autonomous learning variable, meaning that values in both variables vary in the same direction (Martínez, 2012). Therefore, the application of digital platforms like Google Classroom constitutes a necessary, albeit insufficient, condition for creating the circumstances that facilitate self-management of learning.

Table 5

Logistic regression parameters based on the influence of Google Classroom dimensions on autonomous learning

Model: x2 = 411.351; Sig. = 0.000	**Model fit information and Pseudo R^2**			
Cox and Snell = 0.477 Nagelkerke = 0.529	**Model fit**	**Chi-square**	**df**	**Sig.**
Intercept	1358.626	358.592	0	
Digital resources	1013.566	13.533	3	0.004
Digital content	1021.152	21.119	3	0.000
Learning activities	1027.690	27.657	3	0.000

Dependent variable: Autonomous learning

Table 5 summarizes the logistic regression results, where the likelihood ratio test indicates that the identified model is significant (x^2 = 411.351; p < 0.00). This suggests that the Google Classroom platform, through its components of digital resources, digital content, and learning activities, positively influences the autonomous learning of the surveyed Peruvian university students. Furthermore, the Pseudo R^2 score (Cox and Snell = 0.477 and Nagelkerke = 0.529) indicates that 52.9% of the variation in autonomous learning can be explained by the presence of these components in Google Classroom.

Regarding the third objective, it is confirmed that the components of Google Classroom—such as digital resources, digital content, and learning activities—favor the promotion of autonomous learning. These findings align with those of Reyes (2023), who found a highly significant association (Rho=0.771; p<0.01) between the use of the virtual classroom and the development of processes related to autonomous learning. Therefore, the teacher's role should focus on designing and organizing the virtual platform, as well as implementing activities that encourage student participation. Additionally, Pumacayo et al. (2022) support this notion by stating that remote work through digital environments is a viable alternative that enhances student engagement and participation, thereby promoting components of autonomous learning.

Conclusions

The application of the Google Classroom platform as a digital environment is a necessary, albeit insufficient, condition for promoting learning. Its effectiveness is contingent upon the planning, organization, presentation, evaluation, and feedback provided by the teacher. Moreover, it is dependent on the responsibilities, motivations, attitudes, resources, and tools that students possess to manage their learning processes autonomously.

Students' self-management of learning entails the prior appropriation of a set of cognitive, metacognitive, and socio-affective tools that enable them to successfully carry out their academic activities in both face-to-face and non-face-to-face modalities, mediated by technologies and virtual platforms.

Regarding the limitations of the study, the lack of inclusion of private universities in the sample is noted, which could have provided valuable insights. Future research could involve students from basic education and other study variables, offering additional elements to better understand the conditions for the formation and development of autonomous learning.

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AUTHORSHIP CONTRIBUTION:

1. Salomón Marcos Berrocal Villegas: Project coordination, conceptualization, data curation, formal analysis, methodology, validation, original draft writing, proofreading, and editing.
2. Willner Montalvo Fritas: Conceptualization, data curation, formal analysis, methodology, validation, original draft writing, proofreading, and editing.
3. Carmen Rosa Berrocal Villegas: Conceptualization, data curation, formal analysis, methodology, validation, original draft writing, proofreading, and editing.
4. Maria Yiseel Flores Fuentes Rivera: Conceptualization, data curation, formal analysis, methodology, validation, original draft writing, proofreading, and editing.
5. Fredy Armando Jaimes Yabar: Conceptualization, data curation, formal analysis, methodology, validation, original draft writing, proofreading, and editing.