

Original article

Relationship between study habits and learning styles in Peruvian AutoCAD Engineering students



Relación entre hábitos de estudio y estilos de aprendizaje en estudiantes peruanos de Ingeniería AutoCAD

Relação entre hábitos de estudo e estilos de aprendizagem em estudantes peruanos de Engenharia AutoCAD

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ABSTRACT

Study habits and learning styles are key factors in academic performance, especially in technical subjects such as computer-aided drawing. This study analyzes their relationship in learning AutoCAD among higher education students. The research aims to determine the relationship between study habits and learning styles in computer-aided drawing – AutoCAD in fourth-cycle students. The

methodology is descriptive with a case study design. The sample consists of 65 students from the AutoCAD course in the fourth cycle of the Professional School of Industrial Engineering at a Peruvian denominational university. More than three-quarters of the surveyed students indicated the need to maintain an organized behavioral pattern in their academic performance. It was concluded that there is indeed a relationship between both variables in computer-aided drawing – in the curricular experience investigated.

Keywords: learning; professional training; students; higher education.

RESUMEN

Los hábitos de estudio y los estilos de aprendizaje son factores clave en el rendimiento académico, especialmente en asignaturas técnicas como el dibujo asistido por computador. El presente estudio analiza su relación en el aprendizaje de AutoCAD en estudiantes de educación superior. El trabajo de investigación tiene como objetivo determinar la relación entre hábitos de estudio y estilos de aprendizaje en dibujo asistido por computador (AutoCAD) en estudiantes del cuarto ciclo. La metodología tiene nivel descriptivo y tipo estudio de caso. Se tiene como muestra a 65 estudiantes de la asignatura de AutoCAD del cuarto ciclo de la Escuela Profesional de Ingeniería Industrial de una universidad confesional peruana. Más de tres cuartas partes de los estudiantes encuestados señalaron la necesidad de mantener un patrón conductual organizado en su desempeño académico. Se concluyó que sí existe relación entre ambas variables en dibujo asistido por computador, en la experiencia curricular investigada.

Palabras clave: aprendizaje; educación superior; estudiantes; formación profesional.

RESUMO

Os hábitos de estudo e os estilos de aprendizagem são fatores chave no desempenho acadêmico, especialmente em disciplinas técnicas como o desenho assistido por computador. O presente estudo analisa sua relação na aprendizagem do AutoCAD em estudantes de educação superior. O trabalho de pesquisa tem como objetivo determinar a relação entre hábitos de estudo e estilos de aprendizagem em desenho assistido por computador – AutoCAD em estudantes do quarto ciclo. A

metodologia tem nível descritivo e tipo estudo de caso. A amostra é composta por 65 estudantes da disciplina de AutoCAD do quarto ciclo da Escola Profissional de Engenharia Industrial de uma universidade confessional peruana. Mais de três quartas partes dos estudantes pesquisados indicaram a necessidade de manter um padrão comportamental organizado em seu desempenho acadêmico. Concluiu-se que existe relação entre ambas as variáveis em desenho assistido por computador – na experiência curricular investigada.

Palavras-chave: aprendizagem; formação profissional; estudantes; ensino superior.

INTRODUCTION

Higher education in Latin America focuses on the need to reorganize the teaching and learning of individuals who will perpetuate society. In Asian nations, the generational gap is driving an analysis of how students acquire knowledge, considering the habits and learning styles of both students and professors in the face of emerging approaches in universities, both in-person and online. Similarly, research is encouraged because there is no intergenerational gap and a lack of students to provide continuity to these industrialized societies (Bamberger & Kim, 2023).

The perspective of accepting a liability with flaws is being abandoned, and instead, it is being assumed that higher education institutions, both university and non-university, need to embrace this restrictive condition of students in order to enhance their strengths and reduce the limitations that lead to dropout, desertion, or low learning expectations, to the detriment of the profile of incoming and outgoing students at each institution in Latin America. Regarding the education system, Peru faces a serious problem starting in primary education, negatively impacting students' life skills (Polanco, Camilo & Zegarra, 2023).

During the first ten years of the 21st century, education has produced students who are memorizing, inactive, and have bad study habits, reducing opportunities to foster self-efficacy; that is, to achieve their own learning through exploration or experimentation.

According to the PISA assessment in Latin America, Peru ranks second to last, being the only nation to have surpassed the Dominican Republic, a country recently assessed. Furthermore, it is emphasized that, in terms of mathematical reasoning, Peru has progressed, even surpassing Brazil.

However, in fields such as science and reading, the level remains low, falling short of countries like Chile, Uruguay, and Costa Rica, among others. Nevertheless, the discrepancy between Chile and Peru is notable, with the southern country demonstrating superior performance in the sciences. In short, the results may not be encouraging, but the role of teachers must undergo transformations; ongoing professional development is essential to avoid repeating the same mistakes and to prevent Peru from being considered by the OECD as a country that has not achieved a passing grade.

In Peru, study patterns are not linked to academic performance (Gamero-Burón, 2024), because the university has a diversity of populations that have problems managing their grades from the beginning of the cycles to the end.

The educational experience of AutoCAD (computer-aided design) with fourth-year engineering students was considered, as it is part of the basic education curriculum. In the chosen course, the final result requires drawings that either confirm or refute the student's ability to acquire the knowledge required to achieve the learning objectives, or demonstrate the procedure or lack thereof, according to the national standards of the Republic of Peru. The factors considered include perseverance in research, lack of coherence in task solutions, distraction during lectures, and negligence in seeking study support.

University students reflect on how they study the content, but from their individual learning styles, contrasting the theoretical, the pragmatic, the reflective, and the active, based on principles, authors, or theoretical foundations. Therefore, it is necessary to investigate how these relationships unfold in the process, from the perspective of both teacher and student, in order to fulfill the educational proposal of the selected university within the engineering faculty.

Students complete their assignments empirically, based on their learning methods, which influence their grades. Relationships impact student well-being, as they are a requirement for their academic studies, both general and specialized, by linking these academic approaches. Students prepare for their exams based on their previous experiences of mediated success, such as their regular primary education, which contributes to improving their assessment skills and learning methods.

Similarly, the way they listen to their classes—asynchronously or synchronously—influences the improvement or limitation of their learning methods in the face of technological limitations, reinforcing or hindering the class session. Likewise, their study time, whether they use distracting

elements or concentrate fully on their learning, will benefit their grades each semester from now on. If the researcher achieves their objective, they will make an effort to strengthen the educational proposal of the university selected for the postgraduate study.

Two advantages have been considered for the undergraduate students participating. First, to help students optimize their study habits, which in turn impacts their knowledge of the discipline, they will have indicators that promote their academic performance according to pass/fail parameters. This will facilitate the completion of their academic credits and support the increased fulfillment of the current curriculum. Second, the pedagogical team will adopt psycho-pedagogical strategies to address students' learning styles, with the aim of improving knowledge in both general and specialized courses, in order to meet SUNEDU's requirements regarding pedagogical processes.

Study habits

Study habits are assumed to be a voluntary act oriented toward systematic learning (Vicuña, 2014). These habits improve when students organize their time and space to focus on their learning, which requires them to define their intention to make a physical and mental effort in time management. Furthermore, it is a practice or habit carried out regularly, requiring rigorous adherence, whether through conviction or reinforcement, as a consistent and fixed action to achieve this goal. Similarly, the habit can be learned; if it doesn't develop until a certain age, then it's necessary to work with those who apply their abilities to consolidate their learning.

The practice is individual, requiring solitude to concentrate, engage with one's own thoughts, become aware of one's needs, and learn concepts, relationships, procedures, and so on. Context is also relevant, as it is within this context that learning occurs and the conditions for meaningful learning take place.

Behavioral model of Vicuña Peri's study habits

According to the lead author (Vicuña, 2014), a habit is defined as a learned behavior applied at specific times when the individual needs it in response to a particular context or stimulus. Vicuña (2014) stated that the individual exhibits a set of behaviors in the interaction between teacher and student. From this model, study habits are defined as any behavior acquired based on the principles

and conditioning established thus far (classical, operating, vicarious, symbolic conditioning, among others).

Vicuña (2014) argues that study habits are learned patterns of behavior acquired through repeated practice, and that continuous repetition increases their likelihood of occurring. Similarly, behaviors derived from study habits are linked to social reinforcements such as material rewards, consumption, and manipulation, among others. This ingrained behavior contributes to the student's academic success in their curricular experiences within educational institutions. Habits are not a single behavior, but rather a set of responses that the student exhibits in the educational environment. These responses are related to study times, how they listen in class, how they complete assignments, and how they prepare for tests.

Therefore, Vicuña (2014) suggests five dimensions that define study habits. The first is the study method, which refers to the timing of study activities, how notes are reviewed, the time spent rereading previously noted material, and the management of distractions; that is, whether the student studies with the radio or television on, while chatting online, or maintains adequate control over distractions by turning everything off. Furthermore, effective study methods promote long-term learning, as the effort required is optimized to achieve better results on assessments.

The second aspect is task completion, which emphasizes how students carry out their responsibilities. This involves identifying behaviors they should have learned for better task completion, such as advance reading, accountability, and responsible information gathering. Emphasis is placed on organizing activities for the long, medium, and short term, which are useful for each curricular experience. The third aspect is exam preparation, which measures behaviors such as reviewing content well in advance, repeating material, self-assessing, or cramming days or hours before the exam. Tests generate anxiety among students. Written assessments facilitate the strengthening of skills and knowledge, given that the combinations of strategies are complementary.

The fourth aspect is the way students listen to lectures, which addresses how they engage during class; that is, whether they take notes, listen, ask questions, or remain silent, not participate, and don't take notes, which requires effort and determination from the student. The student's active involvement is significant in this process. The fifth aspect is study support, in which students have access to various technological tools for their learning, thus diversifying the teacher's role in advising them.

Learning styles

Regarding learning styles, it is assumed that these are the cognitive, affective and physiological traits that serve as relatively stable indicators of how learners perceive, interact and respond to their learning environments (Albornoz, Silarayan & Hidalgo, 2022).

These theories are based on Albornoz, Silarayan and Hidalgo (2022), who first suggest the divergent approach, which represents tangible experience; reflective processing is a method for processing information. Second, they propose a convergent approach, where individuals process concepts through experimentation. Third, they suggest the assimilative or analytical approach, in which individuals interpret information abstractly; however, this process is carried out reflectively. Fourth, they propose an accommodative approach, in which individuals assimilate specific experiences, processing them actively. Furthermore, they often possess the ability to adapt to novel circumstances.

The theoretical foundations presented in the previous paragraph agree that students are fully aware of their shortcomings and can only adopt appropriate learning methods through analysis by researchers. All studies emphasize the cognitive process, but the emotional component of performance satisfaction is not directly described.

The convergent, divergent, assimilative, and accommodative learning styles, learning characteristics, skill descriptions, and occupations that align with research support the instrument developed by Honey and Alonso, who use the categories of active, pragmatic, reflective, and theoretical. Experiential learning theory (ELT) is based on the combination of transformative perception and experience (Albornoz, Silarayan & Hidalgo, 2022).

Learning style classifications are used based on the specific learning characteristics of each individual (Albornoz, Silarayan & Hidalgo, 2022), emphasizing personal decisions and preferences. Furthermore, students can establish their own style according to their context. Likewise, the combinations within the educational process are intricate and, to some extent, contradictory.

Furthermore, it is argued that students (Albornoz, Silarayan & Hidalgo, 2022) need guidance and support in reflective observation to unify perceptions and creative processes, based on the unique and unrepeatable personal experience of each individual being studied. However, a direct correlation

between personality type and an individual's effectiveness or difficulties in oral or written production of the foreign language is not established, as other research has shown that extroverts are more fluent speakers, while introverts require more time to organize their ideas, particularly when writing.

The research focuses on higher education students who need to identify their learning styles to improve their learning processes in their academic activities. Furthermore, students require guidance and support in reflective observation to unify their perceptions and processes, based on the unique and unparalleled personal experience of each individual being studied. The method used was the hypothetical deductive method, to identify and determine the operational variables (Ruiz & Valenzuela, 2022).

The research work aims to determine the relationship between study habits and learning styles in computer-aided drawing (AutoCAD), in fourth cycle students.

MATERIALS AND METHODS

The design used was non-experimental and a case study, because the contribution generates knowledge without creating entirely new results. Information was gathered from the surrounding environment to increase knowledge in accordance with current principles and laws. It is a case study because it is only valid for the group that participated in the research.

The participants consisted of 65 fourth-year students enrolled in the Industrial Engineering program at a Peruvian Catholic university located in Lima. Eighteen percent were female and 72% were male. The sample was selected using a non-probability convenience sampling method. The population and sample were aligned in the study. Each participant received an explanation of the purpose of the research, and the voluntary nature of their participation was emphasized. Furthermore, the informed consent document, which explicitly and unequivocally guarantees the privacy and anonymity of the information provided and the research results, was sent via email and/or WhatsApp. The ethical principles of good faith and transparency were also upheld by both parties, ensuring the quality of the research work.

The process requires rigorous evaluation and detailed interpretation of the analyzed information to tabulate and organize the data obtained. To determine whether the research goals have been achieved, it is necessary to link and compare the results.

RESULTS

The data collected for this research were analyzed using the software applications Microsoft Excel 2016 and SPSS 23. The spreadsheet was used for the presentation of the respective results.

The descriptive analysis is described on the following pages (Table 1).

Table 1. Distribution of surveyed students by sex

	Frequency	Percentage
Women	16	18,8
Men	69	81,2
Total	85	100,0

Table 1 show that 81.2% of the students participating in the selected university are men and 18.8% are women (Table 2).

Table 2. Theoretical learning

	Frequency	Percentage
Disagree	44	51,8
Agree	41	48,2
Total	85	100,0

It can be seen how 48.2% of participants in the selected university agree that learning is exclusively through implicit or formal knowledge and develops responses according to conventional constructs; and 51.8% disagree with this type of learning (Table 3).

Table 3. Pragmatic learning

	Frequency	Percentage
Disagree	1	1,2
Agree	85	98,8
Total	85	100,0

It is noted that 98.8% of the participants at the selected university agree with pragmatic learning; that is, their knowledge is based on their successful or unsuccessful experiences. Only 1.2% disagree with this type of learning (Table 4).

Table 4. Active learning

	Frequency	Percentage
Disagree	22	25,9
Agree	63	74,1
Total	85	100,0

It was found that 74.1 % of participants from the selected university agreed with active learning, where the learner learns in a participatory manner, based on their positive or negative experiences of knowledge generation. 25.9% disagreed with this type of learning; therefore, they had a different perception (Table 5).

Table 5. Reflective learning

	Frequency	Percentage
Disagree	21	24,7
Agree	64	75,3
Total	85	100,0

It was found that 75.3% of participants from the selected university agreed with active reflective learning, where the learner uses theoretical or tacit knowledge to compare it with reality asynchronously. 24.7% disagreed with this type of learning and expressed a different perception (Table 6).

Table 6. Learning styles

	Frequency	Percentage
Disagree	21	24,7
Agree	64	75,3
Total	85	100,0

It was found that 75.3% of the participants from the selected university agreed with the learning style characterized, according to Kolb's theoretical framework, by which each individual's learning experience is based on their individual abilities. 24.7% disagreed with this type of learning; therefore, they had a different perception (Table 7).

Table 7. Study habits

	Frequency	Percentage
Never	29	34,1
Always	56	65,9
Total	85	100,0

Table 7 shows that 75.3% of the students at the selected university believe that the student should always develop a behavioral pattern in their academic work (Table 8).

Table 8. Learning styles by sex

			Sex		Total
			Women	Men	
Learning styles	Disagree	Frequency	3	18	21
		% of total	3,5%	21,2%	24,7%
	Agree	Frequency	13	51	64
		% of total	15,3%	60,0%	75,3%
Total		Frequency	16	69	85
		% of total	18,8%	81,2%	100,0%

Table 8 shows that 60% of the students at the selected university are male and agree with the learning styles. 3.5% of the female students surveyed disagree with the learning styles.

The study identified that 54.1% of the students at the selected university are men and believe that study habits should always be practiced. The remaining 7.1% are women and do not consider study habits important.

DISCUSSION

The links between the bibliographic sources and the results obtained have been considered for future readers.

First, the general objective refers to determining if there is a relationship between study habits and learning styles in computer-aided drawing (AutoCAD) in fourth-cycle students. According to 75.3% of the study participants at the selected university, it was considered that students should always develop a behavioral pattern in their academic work; that is, to have organized behavior based on certain strategies (Vicuña, 2014; Albornoz, Silarayan & Hidalgo, 2022). Study habits demand individual effort from each student to learn and, at the same time, their adaptation to the learning style necessary and useful for them, since the dynamics of learning are contextual to the characteristics of the students. However, there is a possibility that a level of demand may be established beyond the student's situational capabilities, which could harm their mental and physical health. It was determined that a relationship exists between the two variables in fourth-year students, which needs to be intensified for the benefit of undergraduate students.

Secondly, the first specific objective concerns describing the relationship between studying, homework, exams, listening to lectures, and study support with the pragmatic learning of learning styles in the students analyzed. According to the results obtained, 98.8% of the respondents expressed agreement with pragmatic learning; that is, they recognized that their knowledge is built from successful or unsuccessful experiences. Only 1.2% disagreed with this type of learning, and based on Ellis and Murdoch (2024), we address the link between the two in accordance with the research conducted. Similarly, Lim (2024) indicates the importance of fostering the development of the pragmatic learning style, adapted to the specific educational contexts of each institution. Secondly, the relationship between both dimensions was described in fourth-year students, which can be considered for continuous improvement in the evaluation system of the selected university.

Third, considering the second specific objective, which is to describe the relationship between studying, assignments, exams, listening in class, and study support—all of which are interconnected—according to the results obtained, 48.2% of the surveyed students agree that theoretical learning occurs exclusively through implicit or formal knowledge and develops responses based on conventional constructs, while 51.8% disagree with this type of learning. This is supported

by authors such as Zoltán, Tóth, and Vaszkun (2024), who, in their respective research, infer how the dimensions of each study variable are linked to support student learning. Similarly, Nazarí and Seyri (2023) confirm that these links differ depending on the study habits applied at the undergraduate level. The relationship between the two dimensions was described in fourth-year students, which can be used to improve the learning feedback form at the specialization level.

Fourth, considering the third specific objective, which was to describe the relationship between studying, homework, exams, lecture attendance, and study support in fourth-cycle students, 74.1% of the learning was generated through active learning, where the learner engages in participatory learning based on their positive or negative experiences of knowledge generation. 25.9% disagreed with this type of learning; therefore, they had a different perception. This is based on the work of authors such as Fardella, Marchant, and Baleriola (2024), who concur with the discussion on the relevance of the relationships between the study variables to ensure an education that respects how undergraduate students learn. Similarly, Barnes, Fischer, and Kilpatrick (2024) state that university students require institutional support to consolidate their learning. The relationship between the dimensions in fourth-cycle students is described as favoring simulation exercises to benefit learning.

In accordance with specific objective four, which describes the relationship between studying, homework, exams, listening in class, and support among fourth-cycle students—all of which are interconnected—the results show that 75.3% of students agree with reflective learning, where the learner uses theoretical or tacit knowledge to compare it with reality asynchronously. 24.7% disagree with this type of learning and express a different perception. Authors such as Albornoz, Silarayan, and Hidalgo (2022) concur that these dimensions are necessary for future decision-making in work contexts. Similarly, Fombona and Listopadzka (2024), with whom we agree, point out the need to encourage students to be reflective in their learning, ensuring relevance and suitability. The relationship between these dimensions was described in fourth-cycle students, which can influence their decision-making processes that require reflection in different contexts.

This study investigated the relationship between study habits and learning styles in fourth-year engineering students enrolled in a computer-aided design (AutoCAD) course at a private Peruvian university. The key findings and their implications are as follows:

Crucial Interconnection: A significant relationship was confirmed between organized study habits and the adoption of specific learning styles. Students recognize that structured academic behavior and

personalized learning strategies are fundamental to their progress in engineering. This underscores the need to foster self-awareness of these variables to optimize academic performance.

Emphasis on practice: Pragmatic learning emerged as the predominant style, indicating that students value knowledge derived from direct experience. This suggests that engineering teaching methodologies should prioritize practical application and the analysis of real-world cases for more effective learning.

The need for a balanced approach: The division in perception regarding theoretical learning highlights the importance of coherently integrating theory with practice. A pedagogical approach that combines solid theoretical foundations with relevant practical experiences could better address diverse learning preferences.

Active role in learning: The strong inclination towards active learning highlights the effectiveness of participatory pedagogical strategies. Incorporating activities that actively involve students in knowledge construction can significantly enhance their engineering learning.

Reflection as a key tool: the value placed on reflective learning underscores the need to develop critical thinking skills. Promoting activities that allow students to analyze, apply, and reflect on theoretical knowledge in practical contexts is essential for their training as engineers.

Theoretical and empirical consistency: The results of this study support existing literature on the influence of study habits and learning styles on academic success (Vicuña, 2014; Albornoz, Silarayan & Hidalgo, 2022). Furthermore, the identification of pragmatic and active learning as relevant for engineering students aligns with contemporary pedagogical approaches (Ellis & Murdoch, 2024; Fardella, Marchant & Baleriola, 2024).

Implications for teaching: These findings suggest that engineering educators should design diversified teaching strategies that consider different learning styles and promote the development of effective study habits. This could translate into the implementation of a variety of teaching methods, from hands-on problem-solving to guided reflection.

Directions for future research: It is recommended that future research further explore how specific contextual factors influence the interaction between study habits and learning styles in the Peruvian

engineering student population. It would also be valuable to investigate the effectiveness of educational interventions aimed at improving these variables.

In conclusion, this study highlights the intrinsic relationship between study habits and learning styles in engineering students, providing valuable information to optimize pedagogical practices and improve the training of future professionals in the field of engineering in the Peruvian university context.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.



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