

Evaluation of self-regulated learning in university students. Analysis from online education

Evaluación de aprendizajes autorregulados en estudiantes universitarios. Análisis desde la educación en línea

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ABSTRACT

Keywords

Self-regulated learning;
online courses; virtual
learning; cognitive
strategies; motivation;
college student

A self-regulated student is guided by task-oriented strategies, seeks to achieve his personal goals, and monitors his or her behavior in terms of his goals. This paper presents the results of a quantitative study whose purpose was to describe the components of self-regulated learning used by students in their online learning processes and to determine if there are significant differences in the way that these components are used. In this investigation, a questionnaire was applied to 306 students of online courses, and the data obtained were processed using descriptive statistics and ANOVA of one factor of repeated measures. The results showed that most of the factors and strategies of self-regulates learning are used in an acceptable way; in addition, significant differences were found of the motivational component and in the strategies of the behavioral and contextual component. The findings of the study provide instructional designers with information on the aspects that can be emphasized to motivate students, which would contribute to the development of different types of skills and methods to self-regulate their learning, training that will allow them to advance more successfully through their education, regardless of the modality in which they work.

RESUMEN

Palabras clave

Aprendizaje
autorregulado; cursos en
línea; aprendizaje
virtual; estrategias
cognitivas; motivación;
estudiante universitario

Un estudiante autorregulado se guía por estrategias orientadas a la tarea, busca lograr sus objetivos personales y monitorea su comportamiento en términos de sus metas. Este trabajo presenta los resultados de un estudio cuantitativo cuyo propósito fue describir los componentes del aprendizaje autorregulado que usan los estudiantes en sus procesos de aprendizaje en línea y determinar si hay diferencias significativas en cómo los utilizan. El instrumento de análisis que se aplicó fue un cuestionario a 306 alumnos de cursos en línea del Centro Universitario del Sur (CUSur), de la Universidad de Guadalajara, de un universo de estudio compuesto por 1 513 estudiantes. Los datos obtenidos se procesaron mediante la estadística descriptiva y el análisis de varianzas (ANOVA) de un factor de medidas repetidas. Los resultados mostraron que la mayoría de los factores y estrategias del aprendizaje autorregulado se usan de forma aceptable; además, se encontraron diferencias significativas en los factores del componente motivacional y en las estrategias del componente conductual y contextual. Estos hallazgos proporcionan a los diseñadores instruccionales información sobre los aspectos que podrían priorizarse para motivar a los estudiantes, lo que contribuiría en el desarrollo de diferentes tipos de estrategias y métodos en beneficio de autorregular su aprendizaje, formación que les permitirá avanzar con mayor éxito en su educación, independientemente de la modalidad con la cual se trabaje.

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INTRODUCTION

In recent decades, information and communication technologies (ICT) have become essential in most areas of life, a situation that has expanded throughout the world. In particular, the education sector has been very dynamic in the introduction and use of technology because, to a greater or lesser extent, these tools have helped to improve the quality of both administrative and academic processes. ICTs have also allowed educational institutions to analyze issues related to competitiveness, scope, coverage and educational opportunities with fewer limitations of time, space and distance. On the same topic, it is relevant to mention that ICTs became even more important in the wake of the covid-19 pandemic, which began in 2020, as they helped millions of students at all educational levels to continue their education despite the total or partial closure of schools.

There are several ways in which educational institutions have incorporated ICTs to replace face-to-face classes, including online classes, tele-training and e-learning. This type of education is conceived as courses with an instructional design and methodological structure based specifically on the use of different technologies. Courses can be offered using different Learning Management Systems (LMS) and digital tools (such as messaging or video telephony applications), and can be taken from anywhere and at different times, allowing students to interact with their peers and teachers, access the content through the learning materials provided, as well as perform the corresponding activities and evaluations.

When teaching courses virtually, it is important to take the target student into account, especially at higher education levels. In the literature there is a construct that brings together the competencies that are necessary in the profile of the online student: self-regulated learning, which refers to the set of self-directive processes of students to systematically manage thoughts, feelings and behaviors towards the achievement of academic goals (Lee et al., 2020; Pintrich, 2000; Schunk, 2012; Wong *et al.*, 2019; Zheng *et al.*, 2020; Zimmerman, 2002).

The importance of self-regulation is reflected in different works that talk about online education, in which it is mentioned that the profile of the online student should be different from that of traditional education (Beaudoin *et al.*, 2013; Bylieva *et al.*, 2021; Peñalosa, 2013; Sancho and Borges, 2011; Snow, 2012; Wong *et al.*, 2019). This idea is supported by Bautista *et al.* (2006), who mention that a student should not be incorporated into an online environment only with the skills and competencies of face-to-face learning, since in order to obtain the desired results it is necessary to mediate a process of acquisition of skills and abilities appropriate to the virtual model.

Because the ICT-mediated learning context involves particular difficulties, in order for the student in distance modes to perform successfully he/she must be able to self-regulate his/her learning, that is, possess competencies such as planning activities, setting goals, monitoring his/her performance and adapting strategies in case he/she is not achieving these goals (Anthonysamy *et al.*, 2020; Bylieva *et al.*, 2021; García *et al.*, 2018; Zheng *et al.*, 2020).

These arguments provide the framework for estimating the importance of the present research, conducted at the Centro Universitario del Sur (CUSur), regional campus of the University of Guadalajara, Mexico, which currently has 385 online courses, of which 80 are active with 1,513 students enrolled. The objectives of the study were: to identify the self-regulated learning competencies used by undergraduate students in their online courses and to determine if there are significant differences in how they use the components of self-regulated learning.

ONLINE EDUCATION

The evolution of ICT and its dissemination, in conjunction with progress in the educational area, allowed education in line outside a reality, reaching thousands of people in various countries. For Khan (2016), this type of education:

can be viewed as an innovate approach for delivering well designed, learner centered, interactive, and facilitated learning environment to anyone, anyplace, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open, flexible, and distributed learning environment (p. 5).

As Borges (2007) points out, online education refers to a broad set of educational applications and processes, located between innovation and the use of ICT, characterized by the separation of teachers and students in both space and time, as well as by the use of technologies to mediate asynchronous and synchronous learning and teaching activities. Bylieva *et al.* (2021) and Kumar *et al.* (2018) point out that this instructional practice refers us to the use of ICT effectively, which encompasses a broad spectrum of tools and practices:

- Interactive learning resources, digital content, simulation software that engage students in academic content.
- Access to online databases and other primary source documents.
- The use of data and information to personalize learning and provide targeted supplemental instruction.
- Online assessments.

- Collaborative environments, including content experts and peers.

Educational institutions that offer online courses must consider a series of factors: institutional, ethical, pedagogical, technological, human, administrative and financial. Among the elements to be taken into account is the learner profile. As already mentioned, this is different from the student profile in traditional education, since, due to the characteristics of the online training context, the joint activity (task, teacher and student), materials, self-learning resources, telematic communication, collaborative learning, the teacher's action and the student's work, cannot be or be carried out in the same way as it would be in face-to-face education (Onrubia, 2016; Sancho and Borges, 2011).

In traditional education the responsibility for the educational act in practice lies mainly with the teacher. In a class of this type, the student is reactive, is accustomed to expect the teacher to perform the tasks of motivation, reinforcement and control, as well as decision making on the learning strategies to be used and other tasks related to the transmission of knowledge (Bautista *et al.*, 2006).

In contrast, in the online mode, the student must find the motivation to become involved in his own learning; he is the one who determines how to reward himself, who makes the decisions and chooses the learning strategies. In these distance models, the student is expected to be attentive to his course, to review his materials constantly, to organize his time (to combine it with his work and family responsibilities) and his environment in order to study and complete his assignments.

Ideally, at the beginning of an activity, the student should establish an agenda, with a schedule and a strategy to carry it out, locate a space without distractions where he can concentrate to complete the tasks, and foresee everything he will need to do it; this includes knowing who to turn to for help in case of doubts and seek feedback from his teacher, a classmate or someone else in his social network. Thus, to be successful in online courses students need to be autonomous (Anthonysamy *et al.*, 2020; Bylieva *et al.*, 2021; Wong *et al.*, 2019; Zheng *et al.*, 2020).

Other competencies necessary for the online student are linked to the affective part. Yu (2014) considers that emotional competencies are a primary factor for academic achievement. This plays an important role in the virtual mode, since the confluence of the asynchrony of the teacher as a guide and the availability of content in digital materials and resources can cause anxiety, doubts or insecurity in the student about their learning (Sancho and Borges, 2011).

A third cardinal factor for good performance is social competencies. Collaborative work is a strategy implemented in many online courses, because the results and learning are greater, richer and more complete

than those that the student would obtain alone. These competencies require the student's willingness and tolerance towards his peers, as well as cordial and effective communication (González and Lobato, 2008; Sancho and Borges, 2011).

For Anthonysamy *et al.* (2020), Borges (2007) and Burkle and Cleveland-Innes (2013), the online student assumes greater responsibility and control over his or her learning, which is the heart of online learning and represents a significant change from the transmission of information in a traditional classroom and a transformation in the role of the learner from passive to proactive. Therefore, the online mode demands adjustments in the role of the student, which creates the need to understand all the changes that this implies. Sancho and Borges (2011) point out that the role of the virtual student must be integrated in accordance with the competencies of four dimensions: instrumental, cognitive, relational and metacognitive.

Research by Beaudoin *et al.* (2013) identified three domains of competencies that are critical for student success in this mode:

- The personal domain, which involves six competencies: 1) setting realistic expectations, 2) maintaining determination in achieving goals, 3) managing learning challenges, 4) effective time management, 5) compliance with academic, ethical, and legal standards, and 6) using technology efficiently.
- The learning domain, which involves five competencies: 1) being an active learner; 2) being a resourceful learner, i.e., possessing multiple learning strategies and making optimal use of the resources and human support available in their environment; 3) being a reflective learner; 4) being a self-monitoring learner; and 5) being a learner who applies what they have learned.
- The interaction domain, comprised of three competencies: 1) commitment to effective online communication, 2) commitment to productive online interaction, and 3) commitment to collaborative communication for knowledge construction.

The concept of self-regulated learning brings together a large part of these competencies (Anthonysamy *et al.*, 2020; Beaudoin *et al.*, 2013; Bylieva *et al.*, 2021; Carter *et al.*, 2020; Peñalosa, 2013; Sancho and Borges, 2011; Snow, 2012; Zheng *et al.*, 2020).

SELF-REGULATED LEARNING

Authors such as Anthonysamy *et al.* (2020), Bylieva *et al.* (2021), Carter *et al.* (2020) and Lee *et al.* (2020), agree that self-regulated learning refers to the processes in which students systematically activate and maintain

their cognitions, motivations, behaviors and feelings towards the achievement of their learning goals. Boekaerts and Cascallar (2006) and Pintrich (2000) define it as a constructive, interactive and self-management process, where learners establish their learning goals and then monitor, regulate and control their cognition, motivation and behavior according to these and the contextual characteristics of their environment.

Self-regulated learning involves a set of processes that various authors group into phases and areas. Pintrich (2004) proposes the existence of four phases or stages: the first one includes the processes that prepare for the learning event, the second one occurs during the learning event and involves aspects related to monitoring the performance of the task, the third one concerns efforts to monitor and regulate the processes related to the execution of the task, and the last phase represents the reactions and reflections that the student must make between the pauses of the task and at the end of the learning event.

In relation to the areas, Pintrich's model proposes four, the first three: cognition, motivation/affect and behavior represent the tripartite division of the different areas of psychological functioning that the learner can monitor, control and regulate (of course other people such as teachers, family and friends can also try to regulate these areas, directing or supporting them in terms of what, how and when to do a task). The fourth area of the model is context and is composed of various attributes of the task environment, classroom or cultural environment where learning takes place. Table 1 presents Pintrich's (2004) proposal, with more detail on the elements involved in students' self-regulated learning.

Phases/Areas	Cognition	Motivation/Affection	Conduct	Context
1) Prevision, planning and activation	Objective establishing. Activation of background knowledge. Activation of metacognitive knowledge	Orientation toward goals. Efficacy judgements. Ease to learn judgements. Homework value. Intrinsic interest.	Time and reinforcement for planning. Planning of the auto observations of conduct.	Task perception. Context perception.
2) Monitoring	Metacognitive consciousness and cognitive monitoring	Consciousness and following of the motivation and affection	Consciousness and following of the effort, use of time, need for help. Auto observation of conduct.	Monitoring of the changing conditions of task and context

3) Control	Selection and adaptation of learning strategies	Selection and adaptation of strategies of motivation and affection	Increase/decrease the effort	Change the task. Change the context.
4) Reaction and reflection	Cognitive judgements. Attributions	Affective reactions and motivations	Persist/renounce. Seek help. Election	Task evaluation. Context evaluation.
	Strategies: Trial and error. Elaboration. Organization. Critical thinking. Metacognition	Intrinsic objectives. Extrinsic objectives. Task value.	Effort regulation. Look for help	Learning between pairs. Environment of study/time

From the above elements it is inferred that self-regulation of learning is not a personal trait that the student possesses or not, but can be developed and consists of a set of skills: goal setting by the student himself; strategic planning; the use of effective strategies to organize, encode and store information; tracking and metacognition; monitoring one's own performance; restructuring the physical and social context to make it compatible with goal achievement; causal attributions of outcomes; adapting future methods (Anthonysamy *et al.*, 2020; Bylieva *et al.*, 2021; Pintrich, 2000, 2004; Schunk, 2012; Zimmerman, 2002; Zeidner & Stoeger, 2019).

METHOD

This work is a quantitative study of explanatory correlational scope, which was conducted at CUSur, University of Guadalajara, Mexico, with a probability sample, with 95% confidence level and 5% error, with a size of 306 participants (students of the online mode).

The Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich *et al.* (1993) was used to measure self-regulated learning. This questionnaire has already been translated and validated in a Mexican university (Ramírez, 2015); however, it was designed for a face-to-face learning environment, so it had to be adapted to a virtual environment, reviewing each of the items to analyze the applicability and relevance in the online mode.

Validation of the instrument

For the validation of the instrument, content validity was first verified. For this purpose, the questionnaire was given to five judges, experts in online courses, to evaluate the relevance of each item on a Likert scale, where 1 is not relevant at all and 5 is very relevant. Subsequently, Kendall's W coefficient of concordance was calculated, used to measure the level of agreement between judges with respect to the items. The coefficient obtained was $W = 0.7$, with a significance level of less than 0.05, so H_0 is rejected and H_1 is accepted, which indicates that there is significant agreement between evaluators (Escobar-Pérez and Cuervo-Martínez, 2008). To verify the internal consistency of the instrument, Cronbach's Alpha coefficients were calculated for all the scales of the instrument (see Table 2).

Tabla 2. Índices de fiabilidad

ESCALA	NÚMERO DE REACTIVOS	ALFA DEL ESTUDIO
Motivación	20	.88
Estrategias de aprendizaje cognitivas y metacognitivas	26	.93
Estrategias conductuales y contextuales	17	.71
Total del MSLQ	63	.91

Fuente: elaboración propia a partir de los datos de la encuesta.

Reliability indices were greater than .70. According to Darren and Mallery (2016), they are acceptable if greater than .70, good if greater than .80, and excellent if above .90. For construct validity, a principal components analysis with Varimax rotation was performed.

The results of the Motivation scale showed that the variables are better distributed in three factors according to the criterion of eigenvalues greater than 1; together, these explain 57.42% of the variance. The loadings of all the items of the scale have a contribution ranging from .31 to .80. For Méndez and Rondón (2012), in an item-factor correlation between .3 and .5 the contribution is minimal; between .5 and .7 the contribution is significant, and greater than .7 is relevant. The Barlett's test of sphericity of this scale was significant (2933.79, $gl = 190$, $p\text{-value} = 0.001$), suggesting that the matrix is adequate to run the factor analysis. The Kaiser-Meyer-Olkin (KMO) statistic is an indicator of the strength of the relationship between variables, a value close to 1 indicates that factor analysis is possible, the recommendation for this is .60. In the analysis, the KMO gave a value of 0.928.

The results of the Cognitive and Metacognitive Learning Strategies scale showed that the items are best distributed in five factors with the criterion of eigenvalues greater than 1. Together, these factors explain 63.13% of the variance. The loadings of all items were between the values of .30 and .86. The Barlett's test of sphericity of this scale was significant (4451.78, $gl = 325$, $p\text{-value} = 0.001$). The KMO gave a value of 0.947.

The results of the Behavioral and Contextual Strategies scale indicate that the items are best distributed in four factors with the criterion of eigenvalues greater than 1; these explain 54.21% of the variance. The factor-item loadings ranged from .37 to .79. The results of the latter analysis showed that Barlett's test of sphericity was significant (1440.00, $gl = 136$, $p\text{-value} = 0.001$). The KMO statistic had a value of 0.876.

The final instrument was composed of 63 items, whose three scales comprise the following items:

- a) Motivation. Integrated by intrinsic goal orientation, extrinsic goal orientation, task value, self-efficacy for learning and anxiety.
- b) Cognitive and metacognitive learning strategies. Composed of learning strategies of rehearsal and repetition, elaboration, organization and critical thinking, as well as metacognitive strategies.
- c) Behavioral and contextual strategies. Formed by study environment and time, effort regulation, peer learning and help-seeking.

Data analysis

To describe the use of the components of self-regulated learning found in the learning processes of CUSur online students, the mean and standard deviation were used. In the item responses, a seven-point Likert-type scale was used, ranging from 1 = not true for me, to 7 = totally true for me. Based on the results, the following qualitative scale of use was established: from 1 to 1.75, low (lowest 25%); greater than 1.75 to 3.5, fair; greater than 3.5 to 5.25, acceptable; greater than 5.25 to 7 (highest 25%), good.

To determine the existence of significant differences in the use of self-regulated learning components by online students, repeated-means ANOVA with a $p\text{-value}$ of 0.05 was used. The assumptions of homogeneity of variances, normality and randomness were also checked.

RESULTS

Two important aspects related to ICTs in the learning process are the level of technological empowerment that students in online courses have and the time they use ICTs for educational purposes. Descriptive data for these variables are shown in Table 3.

Tabla 3. Habilitación y frecuencia de uso de las TIC

HABILITACIÓN TECNOLÓGICA EN EL HOGAR	PORCENTAJE (%)
Internet	88.6
Computadora	85
HORAS PROMEDIO POR DÍA DE USO DE LAS TIC EMPLEADA PARA LOS ESTUDIOS	PORCENTAJE (%)
Menos de 1 hora	6.9
De 1 a 2 horas	32.7
De 3 a 4 horas	44.1
5 horas o más	16.3

Fuente: elaboración propia a partir de los datos de la encuesta.

It is observed that 85% of the students surveyed have basic technological skills at home (Internet access and computer), and that they connect an average of three to four hours a day, which indicates a significant use of ICTs for their school activities. The identification of the self-regulated learning competencies used by students in their online courses is derived from the three scales integrated in the survey.

Motivation Scale

The results of this scale (see Table 4) revealed that the highest motivational factor in CUSur online students was task value (TV) ($M = 5.57$), which is related to the interest, importance and usefulness of the task. The second aspect was extrinsic goal orientation (EGO) ($M = 5.47$), where it indicates that for the student the grade, recognition by another, rewards and competition among peers, are their main motivations. The third was intrinsic goal orientation (IGO) ($M = 5.46$), which refers to the level at which the student perceives himself as performing an activity for reasons such as learning. The fourth factor was self-efficacy for learning (SE) ($M = 5.24$), which represents the student's perception of his or her abilities to perform a task.

Tabla 4. Descriptivos de la escala de Motivación

FACTORES MOTIVACIONALES	MEDIA (M)	DESVIACIÓN ESTÁNDAR
Valor de la tarea (VT)	5.57	1.31
Orientación extrínseca hacia los objetivos (OEO)	5.47	1.24
Orientación intrínseca hacia los objetivos (OIO)	5.46	1.14
Autoeficacia para el aprendizaje (AE)	5.24	1.19
Ansiedad en cursos en línea (ACL)	4.57	1.34
Total	5.26	0.92

Fuente: elaboración propia a partir de los datos de la encuesta.

It is observed that the online course anxiety (OCA) aspect ($M = 4.57$), which includes the negative emotions and worry felt by the learner during the completion and delivery of the task, obtained the lowest score. This result is considered positive, since high levels of anxiety are associated with lack of learning and other elements such as stress and illness.

One aspect to note in the descriptive results of the motivational factors is that the difference in means between some of these aspects is small, so we proceeded to perform repeated measures ANOVA analysis to find statistically significant differences (see Table 5).

The results of the pairwise comparisons reveal that there are no statistically significant differences between TV, EGO and IGO, meaning that students are similarly inclined to these types of motivation. On the other hand, differences were found between the IGO, EGO and TV subscales, with the SE and OCA (see Table 5).

Tabla 5. Comparación por pares de la escala de Motivación en el CUSur

PARES DE SUBESCALAS		P
1) OIO	2) OEO	1.000
	3) VT	.343
	4) AE	.000*
	5) ACL	.000*
2) OEO	3) VT	1.000
	4) AE	.001*
	5) ACL	.000*
3) VT	4) AE	.000*
	5) ACL	.000*
4) AE	5) ACL	.000*

* diferencias significativas con $p < 0.05$.

Fuente: elaboración propia a partir de los datos de la encuesta.

Cognitive and Metacognitive Learning Strategies Scale

In this scale, the highest means were for organizational strategies ($M = 4.94$), which help to select information and create connections, as well as grouping and selecting main ideas; and metacognitive strategies ($M = 4.94$), which refer to awareness and control of one's own learning. In second place were the elaboration strategies ($M = 4.92$), which facilitate the long-term storage of information by connecting new learning content with previous knowledge, placing it in cognitive structures of broader meanings; examples of these are the application of knowledge, paraphrasing, the elaboration of summaries, and the generation of notes.

Likewise, with the same mean were the critical thinking strategies ($M = 4.92$), which allow students to follow the thinking of an author while establishing their conclusions based on their previous knowledge and their own arguments. In last place were the rehearsal and repetition strategies ($M = 4.80$), related to the repetitive exposition of the content to be learned (see Table 6).

Tabla 6. Descriptivos de la escala de Estrategias de aprendizaje cognitivas y metacognitivas

ESTRATEGIAS DE APRENDIZAJE COGNITIVAS Y METACOGNITIVAS	MEDIA (M)	DESVIACIÓN ESTÁNDAR
Organización (EAO)	4.94	1.34
Metacognitivas para la autorregulación (EAM)	4.94	1.14
Elaboración (EAE)	4.92	1.24
Pensamiento crítico (EAP)	4.92	1.27
Ensayo y repetición (EAER)	4.80	1.29
Total	4.90	1.12

Fuente: elaboración propia a partir de los datos de la encuesta.

For this set of means we also ran the repeated measures ANOVA test for one factor. The results revealed that there are no significant differences, with an $F(3.41, 1041.26) = 2.453, p > .05, \eta^2 = 0.008$.

Behavioral and contextual strategies

The results of the use of behavioral and contextual strategies by CUSur students are presented in Table 7. The study environment and time strategies, which involve the administration and effective use of time for studying and the management of the environment for learning, obtained a higher score ($M = 5.02$). In second place were effort regulation strategies ($M = 4.81$), related to the student's ability to control his or her effort and attention in the face of distractions and boring tasks. In third place was the peer learning strategy ($M = 4.61$), which refers to collaboration among peers to achieve learning objectives. Finally, the strategy of this scale to which students least resorted was help-seeking ($M = 4.35$), which involves the student's ability to identify someone who can provide support when he or she does not know something.

Tabla 7. Descriptivos de las Estrategias conductuales y contextuales

ESTRATEGIAS CONDUCTUALES Y CONTEXTUALES	MEDIA (M)	DESVIACIÓN ESTÁNDAR
Ambiente y tiempo de estudio (ATE)	5.02	1.22
Regulación del esfuerzo (RE)	4.81	1.06
Aprendizaje entre pares (AP)	4.61	1.04
Búsqueda de ayuda (BA)	4.35	1.08
Total	4.73	0.81

Fuente: elaboración propia a partir de los datos de la encuesta.

Subsequently, the ANOVA test was performed and it was found that there are significant differences in the use of contextual and behavioral strategies, with an $F(2.84, 866.76) = 30.28, p < .001, \eta^2 = 0.090$. Table 8 gathers the pairwise comparisons of the behavioral and contextual Strategies, where it can be seen that the differences in the means between most of the pairs are significant: ATE-RE, ATE-AP, ATE-BA, RE-BA and AP-BA.

Tabla 8. Comparación por pares de la escala de las Estrategias conductuales y contextuales

PARES DE SUBESCALAS		P
1) ATE	2) RE	.037*
	3) AP	.000*
	4) BA	.000*
2) RE	3) AP	.083
	4) BA	.000*
3) AP	4) BA	.000*

* diferencias significativas con $p < 0.05$.

Fuente: elaboración propia a partir de los datos de la encuesta.

The results confirm that students use the study environment and study time strategies above all others, with a significant difference and an effect size above the median, as well as those of effort regulation above those of peer learning and help-seeking.

DISCUSSION

This paper describes quantitatively the self-regulated learning competencies of CUSur online students. To the same extent, it determines the significant differences present between the means of the factors of each of the components. Some of the main results for each scale are discussed below.

Motivational factors

In this first factor, the valuation of the means was good (5.26), and according to the classification of Beaudoin *et al.* (2013), the actions that comprise it is personal domain. The ANOVA results evidenced that there were relevant differences in the way students motivate themselves in online courses. For Anthonysamy *et al.* (2020), Carter *et al.* (2020) and Piesmontesi and Heredia (2011), if a student considers himself capable, he will be motivated and will use the necessary strategies to carry out the task successfully; otherwise, his motivation declines and he will not make an effort to avoid failure.

Duran and Acle (2019) state that the motivation to perform a task is linked to its value, and it is in this factor where the reasons that a student has for completing an activity are underlying. Thus, if a student perceives the usefulness of the task or work, his motivation to perform it and learn from it will grow, which, consequently, will activate more strategies to complete it (Pintrich, 2000; Schunk, 2012; Panadero and Alonso-Tapia, 2014). These beliefs can be consciously activated from the instructional design, elaborating important activities in challenging and interesting ways for students, applied as much as possible to the real context, so that their usefulness is evidenced; at the same time, when presenting the activity to students, explanations about the relevance of the task can be added.

Cognitive and metacognitive learning strategies

In this factor, a mean of acceptable (4.9) was obtained; however, at the university level it would be expected that students would employ these strategies more frequently, i.e., that they would reach the "good" level. The mastery and use of various cognitive and metacognitive learning strategies are related to such important aspects as learning satisfaction in online courses (Anthonysamy *et al.*, 2020; Beaudoin *et al.*, 2013; Puzziferro, 2008; Wang *et al.*, 2013) and the acquisition of skills to improve overall performance in online courses (Carter *et al.*, 2020; Pintrich, 2000, 2004). The results of the repeated measures one-factor ANOVA revealed that there were no significant differences in how these learning strategies are employed. These results are relevant for the institution, since actions can be promoted to strengthen students' academic capabilities in the use of these strategies, involving an instructional redesign of online courses.

Behavioral and contextual strategies

The mean rating for Behavioral and Contextual Strategies was acceptable (4.73). This component of self-regulated learning is linked to learning satisfaction and academic performance (Broadbent & Poon, 2015; Bylieva *et al.*, 2021; Puzziferro, 2008). The ANOVA test for this factor indicated that there are significant differences between most of the pairs, referring that students use the study environment and study time strategies over all others, and effort regulation over peer learning and help-seeking.

CONCLUSIONS

In the results obtained, it can be noted that self-regulation is not a competence that students possess at the beginning or that it is easy for them to acquire on their own. A point in favor of this issue is that research in the field suggests that regulatory processes can be taught to increase performance and motivation (Carter *et al.*, 2020; Cerezo *et al.*, 2011; Zimmerman, 2002). According to Pintrich (2000), this is supported by the fact that students who are proficient in self-regulated learning express greater academic satisfaction and learn with less effort.

One of the recommendations for educational institutions to improve self-regulated learning competencies is to develop an evaluation and continuous improvement program, to take care of the quality of the dimensions that make up an online course, and to incorporate teacher training to provide instruction in this mode from the perspective of self-regulated learning. In general, the information provided by this study may be valuable for educational institutions to implement the necessary actions to strengthen the incorporation of ICTs in the online mode, in order to reinforce self-regulated learning competencies.

Although this analysis was carried out meticulously, it has a number of limitations. The main one is that it only offers hard data to explain self-regulated learning in online education, so it would be important to use mixed methods, such as individual and group interviews (Torrano and González, 2004), to complement the picture. Finally, it is considered that the teachers' point of view can generate important information on the training, regulatory and management needs within the institutions, which is why the study could be expanded with these participants.

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