reop
Revista Española de Orientación y Psicopedagogía

PERCIBIR LA REGULACIÓN DEL APRENDIZAJE CON MOODLE: IMPLICACIONES PARA LA ORIENTACIÓN Y TUTORIA

PERCEIVING LEARNING REGULATION WITH MOODLE: IMPLICATIONS FOR GUIDANCE

Paula **Diogo de Oliveira**[1]

Agrupamento de Escolas Moinhos da Arroja. Odivelas, Portugal

Ana Margarida **Vieira da Veiga-Simão**

CICPSI, Facultad de Psicología, Universidad de Lisboa. Lisboa, Portugal

Paula **Costa Ferreira**

CICPSI, Facultad de Psicología, Universidad de Lisboa. Lisboa, Portugal

Aristides **Ferreira**

ISCTE-Instituto Universitário de Lisboa. Lisboa, Portugal

RESUMEN

El presente estudio tuvo como objetivo comprender cómo los estudiantes de secundaria informan sobre cómo se autorregulan el aprendizaje al usar la plataforma del Entorno de aprendizaje dinámico orientado a objetos modulares (Moodle). Para lograr este objetivo, una muestra de estudiantes de secundaria (N=438) respondió al Aprendizaje Autorregulado con Inventario Moodle (SRL-MI). El análisis factorial exploratorio (219 participantes) y el análisis factorial confirmatorio (219 participantes) revelaron buenos índices de ajuste para el instrumento utilizado. En general, los resultados mostraron que los estudiantes reflexionaron e informaron cómo autorregularon su aprendizaje al usar la plataforma Moodle. Los resultados también demostraron cómo los estudiantes de secundaria se consideraban a sí mismos como aprendices. A través de la teoría de

[1] *Correspondencia*: Paula Diogo de Oliveira. Correo-e: pauladiogo13@gmail.com

respuesta al ítem, los resultados mostraron que los estudiantes sobreestimaron la forma en que autorregularon su aprendizaje en diferentes fases (previsión: α = 0,93, rendimiento: α = 0,88 y autorreflexión: α = 0,92). Esto revela la dificultad que tienen los estudiantes de este grupo de edad y la inexactitud con la que informan cómo autorregulan su aprendizaje al usar la plataforma Moodle. Específicamente, los estudiantes revelaron cierta dificultad para informar los procesos de planificación estratégica, los procesos de regulación de la atención y sus procesos de autorreacción. Los estudiantes demostraron menos dificultad para informar creencias de autoeficacia sobre lo que pudieron aprender, monitorear estrategias y las razones del éxito. Se discuten las implicaciones para la práctica orientadora con respecto a la promoción de la autorreflexión de los estudiantes y las sugerencias para futuras investigaciones.

Palabras clave: autorregulación, aprendizaje, Moodle, percepciones, teoría de respuesta al ítem.

ABSTRACT

The present study aimed to understand how middle school students report how they self-regulate learning when using the Modular Object-Oriented Dynamic Learning Environment (Moodle) platform. To achieve this goal, a sample of middle school students (N=438) responded to the Self-Regulated Learning with Moodle Inventory (SRL-MI). Exploratory factor analysis (219 participants) and confirmatory factor analysis (219 participants) revealed good fit indices for the instrument used. In general, the results showed that students reflected on and reported how they self-regulated their learning when using the Moodle platform. Results also demonstrated how middle school students thought of themselves as learners. Through Item Response Theory, results showed that the students overestimated the way in which they self-regulated their learning in different phases (forethought: α = 0.93, performance: α = 0.88, and self-reflection: α = 0.92). This reveals the difficulty students of this age group have and the inaccuracy with which they report how they self-regulate their learning when using the Moodle platform. Specifically, students revealed some difficulty in reporting strategic planning processes, the processes of regulating attention, and their self-reaction processes. Students demonstrated less difficulty in reporting self-efficacy beliefs about what they were able to learn, monitoring strategies and the reasons for success. Implications for guidance practice regarding the promotion of students' self-reflection and suggestions for future research are discussed.

Key Words: Self-regulation, Learning, Moodle, Perceptions, Item Response Theory.

Cómo citar este artículo:

Diogo de Oliveira, P., Vieira da Veiga-Simão, A.M., Costa Ferreira, P. & Ferreira, A. (2022). Perceiving learning regulation with Moodle: Implications for guidance. *Revista Española de Orientación y Psicopedagogía, 33*(1), 87-107. https://doi.org/10.5944/reop.vol.33.num.1.2022.33759

Introduction

The introduction of information and communication technologies (ICT) in schools and in the classroom implies strategic changes in institutions, teachers' pedagogical practices and students' learning strategies (O´Callaghan, 2020; Souza et al., 2016;). Specifically, ICT integration in the classroom context requires that teachers learn to integrate them into the activities they propose to students (Brodeur et al., 2006 & O´Callaghan, 2020), so that they play a progressively more active role in their learning. Through this management of resources, teachers can teach how to learn, create meaningful learning experiences for students, and provide them with opportunities to self-regulate their learning. Thus, teachers' planning of their work with new technologies should reflect pedagogical differentiation (i.e., assigning tasks adapted to students' competencies), attend to the different rhythms of students' learning, and consider the learning context (Daura, 2013).

In this context, technology emerges as a resource that can provide opportunities to develop self-regulatory competencies and allow students to reflect on the strategies used, reflection processes, proposed activities and expected results, leading them to make decisions about how best to achieve their learning objectives (Carneiro y Veiga Simão, 2011; Banyard et al., 2006). However, the literature has shown that research is needed on the dynamic phases of self-regulated learning and how the learning environment plays a central role in the progress of self-regulatory processes (Boekaerts & Corno, 2005), especially in environments supported by technology (Zimmerman, 2015). In order to fill this gap, the main objective of the present study is to understand how middle school students report how they self-regulate their learning when they use the Modular Object-Oriented Dynamic Learning Environment (Moodle) platform in order to design activities and structure content with the integration of metacognitive didactics and that contributes to the effective orientation of learning and adapt to the individual differences of the learners.

Self-regulation of learning

The self-regulation of learning can be defined as a multidimensional process that develops in an interaction between behavioral, contextual and personal components, and encompasses the cognitive, metacognitive, motivational, and emotional dimensions (Zimmerman, 2013). The present study positions itself within this definition, which is encompassed in the sociocognitive perspective of self-regulated learning (Zimmerman, 2013). This perspective considers self-regulated learning as a triadic, cyclical, and dynamic process, composed of three phases, namely, forethought, performance, and self-reflection in which the student self-directs thoughts, feelings, and actions to reach their objectives (Zimmerman, 2013).

In the forethought phase, students define and clarify specific learning objectives, analyze tasks, and plan strategies to achieve goals. The motivational factors, among them, the beliefs of self-efficacy, the intrinsic interest, and the orientation towards objectives, appear in interaction with these processes (Zimmerman, 2013). During the performance/volitional control phase, students check whether their learning process is progressing as expected or whether they should adapt/change some behaviors, or possibly restructure the physical and social context to facilitate achievement (Zimmerman, 2015). In the self-reflection/self-examination phase, students self-evaluate their methods, assign causes to outcomes, further analyze how they feel (i.e. satisfaction/dissatisfaction reactions to performance), identify mistakes, reflect on how they can act in the future, and try out alternatives they may have encountered to improve their performance.

Based on this model of self-regulation of learning, self-regulated learners are perceived as being active and able to exercise control over their learning process in metacognitive, motivational and behavioral terms (Zimmerman, 2015), adapting their behavior and personal processes according to the context requirements to achieve goals. In agreement, they define objectives, plan strategies, self-monitor and self-evaluate their work during the learning process. In the same way, throughout the self-regulation process, they monitor the development of their learning, reflect, react and adapt their behavior to their objectives.

Self-regulated learning with the Moodle platform

The literature has highlighted the role of context in the development of self-regulatory processes (Daura, 2013; Montalvo & Torres, 2004; Zimmerman, 2013). Some researchers point out that the opportunities provided by the learning environment for students to set goals, make decisions and exercise control over their learning methods and strategies may create conditions for the development of self-regulated personal learning (Rosário et al., 2004). In this sense, ICT favor the contextualization of learning and the development of self-regulated learning (Baggetun & Wasson, 2006).

The role of technology-supported learning environments (TSLE), characterized by their complexity, interactivity, and authenticity (Beishuizen, 2011), have been highlighted as tools that enable a personalized path, decision making and sharing of ideas in the promotion of self-regulated learning (Schraw et al., 2006).

Research related to environments that allow autonomous learning have focused on virtual platforms, such as the Moodle platform, and have been carried out essentially in higher education contexts, emphasizing pedagogical models, activities, types of use and student perceptions (Cabero et al., 2019; Iniesta-Bonillo et al., 2013; Núñez et al., 2011; Rubio-Hurtado et al., 2010; Yeou, 2016). Other studies on the Moodle learning environment have highlighted the pedagogical practices of teachers (Lisbôa et al., 2009), their advantages in learning French (Ali & Jaafar, 2010) and English in a self-regulated manner (Ferreira et al., 2016).

Literature shows that the Moodle platform is a learning environment that utilizes social constructionist instructional method standards (Wood, 2010), which has several tools for educational purposes (Arul Kumar et al., 2017; Rabiman et al., 2020). The Moodle platform also focuses on collaboration, critical reflection and instructional activities which provide opportunities for planning, monitoring, and reflecting. Social constructivism places the focus on the learner as part of a social group, and it highlights student control over their own learning process. It emphasizes the importance of interactive processes -reciprocal teaching, social and collaborative learning and development of metacognitive skills.

This growing learning environment (Coelho et al., 2016) has been adopted by most Portuguese schools (Pedro et al., 2008), following a decision by the Ministry of Education to provide ICT in schools and the use of more interactive and constructivist teaching methods. It is characterized by its unrestricted access to space and time, its modularity, and the adaptations that the user can make of the environment. The user can manage time and tasks, make decisions about which material to use and which is most useful, share ideas (Carneiro & Veiga Simão, 2011; Banyard et al., 2006), as well as monitor and evaluate learning (Bartolomé & Steffens, 2011). Students can also access the information they need and communicate with other users (Germ & Mandl, 2010). The option for this type of tool in the Portuguese education system is part of a philosophy of creating a culture of lifelong learning, promoting autonomy and empowering students through their learning process (European Council Resolution 2001).

In a study carried out in Portugal regarding the use of the Moodle Platform and the development of self-regulated learning competences in childhood in English as a foreign language class, significant differences were found between students in the experimental group and the control groups (Ferreira et al., 2016). Specifically, students who were trained in self-regulated learning strategies and worked with the Moodle platform, reported a higher level of planning, monitoring and self-reflection throughout the class, as well as more relevant and specific learning intentions, anticipated outcomes, and self-reflection. Students also performed better on the proposed tasks.

The World Health Organization (WHO) proclaimed COVID-19 as a worldwide pandemic in March of 2020. In this context, many governments have taken measures to close schools and required teaching and learning to be implemented by distance.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) stated on the official website that in April, 94% of children were left without face-to-face education (UNESCO, 2020). In this way, almost two billion teachers and students developed the online teaching and learning process (Miks y McIlwaine, 2020). In Portugal, in compliance with Decree-Law no. 10-A / 2020, of 13 March, the schools had to make the transition from face-to-face teaching to distance learning (Ordinance 359/2019, of October 8), using digital media and using the methodologies that each school considers the most appropriate. The use of Moodle as a teaching and learning tool learning increased its number of users during this pandemic outbreak. Since March until May 2020, around 50,000 new Moodle sites have been registered.

The present study

Considering that the Moodle platform is a learning environment that promotes the development of self-regulatory skills, further studies are needed to increase knowledge about students' perceptions of their use of this tool to self-regulate their learning (Zimmerman, 2013). Despite the research presented in this context, few studies have focused on the perspectives of middle school students regarding how they self-regulate their learning when using Moodle. Also, the literature shows that from a social cognitive perspective, which emphasizes collaborative work and critical reflection during instructional tasks, the Moodle platform comprises various educational tools (Arul Kumar et al., 2017) and may be used as a complement to in-class lessons. Also, the adoption of this platform in Portuguese schools and the potentialities pointed out in terms of the development of self-regulatory processes have been emerging widely (Ferreira et al., 2016; Pedro et al., 2008). Considering the current pandemic scenario and the use of digital technologies, namely the Moodle Platform, we are faced with the problem of whether the use of the Moodle platform promotes self-regulation of learning and how students report their self-regulation of learning when using this platform. Thus, the present study intends to understand how middle school students report the self-regulation of their learning when using the Moodle Platform. To achieve this goal, the following research question is proposed:

How do middle school students report how they self-regulate their learning when they use the Moodle Platform? What implications does this have for guidance intervention?

Method

Participants

Three groups of six 7th to 9th grade students (N = 18), aged 11 to 14 years (M = 12.5) participated in the study in the construction, face validation and content validity phases (Nunnally, 1978) of the Self-Regulated Learning with Moodle Inventory (SRL-MI).

Another (non-probabilistic and convenience) sample participated in the pilot studies 1 (exploratory factor analysis – EFA; n=219)) and another one in the pilot study 2 (the confirmatory factor analysis – CFA; n=219) and main study for a total sample of 438, as shown in Table 1.

The work was developed with middle school students because they are a major focus of the Technological Plan[2] and because they are in preparation for high school, which requires more autonomy and regulation of learning itself.

Table 1

Sociodemographic characterization of the sample.

Studies	Sample (N)	Gender		Grade			Age			
		M	F	7º	8º	9º	Below 12	12-14	15-17	Over 17
Pilot Study 1	219	50,2%	49,8%	31,1%	47%	21,9%		76,7%	19,6%	3,7%
Pilot Study 2/ Main study	219	47,5%	52,5%	31,5%	46,6%	21,9%	0,4%	83,6%	16,0%	

Fuente: Elaboración propia

Instruments

The SRL-MI was based on a literature review (Bartolomé & Steffens, 2011; Zimmerman, 2013), namely, on the theoretical framework of self-regulated learning proposed by Zimmerman (2013) and previous questionnaires (Brodeur et al., 2006). It was subjected to a face validation process where students and two experts in the area of self-regulated learning proposed improvement in item construction in terms of clarity and ambiguity and mentioned what they thought the instrument measured.

The inventory consists of 39 items randomly distributed across 3 scales (16-item Forethought Scale, 9-item Performance Scale, and Self-reflection Scale with 14 items), each corresponding to one stage of the self-regulation process. The inventory begins with the type of environment in which students learn, the objectives of the study, the request for students' collaboration and instructions. Responses are scored according to a 5-point Likert-type polytomous scale, from 1 "Never" to 5 "Always" (e.g., Forethought Scale: "I clearly know what I want to learn"; Performance

[2] http://www.planotecnologico/o-que-e-o-plano/lista.aspx

Scale: “I focus my attention on what I am learning”; "Self-Reflection Scale: “When I evaluate my results, I try to know where I went wrong in order to find a solution "). Demographic information is requested at the end of the inventory.

Procedures

Informed consent and authorization were retrieved from the students' legal representatives, Ministry of Education and the school’s Board of Directors and guaranteed anonymity, confidentiality, and data protection. The SRL-MI was made available online to facilitate its administration and applied in a room with one computer per student. The researchers explained the objectives, gave guidance, and clarified any doubts. It took 15 to 20 minutes to complete.

Data analysis

For pilot study 1, an EFA was performed using the statistical package FACTOR 9.2 (Lorenzo-Seva & Ferrando, 2013) to understand the internal structure of each scale of the inventory. Various analyses were carried out: 1) with all items and all participants; 2) with all items and without participants with Large Person-Fit Index (greater than 2.99); (Ferrando, 2013); and 3) with all participants and without the items that presented low power of discrimination (Baker, 2001).

The normality of the items was evaluated by the coefficients of asymmetry (sk) and kurtosis (ku). According to Bollen & Long (1993), there is multivariate normality if Mardia's coefficient is less than P (P+2), where P is the number of observed items (Table 3). Due to the value presented by kurtosis, Unweighted Least Squares (ULS) was used in the absence of multivariate normality for factor extraction and Principal Component Analysis (Henson & Roberts, 2006) with kurtosis and skewness normality (Bollen & Long, 1993). The Mardia coefficient values are shown in table 3. The Forethought Scale included 16 items, while the Performance Scale included 9 items and the Self-reflection Scale included 14 items. The Kaiser-Meyer-Olkin (KMO) test of each scale revealed the suitability of the sample (Tabachnick & Fiddell, 2007) and Bartlett's sphericity test showed the adequacy of the items for factor analysis (Table 3).

In order to determine the number of factors to be retained, the matrix of correlations between items with polychoric correlations (Brown, 2006) was constructed using Horn's parallel analysis (Hayton et al., 2004) and the MAP method (Ruíz & San Martín, 1993). These tests are superior to others to determine the number of factors, such as the Cattell Scree test or the Kaiser criterion (Bandalos & Finney, 2010).

For pilot study 2, a CFA was performed to evaluate the construct validity of the scales by using AMOS 21 software. Maximum likelihood estimation procedures were used, considering the following adjustment indices: chi-square, comparative fit index (CFI), Goodness-of-Fit statistic (GFI), Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA) and the Akaike Information Criterion (AIC). The chi-square is the measure of adjustment of the most used model and the smaller the value, the better the adjustment. A good fit of the model will yield an insignificant score in the range of $p>.5$ (Barrett, 2007).

For the main study, Winsteps (Linacre, 2013) was used to verify the unidimensionality of each scale with Item Response Theory (IRT) considering the Rasch model and to understand how middle school students reported their self-regulated learning while using Moodle. The items were evaluated to see if they conformed to the model ($p<.01$) or if there were items with large infit

standardized mean squares or outfit standardized mean-squares. IRT produces skill and difficulty parameters for items on an interval scale. Compared with the Classical Test Theory, one of the essential advantages of IRT is that the subject's (theta or θ) performance (Pasquali &Primi, 2003) is estimated from the responses given to the items. The IRT treats the items individually, estimates the parameters of each item and guarantees their independence from the performance of the subjects. The performance of one subject in one item does not affect his/her performance in other items. Accordingly, it is possible to discriminate the individuals and the degree of difficulty of the items. The Cronbach's α, the Person Separation Reliability (PSR) and the Item Separation Reliability (ISR) of the scales indicate good internal consistency (Fox & Jones, 1998).

Results

Pilot Study 1-IAARCM Exploratory Evidences

Table 2 shows the correlations between the items of each of the scales. Descriptive statistics show that most of the items showed positive correlations. However, in the Forethought Scale, item F3 presented only 7 correlations r >0.20 and, in the Self-reflection Scale, item S6 revealed 2 positive correlations r >0.20.

Table 2

Descriptive statistics and correlations of the items from the SRL-MI scales

Variables	Loadings	Mean (*SD*)	Correlations														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Forethought Phase																	
Item F3	1.44	2.97(1.20)															
Item F5	0.96	3.27(.98)	0.16														
Item F8	0.85	3.46(.92)	0.05	0.36													
Item F9	0.94	3.90(.97)	0.14	0.48	0.40												
Item F10	1.08	3.26(1.04)	0.23	0.65	0.34	0.44											
Item F16	0.99	3.34(.99)	0.14	0.34	0.33	0.34	0.41										
Item F19	0.98	4.03(.99)	0.24	0.47	0.39	0.52	0.33	0.29									
Item F20	0.98	3.57(.99)	0.24	0.39	0.35	0.41	0.42	0.42	0.48								
Item F26	0.72	3.70(.85)	0.12	0.41	0.40	0.56	0.45	0.26	0.48	0.42							
Item F27	0.93	3.87(.96)	0.07	0.38	0.42	0.46	0.38	0.28	0.47	0.34	0.54						
Item F28	1.09	3.81(1.04)	0.11	0.34	0.33	0.47	0.43	0.28	0.46	0.50	0.48	0.52					
Item F29	1.01	3.51(1.01)	0.24	0.55	0.43	0.50	0.61	0.37	0.44	0.41	0.50	0.52	0.47				
Item F34	0.92	3.63(.96)	0.26	0.39	0.45	0.47	0.50	0.46	0.43	0.54	0.56	0.44	0.46	0.46			
Item F35	0.81	3.62(.90)	0.20	0.46	0.44	0.47	0.54	0.50	0.54	0.52	0.50	0.52	0.43	0.51	0.65		
Item F38	0.91	3.55(.95)	0.29	0.45	0.45	0.52	0.51	0.42	0.47	0.48	0.52	0.50	0.38	0.48	0.65	0.66	
Item F40	1.06	3.23(1.03)	0.18	0.36	0.29	0.42	0.39	0.33	0.35	0.37	0.34	0.35	0.26	0.33	0.38	0.44	0.53
Performance Phase																	
Item P4	0.91	3.17(.95)															
Item P11	0.76	3.47(.87)	1.00														
Item P12	0.92	3.57(.96)	0.37	0.51													
Item P15	1.02	3.53(1.01)	0.38	0.51	0.49												
Item P17	1.20	3.52(1.10)	0.35	0.40	0.45	0.39											
Item P23	0.72	3.47(.85)	0.41	0.56	0.48	0.51	0.36										
Item P30	0.91	3.58(.95)	0.29	0.48	0.50	0.47	0.42	0.49									
Item P36	0.84	3.44(.92)	0.39	0.44	0.49	0.41	0.37	0.51	0.53								
Item P39	0.86	3.52(.93)	0.41	0.33	0.41	0.38	0.55	0.39	0.43	0.53							
Self-reflection Phase																	
Item S6	1.10	2.23(1.05)															
Item S7	1.07	3.63(1.03)	0.10														
Item S13	0.80	3.56(.89)	0.08	0.30													

Fuente: Elaboración propia

Table 3

Descriptive statistics and correlations of the items from the SRL-MI scales (Continuation)

Variables	Loadings	Mean (*SD*)	Correlations														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Item S14	0.89	3.53(.95)	0.11	0.48	0.36												
Item S18	1.03	3.20(1.02)	0.06	0.45	0.33	0.43											
Item S21	0.97	3.63(.98)	0.07	0.55	0.43	0.53	0.53										
Item S22	0.98	3.19(.99)	0.27	0.31	0.24	0.27	0.29	0.34									
Item S24	0.85	3.78(.92)	0.08	0.48	0.38	0.37	0.35	0.53	0.26								
Item S25	0.98	3.48(.99)	0.13	0.53	0.35	0.42	0.44	0.55	-0.24	0.57							
Item S31	0.79	3.34(.89)	0.00	0.51	0.40	0.42	0.44	0.57	0.31	0.45	0.52						
Item S32	0.96	3.21(.98)	0.25	0.30	0.24	0.27	0.22	0.33	0.47	0.26	0.22	0.35					
Item S33	0.79	3.56(.89)	0.01	0.50	0.44	0.35	0.45	0.56	0.40	-0.45	0.51	0.51	0.37				
Item S37	1.08	3.63(1.04)	0.08	0.52	0.35	0.39	0.47	0.49	0.28	0.53	0.61	0.47	0.24	0.46			
Item S41	0.82	3.76(.91)	0.10	0.45	0.41	0.42	0.35	0.54	0.25	0.52	0.51	0.47	0.24	-0.46	0.54		

Fuente: Elaboración propia

According to the different retention criteria, a factor for each scale was obtained. Table 3 shows the values of each model chosen for each scale. The three scales revealed good values of goodness-of-fit (GFI), residual statistics (SRMSR) and Guttman-Cronbach's alpha coefficient, according to the literature (Nunnally, 1978).

Table 4

Values of the Forethought, Performance and Self-reflection Scale.

Models*	Mardia's Coefficient		KMO	Bartlett Sphericity	% Variance	GFI	RMSR	α	Eigenvalues
	S	*K*							
Forethought	44.11<16 (16+2) = 288	341.72>16 (16+2) =288	.93	χ^2_{120}=1665.4 (*p* < .001)	46%	.99	.05	.93	7.38
Performance	8.25< 9 (9+2) = 99	120.32>9 (9+2) =99	.90	χ^2_{36}=790.7 (*p* < .001)	50.8%	.99	.05	.88	4.58
Self-reflection	30.11<14 (14+2) = 224	264.75>14 (14+2) =224	.93	χ^2_{91}=1266.8 (*p* < .001)	44%	.98	.06	.92	6.10

* *Minimum Average Partial* (MAP) with *Unweighted Least Squares*. Horn's Parallel Analysis presents the same score.

Fuente: Elaboración propia

Pilot Study 2- Construction Validity of the SRL-MI

Through CFA, the scales of the Forethought (χ^2 [87, *N*=219] =120,649, *p* < 0,01), Performance (χ^2 [14, *N*=219] =21,195, *p* < 0,97) and Self-reflection phases (χ^2[60, *N*=219] =68547, *p* < 0,21) were verified and revealed good fit indices (i.e. Forethought: CFI=0.96, GFI=0.96, RMSEA=0.04, SRMR=0.04, AIC=218,64; Performance: CFI=0.98, GFI=0.98, RMSEA=0.04, SRMR=0.03, AIC=158,54; and Self-reflection CFI=0.99, GFI=0.95, RMSEA=0.02, SRMR=0.03, AIC=83,19) according to values proposed by the literature (Tabachnick y Fidell, 2007). These results showed that the inventory is a consistent tool to understand how students report how they self-regulate their learning in contexts supported by the Moodle platform.

Main Study

Through IRT it was verified whether there were items with excessive infit and outfit in each scale. In the Forethought scale, items F3 (i.e."I prefer to compete with myself than with others.") and F40 (i.e."I make a list of the strategies that will be the most useful for me to achieve my goals.") presented an infit of 1.99 and 1.59 and an outfit of 2.09 and 1.65, respectively. In the Self-reflection Scale, only item S6 (i.e."During a phase where I have less good results, I am satisfied with the work that was developed.") presented an infit of 1.86 and an outfit of 2.12. None of the other items of the scales revealed infit higher than 1.4 and outfit higher than 2.0 (Bond & Fox, 2007). Items with infit and outfit higher than the recommended values were removed. Table 4 shows the TRI parameters in terms of internal consistency with and without items with infit and outfit values higher than those recommended. Since the IRT parameters of all models revealed good internal consistency, the items considered for removal were kept.

Table 4

TRI parameters of the three scales

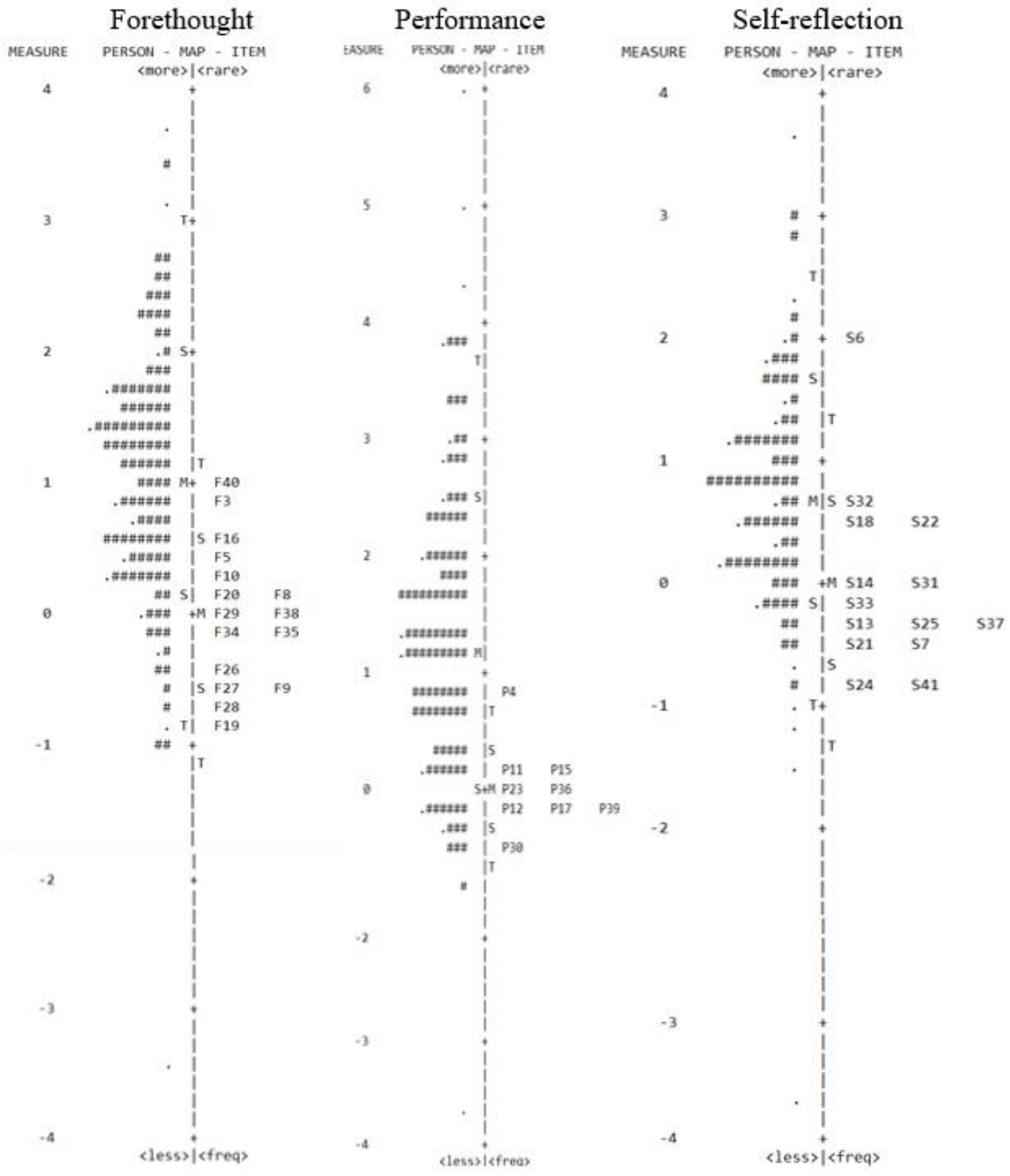
	Models	Cronbach	Item Separation Reliability	Person Separation Reliability
Forethought Scale	16 items	.87	.97	.87
	14 items	.88	.96	.88
Performance Scale	9 items	.83	.92	.84
Self-reflection Scale	14 items	.83	.98	.85
	13 items	.85	.97	.86

Fuente: Elaboración propia

To understand how middle school students reported how they self-regulated their learning when they used the Moodle Platform, the level of difficulty in the reported responses was analyzed. That is, the objective was to understand if there was precision in the way the students reported their perceptions. In the Forethought Scale, item F19 (i.e."I think I can learn what I want.") was the most reported or the easiest to report (-0.90 log), while item F40 (i.e."I make a list of strategies that will be the most useful for me to achieve my goals.") was the least reported or the most difficult to report (0.92 log), revealing a moderate distribution of the level of difficulty (-0.90 <Di <0.92). In the Performance Scale, item P4 (i.e."While I learn, I remove anything that distracts me.") was the least reported or the most difficult to report (0.77 log), while item P30 (i.e."During learning, I try to see if I am doing well.") was the most reported or the easiest to report (-.58 log), revealing a narrow distribution of the level of difficulty (-0.58 <Di <0.77). In the Self-reflection scale, item S6 (i.e."During a phase in which I have less good results, I am satisfied with the work that was developed.") was the least reported, or the most difficult to report, presenting a difficulty level of 1.92 log, while items S24 (i.e."I succeed when I use good strategies.") and S41 (i.e."When I succeed, it's because I knew how to achieve the ends.") were the most reported or the easiest to report, both presenting a difficulty level of -0.80 log. Thus, the Self-Reflection scale revealed a wide distribution of the level of difficulty (- 0.80 <Di <1.91).

Figure 1

Individual item map for Forethought, Performance, and Self-reflection scales



Fuente: Elaboración propia

The indicators of the level of difficulty (Figure 1) show that middle school students overestimated the way they self-regulate learning in an environment supported by the Moodle platform. Thus, there was some imprecision in the way students perceived their functioning as self-regulated students when using this platform to manage school tasks.

Conclusions

This study proposed to understand how middle school students reported how they self-regulated learning when using the Moodle Platform. Hence, it tried to respond to the need to highlight how the dynamic phases of self-regulated learning in a learning environment supported by technology are perceived by students (Boekaerts & Corno, 2005; Zimmerman, 2013).

The results show that students reflected on and reported how they self-regulated their learning when using the Moodle platform. Results also showed how middle school students thought of themselves as learners. Specifically, there was an overestimation of how they planned, performed, and monitored, and reflected and evaluated their work. These results are in line with those of other studies (Ferreira et al., 2015a). However, the present study focused on middle school students and did not contemplate a particular discipline.

According to some studies, during adolescence, students begin to have a more developed metacognitive knowledge and abstraction capacity (Wang et al., 2013). In fact, educators seem to give more emphasis to students' capacity to learn as a source of success or failure than to their efforts to learn (Boekaerts, 2002). Comparing one's own work with others, actual learning experiences, and feedback from others are increasingly considered, leading students to greater precision and realism about their perceptions and self-efficacy beliefs regarding a given domain (Boekaerts, 2002). However, this study showed that in these age groups, students still have difficulty in reporting how they manage their learning and are not precise regarding their regulation of learning with the use of the Moodle platform. These results agree with studies that refer to the difficulty in observing self-regulatory processes such as goal setting and self-monitoring (Valenzuela-Zambrano & Pérez-Villalobos, 2013).

Considering the self-regulated learning model (Zimmerman, 2013), in the forethought phase, students were more likely to report or mention self-efficacy beliefs over what they were able to learn. This result agrees with studies that present similar evidence with students of another age group (Ferreira et al., 2015a,), including distance learning courses (Fantinel et al., 2013). Moreover, the students mentioned less or revealed some difficulty in reporting strategic planning processes, namely in terms of registering the learning strategies they use to reach their objectives.

In the performance phase, the students also showed difficulty in mentioning the processes of regulating attention, namely regarding distractors during the execution of tasks. However, they mentioned more or found it easier to report monitoring strategies. These results complement studies on self-regulated learning strategies used by students in distance learning courses, where they developed self-evaluation strategies, taking-notes, test revision, organization of bibliography and environmental structuring (Silva et al., 2017).

As for the self-reflection phase, this was the least mentioned or the most difficult to report, while the reasons for success were the most mentioned or the easiest to report. These results provide evidence that students had difficulty reporting how self-regulatory processes develop when performing tasks with the Moodle platform. These results sustain suggestions from other studies indicating that learning experiences and feedback may contribute to the accuracy of students' perceptions of learning (Shute, 2008), including different types of feedback. Different types of feedback may facilitate online competency-based learning, such as feedback focused on motivation, interaction, clarification, outcomes and learning transfer (Besser & Newby, 2020), as well as self-regulation and emotional feedback, which are fundamental for learners' success (Wang et al. 2021). In line with this, some authors propose the use of resources which foster reflective interaction with students with regards to actual knowledge, and cognitive and metacognitive evaluation moments in virtual learning environments (Lima & Pimentel, 2013; Chou & Zou, 2020).

In terms of implications for practice, the SRL-MI, which may be applied at any stage of learning and in any discipline, can help teachers and students understand how they see their behavior and reflect on their learning when using technologies, and thus, may contribute to understanding academic performance (Montalvo & Torres, 2004). Metacognitive strategies allow to identify skills and difficulties, verify interactions that function, monitor the process of knowing and learning, and establish strategies to achieve objectives, using and combining the available resources. In fact, with technological advance, if it is important to empower students to learn with innovative scaffolding strategies (Su, 2020), it is also important to verify if they are able to improve learning.

In Moodle, teachers can promote students' conscious involvement in their learning processes through resources such as metacognitive guides. These guides can help configure planning and control strategies to achieve goals, implement content that promotes collaborative work, as well as dynamic evaluation processes with tools that promote reflection and consequent (re)orientation of objectives (Sierra et al., 2014).

According to some authors, the orientation towards the learning goal is a predictor of the use of metacognitive strategies and indicates that learners who seek to improve their skills use self-regulation strategies to a greater degree that help them define performance and improvement standards (González, 2006).

Therefore, understanding how students see themselves as learners and reflect on their learning when using technologies through the application of SRL-MI, as well as identifying the phases, principles and characteristics of self-regulation can provide queues for teacher and students' self-regulation, and contribute to conscious student involvement in their own learning process (Frison, 2012). This knowledge is able to determine the action of educational professionals as well as tutors, allowing them to guide their educational action and design their intervention to stimulate thinking, decision-making, problem-solving skills, and processes, even in technology-supported environments.

Considering that due to the COVID-19 pandemic and school lockdowns, access to online learning is becoming increasingly important, how students and teachers interact with learning management systems, such as the Moodle platform to regulate their learning, is fundamental to create effective learning experiences. Not only is it important to have access to these technologies, but to understand how individuals use them to create effective learning environments in which they interact. How educational and guidance professionals use technologies as a support to engage students in learning can be improved through in-service training on how specific functions of the platform can enable efficacious forethought and planning of activities, execution and monitoring of tasks and self-reflection regarding these learning tasks and the learning process. In-service training could include online or blended learning sessions, for instance to provide teachers with a hands-on approach to learning how to manage technological tools, such as the Moodle platform, and explore all their potential and multi-modal learning management systems to promote metacognitive development.

On the other hand, the SRL-MI can aid teachers and other professionals in understanding the extent to which students take advantage of the opportunities Moodle provides them with to develop strategies for planning, monitoring, and self-evaluating – even though teachers are responsible for proposing activities with the technological tools available to them (Beishuizen, 2011; Carmo y Franco, 2019; Pérez et al., 2020). This instrument enables teachers and tutors to make decisions on lesson planning, considering their students' individuality and therefore, make learning more personalized and inclusive, considering specific characteristics of each learner. Several studies have therefore highlighted the profile and influence of the teacher in the use of this tool (e.g., Dias et al., 2016), as well as his/her role as a "virtual tutor" who is responsible for the construction of activities (Valenzuela-Zambrano & Pérez-Villalobos, 2013), by planning activities that promote active and meaningful learning (Camacho et al., 2020) and by the awareness that students' contexts and characteristics are different (Habowski et al., 2020).

Therefore, the SRL-MI presented in this study constitutes an opportunity for teacher training within the scope of new technologies in contemporary contexts, where access and knowledge on how to manage these resources becomes fundamental. The SRL-MI also constitutes a challenge for practice, as it entices professionals to take their assessment of learners to a new level of self-regulation at a distance.

In addition, the results indicated that it is necessary to work with middle school students regarding their ability to reflect on learning, giving them opportunities to accurately analyze the strategies they use to self-regulate learning (Ferreira et al., 2016). Therefore, student´s guidance through anticipation processes, and planning of learning, supervision and evaluation through systematic activities, resources, and feedback, acquires an increasing importance for students between 12 and 17 years of age.

This paper contains some limitations that should be mentioned. The application of the inventory did not take place in specific disciplines and during the execution of learning tasks (Ferreira et al., 2016). Accordingly, previous research demonstrated no significant diferences with regards to the use of Moodle and different academic disciplines (Al-Ajlouni, 2016). Future studies may use the SRL-MI in specific disciplines and during concrete moments of learning in the classroom, as suggested by some investigations (Ferreira et al., 2016; Zimmerman, 2013). Similarly, it would be interesting to apply the inventory to other age groups as well as to students from other countries to see if there are differences in perceptions as to how they self-regulate their learning with the Moodle platform or other TSLE. It would also be interesting for future studies to consider the variable motivation and motivational regulation within the scope of students' perceptions about this theme (Paulino et al., 2015). Finally, it would be pertinent to conduct an in-depth study on how students report monitoring processes through daily tasks in longitudinal studies (Ferreira et al., 2015b).

The studies presented in the introduction highlight the relevance of technological tools in promoting opportunities to develop self-regulatory competencies, develop self-study abilities and improve and encourage the development of student´s abilities, namely with regards to university students, which have been the preferred target of ICT research (Alameri et al., 2020; Núñez et al., 2011). Therefore, as a contribution to the literature, the present study proposed to focus on younger students and their perceptions of how they self-regulate learning while working with the Moodle platform in a middle school context.

Lastly, considering the growing interest in the study of self-regulation of learning, namely in TSLE (Zimmerman, 2013), and the need to study self-regulatory processes in Moodle contexts (Dias et al., 2016), the SRL-MI constitutes a small contribution for research and practice because of its adequacy and psychometric qualities.

References

Al-Ajlouni, K.I. (2016). Learning Effects of Using Learning Management System (Moodle) by Students of Arab Open University. *International Journal of Instructional Technology and Distance Learning, 13(5),* 1-28.

Alameri, J., Masadeh, R., Hamadallah, E., Ismail, H. & Fakhouri, H. (2020). Students' Perceptions of E-learning platforms (Moodle, Microsoft Teams and Zoom platforms) in The University of

Jordan Education and its Relation to self-study and Academic Achievement During COVID-19 pandemic. *Advanced Research y Studies Journal*, *11*(5), 21-33.

Ali, N. & Jaafar, J. (2010). Transforming Moodle as a reflective tool in learning french language. *International Journal of Academic Research*, *2*(3), 238-240. http://team3edtc6320project4.pbworks.com/f/Moodle-as-reflective-tool-in-learning-french.pdf

Arul Kumar, R. Shiva Guru K., Karthikeyan K., & Srinivasan, S. (2017). Moodle as an E- Learning and Mobile Learning Approach for Education. *International Journal of Current Trends in Engineering y Research (IJCTER), 3*(3), 68-73.

Baggetun, R. & Wasson. B (2006). Self-Regulated Learning and Open Writing. *European Journal of Education, 41*(3/4), 453-472. https://doi.org/10.1111/j.1465-3435.2006.00276.x

Baker, F. (2001). The Basics of Item Response Theory. *ERIC Clearinghouse on Assessment and Evaluation*. University of Maryland.

Bandalos, D. L. & Finney, S. J. (2010). Exploratory and confirmatory factor analysis. In G. R. Hancock y R. O. Mueller (Eds.), *A reviewer's guide to quantitative methods in the social sciences*: *Revise, accept, reject* (pp.93-114). Routledge.

Banyard, P. Underwood, J., & Twiner, A. (2006). Do enhanced communications technologies inhibit or facilitate self-regulated learning? *European Journal of Education, 41*(3-4), 473-489.

Barrett, P. (2007). Structural Equation Modelling: Adjudging Model Fit. *Personality and Individual Differences*, *42*(5), 815-824. https://doi.org/10.1016/j.paid.2006.09.018

Bartolomé, A. & Steffens, K. (2011). Technologies for self-regulated learning. In R. Carneiro, P. Lefrere, K. Steffens y J. Underwood (Eds.), *Self-regulated Learning in Technology Enhanced Learning Environments: A European Perspective*. Sense Publishers.

Beishuizen, J. (2011). Lessons on learning: guidelines for teachers fostering self-regulated learning in a Technology Enhanced Learning Environments. In A. Bartolomé, P. Bergamin, D. Persico, K. Steffens y J. Underwood (Eds.), *Self-regulated Learning in Technology Enhanced Learning Environments: Problems and Promises* (pp. 23-29). Shaker Verlag.

Besser, E. D. & Newby, T. J. (2020). Feedback in a digital badge learning experience: Considering the instructor's perspective. *Tech Trends, 64,* 484-497. https://doi.org/10.1007/s11528-020-00485-5

Boekaerts, M. (2002) *Motivation to Learn*. The International Academy of Education and Bureau of Education. https://unesdoc.unesco.org/ark:/48223/pf0000128056.locale=es

Boekaerts, M. & Corno, L. (2005). Self-Regulation in the Classroom: A perspective on Assessment and Intervention. *Applied Psychology: An International Review*, *54* (2), 199-231. https://doi.org/10.1111/j.1464-0597.2005.00205.x

Bollen, K. A. & Long, J. S. (1993). *Testing structural equations models.* Sage.

Bond, T. G., & Fox, C. M. (2007) *Applying the Rasch model*. Erlbaum.

Brodeur, M., Mercier, J., Dussault, M., Deaudelin, C. & Richer, J. (2006) Élaboration et validation d´une échelle d´autorégulation de l´apprentissage relative à l´intégration pédagogique des TIC (AREGA-TIC). *Revue Canadienne des Sciences du Comportement*, *38*(3), 238-249. https://doi.org/10.1037/cjbs2006011

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. The Guilford Press.

Carneiro, R. & Veiga Simão A. M. (2011). Technology enhanced environments for self-regulated learning in teaching practices. In R. Carneiro, P. Lefrere, K. Steffens y J. Underwood (Eds.), *Self-regulated Learning in Technology Enhanced Learning Environments: A European Perspective* (pp 75-101). Sense Publishers

Chou, C.Y. & Zou, N.B. (2020). An analysis of internal and external feedback in self-regulated learning activities mediated by self-regulated learning tools and open learner models. *International Journal of Educational Technology in Higher Education, 17*(55). https://doi.org/10.1186/s41239-020-00233-y

Daura, F. T. (2013). El contexto como factor del aprendizaje autorregulado en la educación superior. *Educ. Educ., 16* (1), 109-125. http://educacionyeducadores.unisabana.edu.co/index.php/eye/article/view/2139/3077

Dias, P., Alves, N., Abrantes, P. & Rodrigues, C. (2016). Utilização da plataforma Moodle em Portugal- Moodle nas escolas do Ensino Básico e Secundário em Portugal. *Sociologia, Problemas e Práticas, 81*, 115-140. https://doi.org/10.7458/SPP2016813145

Fantinel, P., Angeli, N., Angelo, D., Lima, J.V. & Maraschin, C. (2013). Autorregulação da aprendizagem na educação a distância online. *Nuevas Ideas en Informática Educativa TISE, 9,* 146-154.

Ferreira, P.C., Veiga Simão, A. M. & Lopes da Silva, A. (2015a). The unidimensionality and overestimation of metacognitive awareness in children: validating the CATOM. *Anales de Psicologia*, *31*(3), 890–900. https://doi.org/10.6018/analesps.31.3.184221

Ferreira, P. C., Veiga Simão, A. M. & Lopes da Silva, A. (2015b). Does training in how to regulate one's learning affect how students report self-regulated learning in diary tasks? *Metacognition and Learning, 10*(2), 199-230. https://doi.org/10.1007/s11409-014-9121-3

Ferreira, P. C., Veiga Simão, A.M. & Lopes da Silva, A. (2016). How and with what accuracy do children report self-regulated learning in contemporary EFL instructional settings? *European Journal of Psychology of Education, 32*(4), 589–615. https://doi.org/10.1007/s10212-016-0313-x

Fox, C. M. & Jones, J. A. (1998). Uses of Rasch modeling in counseling psychology research. *Journal of Counseling Psychology*, *45*(1), 30-45. https://doi.org/10.1037/0022-0167.45.1.30

Frison, L. (2012). Tutoria entre estudantes: uma proposta de trabalho que prioriza a aprendizagem. *Revista Portuguesa de Educação*, *25*(2), 217-240. https://doi.org/10.21814/rpe.3008

Germ, M. & Mandl, H. (2010). Use of learning strategies by students in an online-course at university - A situation-specific perspective on the use of self-regulated learning. In A. Bartolomé, P. Bergamin, D. Persico, K. Steffens y J. Underwood (Eds.), *Self-regulated learning in Technology Learning Environments: Problems and Promises* (pp. 10-20). Shaker Verlag.

González, M. (2006). Estrategias de autorregulación del aprendizaje: contribución de la orientación de meta y la estructura de metas del aula. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *7* (1),1-6.

Henson, R.K. & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: common errors and some comments on improved practice. *Educational and Psychological Measurement, 66*(3), 393-416.

Iniesta-Bonillo, M. A., Sánchez-Fernández, R. & Schlesinger, W. (2013). Investigating factors that influence on ICT usage in higher education: a descriptive analysis. *The International Review on Public and Nonprofit Marketing, 10*(2), 163-174. https://dx.doi.org/10.1007/s12208-013-0095-7

Hayton, J. C., Allen, D. G. & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on Parallel Analysis. *Organizational Research Methods, 7*, 191-205.

Lorenzo-Seva, U. & Ferrando, P.J. (2013). FACTOR 9.2: A comprehensive program for fitting Exploratory and Semiconfirmatory Factor Analysis and IRT Models*. Applied Psychological Measurement*, *37*, 497-498.

Lima, A. & Pimentel, E. (2013). Mecanismos para Suporte à Auto-Regulação da Aprendizagem do Estudante. *Anais do XXIV Simpósio Brasileiro de Informática na Educação (SBIE 2013)*, 296-305. http://dx.doi.org/10.5753/cbie.sbie.2013.296

Linacre, J.M. (2013). Winsteps® (Version 3.80) [Computer Software]. Winsteps.com. http://www.winsteps.com/

Lisbôa, E., Jesus, A.,Varela, A., Teixeira, G. & Coutinho, C. (2009). LMS em Contexto Escolar: estudo sobre o uso da Moodle pelos docentes de duas escolas do Norte de Portugal. *Educação, Formação y Tecnologias*, *2* (1), 44-57. http://hdl.handle.net/1822/9428

Montalvo, F. & Torres, M. (2004). Self -regulated learning: current and future directions. *Electronic Journal of Research in Educational Psychology*, *2*(1), 1-34. http://www.investigacion-psicopedagogica.org/revista/new/english/ContadorArticulo.php?27

Núñez, J. C., Cerezo, R., Bernardo, A., Rosário, P., Valle, A., Fernández, E. & Suárez, N. (2011). Implementation of training programs in self-regulated learning strategies in Moodle format: Results of an experience in higher education. *Psicothema, 23*(2), 274-281.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.

O´Callaghan, R. (2020). Pós-covid-19-será o online o futuro da Educação? Porto Business School. https://www.pbs.up.pt/pt/artigos-e-eventos/artigos/pos-covid-19-sera-o-online-o-futuro-da-educacao/

Pasquali, L. & Primi, R. (2003). Fundamentos da Teoria de Resposta ao Item – TRI. *Avaliação Psicológica, 2*, 99-110. http://pepsic.bvsalud.org/pdf/avp/v2n2/v2n2a02.pdf

Paulino, P., Sá, I. & Lopes da Silva, A. (2015). Autorregulação da Motivação: Crenças e Estratégias de Alunos Portugueses do 7º ao 9º Ano de Escolaridade. *Psicologia: Reflexão e Crítica 28* (3), 574-582. http://dx.doi.org/10.1590/1678-7153.201528316

Pedro, N., Soares, F., Matos, J.F. & Santos, M. (2008). *Utilização de Plataformas de Gestão de Aprendizagem em Contexto Escolar: estudo nacional.* DGIDC.

Pérez, M., Serrano-Bedia, A. & García-Piqueres, G. (2020). An analysis of factors affecting students´ perceptions of learning outcomes with Moodle. *Journal of Further and Higher Education, 44* (8), 1114-1129. https://doi.org/10.1080/0309877X.2019.1664730

Rabiman, R., Nurtanto, M. & Kholifah, N. (2020). Design And Development E-Learning System By Learning Management System (LMS) In Vocational Education. *International Journal of Scientific y Technology Research, 9* (1), 1059-1063.

Rosário, P., Soares, S., Núñez, J. C., González-Pienda, J. & Rúbio, M. (2004). Processos de auto-regulação da aprendizagem e realização escolar no Ensino Básico. *Psicologia, Educação e Cultura, 8* (1), 141-157.

Rubio-Hurtado, M., García-Durán, P. & Millet, M. (2010). Evaluación continua a través de Moodle para involucrar al alumnado en su proceso de aprendizaje. *Revista d'Innovació i Recerca en Educació, 3* (1), 46-65. http://www.raco.cat/index.php/REIRE/article/view/180892/233484

Ruíz, M. A. & San Martín, R. (1993). Una implementación del procedimiento MAP para la determinación del número de factores. *Psicothema, 5*, 177-182.

Schraw, G., Crippen, K.J., & Hartley, K. (2006). Promoting Self-Regulation in Science Education: Metacognition as Part of a Broader Perspective on Learning. *Research in Science Education*, *3*, 111-139. https://doi.org/10.1007/s11165-005-3917-8

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, *1*(78), 153 189.

Sierra, I., Carrascal, N. & Buelvas, R. (2014). Los entornos tecnológicos con orientación metacognitiva como recursos para la gestión de ambientes y redes personales de aprendizaje en educación superior. *Congreso Iberoamericano de Ciencia, Tecnología, Innovación y Educación*. Buenos Aires, Argentina.

Silva, T., Lay, L., Hein, N., Biavatti, V. & Zonatto, V. (2017). As Estratégias de Aprendizagem Autorregulada (SRL) no Ensino EAD de Contabilidade. *REPeC, Brasília, 11*(1), 90-109. http://dx.doi.org/10.17524/repec.v11i1.1412

Souza, S., Franco, V. S. & Costa, M. L. F. (2016). Educação a distância na ótica discente. *Educação e Pesquisa, 42* (1), 99-114. https://doi.org/10.1590/s1517-9702201603133875

Su, J. M. (2020). A rule-based self-regulated learning assistance scheme to facilitate personalized learning with adaptive scaffoldings: A case study for learning computer software. *Computer Applications in Engineering Education, 28*(3), 536-555. https://doi.org/10.1002/cae.22222

Tabachnick, B.G. & Fidell, L.S. (2007). *Using Multivariate Statistics* (5th ed.). Allyn and Bacon.

Unesco- United Nations Educational, Scientific and Cultural organization (2020). *Education: From disruption to recovery.* https://en.unesco.org/covid19/educationresponse

Valenzuela-Zambrano, B. & Perés-Villalobos, M.V. (2013). Aprendizaje autorregulado a través de la plataforma virtual *Moodle*. *Educación y Educadores, 16* (1), 66-79.

Wang, C. H., Shannon, D. M. & Ross, M. E. (2013). Students' Characteristics, Self-Regulated Learning, Technology Self-Efficacy, and Course Outcomes in Web-Based Courses. *Journal Distance Education*, *34*(3), 302-323. http://dx.doi.org/10.1080/01587919.2013.835779

Wang, H., Tlili, A., Lehman, J.D., Lu, H. & Huang, R. (2021). Investigating feedback implemented by instructors to support online competency-based learning (CBL): a multiple case study. *International Journal of Educational Technology in Higher Education 18***(**5). https://doi.org/10.1186/s41239-021-00241-6

Yeou, M. (2016). An Investigation of Students' Acceptance of Moodle in a Blended Learning Setting Using Technology Acceptance Model. *Journal of Educational Technology Systems, 44*(3), 300–318.

Zimmerman, B. (2013). From cognitive modeling to self-regulation: a social cognitive career path. *Educational Psychologist*, *48*(3), 135–147. https://doi.org/10.1080/00461520.2013.794676

Zimmerman, B. (2015). Self-Regulated Learning: Theories, Measures, and Outcomes. In James D. Wright (Ed.), *International Encyclopedia of the Social y Behavioral Sciences* (2nd ed., Vol. 21, pp. 541-546). Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.26060-1

Fecha de entrada: 15 junio 2020

Fecha de revisión: 24 septiembre 2020

Fecha de aceptación: 23 marzo 2021