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Scaffolding Matters? Investigating Its Role in Motivation, Engagement and Learning Achievements in Higher Education

Elizabeth Acosta-Gonzaga * and Aldo Ramirez-Arellano

Sección de Estudios de Posgrado e Investigación (SEPI), Unidad Profesional Interdisciplinaria de Ingeniería y Ciencias Sociales y Administrativas (UPIICSA), Instituto Politécnico Nacional, Mexico City 08400, Mexico
* Correspondence: eacostag@ipn.mx

Abstract: In higher education, students' engagement plays an essential role in determining learning success. Several studies have focused on identifying the relationship between engagement and learning achievements. However, comprehensive studies that include engagement, motivation, and scaffolding have yet to be performed. This article introduced a concept of metacognitive and learning engagement based on the frontiers between metacognition and cognition previously established in the literature. A conceptual model including cognitive, behavioural, emotional, scaffolding, and motivation and the two new definitions (metacognitive and learning engagement) was proposed and validated in 220 university students using structural equation modelling. The findings support the conjecture that cognitive engagement is directly influenced by metacognitive engagement. Learning engagement is influenced by cognitive engagement, and all of them are triggered by motivation. Furthermore, scaffolding enhances emotional engagement. Teachers' support fosters students' emotions of being enthusiastic, interested in class, joyful in learning activities, and proud of their learning achievements.

Keywords: higher education; learning achievements; motivation; metacognitive engagement; learning engagement; scaffolding

Citation: Acosta-Gonzaga, E.; Ramirez-Arellano, A. Scaffolding Matters? Investigating Its Role in Motivation, Engagement and Learning Achievements in Higher Education. *Sustainability* **2022**, *14*, 13419. https://doi.org/10.3390/su142013419

Academic Editors: Amador Jesús Lara Sánchez, Manuel Castro Sanchez and Ramón Chacón Cuberos

Received: 7 September 2022
Accepted: 15 October 2022
Published: 18 October 2022

1. Introduction

Students' learning success or failure is determined by various factors, such as engagement and motivation. In higher education, students' engagement plays an essential role that ignites a sense of belonging and participation in learning activities. In systems theory, the mind is divided into three systems: conative, affective, and cognitive, which are also known as the trilogy of the mind. In the study of personality, some models use one or more of these systems (conation, affect, and cognition).

Specifically, the relational model of personality proposes that personality includes conation, affect, and cognition, and it also adds a fourth system: consciousness. This model describes the relationships among these systems and their surrounding categories [1,2]. The conation or motivation system includes various components, such as hunger, thirst, and reproduction; these conative functions alert the organism to its needs for survival and reproduction. The affective system comprehends feelings and states, such as happiness, joy, and alertness. The cognitive system includes thought-related processes, such as working memory, judgments, and reasoning.

In the educational context, students' performance is enriched when motivation is involved in emotional, cognitive, and behavioural engagement [3,4]. According to self-determination theory (SDT) [5–7], there is a relationship between students' engagement, motivation, and learning achievements. This theory explains how a change in engagement is reflected both in the learning environment and in motivation. SDT theory assumes that all students have psychological needs that provide the motivational foundation that serves to demonstrate that the student is highly engaged with learning activities. SDT

theory is composed of five theories, with the aim of explaining a specific motivational phenomenon. One of these theories is cognitive evaluation theory, which explains why some external factors support intrinsic motivation processes, while others can affect it. One of the factors or conditions that promote students' motivation in the classroom is positive feedback. Therefore, self-determination theory shows how scaffolding plays an important role in fostering students' motivation and engagement in school activity. In the school context, Vygotsky [8] defined scaffolding as instructional assistance by which more advanced individuals (teachers or peers) help less experienced students maximise their potential. SDT also offers recommendations for teachers to reinforce and nurture students' motivation during class, thereby fostering high-quality students' engagement. It is at this point that teacher guidance plays an important role in fostering students' engagement [9].

The self-system model of motivational development proposed by Skinner [10,11] suggests that level of students' engagement is determined by contextual features. It mentions that this contextual environment includes a warm context mainly created by the teacher and where the autonomy of the student is supported. This means that the quality of the relationship between the students and teacher determines the level of students' engagement in the learning activities in the classroom. That is, scaffolding serves to capture interest of students and maintain their engagement with learning tasks [12]. Therefore, scaffolding only occurs when the student is engaged in a school activity [13].

Several studies have been conducted to analyse the relationships between students' engagement and their achievements in learning [10,14,15]. However, comprehensive studies that include engagement, motivation, and scaffolding, as far as the authors know, have yet to be proposed. Since the roles of engagement, motivation, and scaffolding are essential for improving student outcomes [15], a conceptual model of the relationships between motivation, scaffolding, emotional, behavioural, metacognitive, cognitive, and learning engagement and their impact on learning outcomes is proposed. Therefore, the following hypothesis is stated:

There is a relationship between motivation, scaffolding, emotional, behavioural, metacognitive, cognitive, and learning engagement and learning achievement.

Likewise, based on psychological literature, the current research also formulates a definition of metacognitive engagement. Similarly, learning engagement is introduced based on the frontier between cognitive and learning strategies. The results provide insight into the relationships among the above-mentioned factors in a traditional higher education context and reveal that motivation directly influences metacognition engagement and learning engagement. Scaffolding showed a direct relationship with emotional engagement, which means that teachers' guidance and support are essential to students' accomplishments.

1.1. Definitions of Motivation, Engagement, and Scaffolding

Motivation is a dependent variable influenced by the educational context, the subject area, and the task to be performed. Moreover, it is an intrapersonal factor that has an 'energizing stimulus' [16,17]. Engagement is a factor that involves observable and evident constructs that drives learning and predicts school success [15,17,18]. It is a meta-construct (multidimensional) [19–21] that includes behavioural, emotional [15,22], and cognitive components [3,23–25]. Engagement only occurs if students have the desire to engage; conversely, students may want something but may not be acting upon it [19]. Hence, motivation supports engagement, and engagement leads to students' achievements [26].

Emotional engagement is defined as students' affective responses (positive or negative emotions) to learning tasks and environments [3] involving interactions with teachers, peers, and schoolwork [15]. According to Skinner and colleagues [10], emotional engagement includes enjoyment, enthusiasm, interest, satisfaction, pride, vitality, and zest. On the other hand, disaffection is the opposite of engagement. Disaffected students can show negative emotions, such as boredom, frustration, depression, anxiety, or even anger. Usually, disaffected students are passive and do not make an effort to face challenges [22].

Behavioural engagement refers to students being involved in academic, social, or extracurricular activities [15,27]. According to González et al. [19], behavioural engagement includes student involvement in learning tasks and environments, such as time-on-task and attendance. Skinner et al. [10] argue that the motivational conceptualisation of behavioural engagement in the academic context includes students' behaviours, such as action initiation, effort, exertion, attempts, persistence, intensity, attention, concentration, absorption, and involvement. Behavioural disaffection has negative behaviours, including students' passivity, giving up, withdrawal, distracted, mentally disengaged, and unprepared [10].

The frontier between metacognition and cognition has been established in the literature. Metacognition is referred to as cognition about cognition or knowing about knowing [28–30] and is divided into two processes: the students must be aware of their knowledge and be able to regulate metacognitive and cognitive strategies to learn and solve problems [31–34]. In contrast, cognition includes reasoning, judgements, learning, and memory; it is tightly related to metacognition, which is on a higher plane than cognition [1,35]. Based on that definition, metacognitive engagement is students' psychological investment in planning, monitoring, and regulating cognition (metacognitive self-regulation) [3,15,36,37]. Further, engaged students in metacognitive activities apply prior knowledge to build more complex knowledge structures [37] and solve problems (critical thinking).

Cognitive engagement is defined as students' psychological investment in selecting the relevant information to be summarised. Moreover, engaged students create connections among the information to be learned [19,38,39]. Noticeably, metacognitive strategies cannot occur if cognitive engagement does not happen first; thus, we propose that metacognitive engagement is a continuum process involving not only the use of cognitive strategies but also their regulation [40]. In addition, learning engagement is proposed as the effort in managing different resources in a learning context that helps learners to achieve cognitive results [38]. It includes use of mechanical learning strategies, such as managing time and the study environment, and attention in the face of distractions and uninteresting tasks [37].

Scaffolding is defined as a process in which an experienced individual assists a novice to solve a problem or carry out a task [41]. Scaffolding occurs when instructors and/or peers interact socially with students to fill the key gaps between what students already know and what can be achieved with guidance to complete an assignment (zone of proximal development) [42,43].

Scaffolding aims to make use of what students already know about a problem to expand their skills in such a way that they have important participation in solving the problem and, therefore, obtain the necessary skills that they would not otherwise have [13]. Scaffolding is support for the current performance of the student, but it is also a guide to perform the skill acquired in the future [13].

Scaffolding serves to capture the interest of the students and maintain their engagement with the learning tasks [12]. Thus, it only occurs when the student is engaged in a school activity [13].

From its theoretical conception, scaffolding comprises two factors, the motivational and the cognitive; both include the same amount of components [12]. For example, in the instructional method PBL (problem-based learning), in which the student solves real problems, if the guidance provided to the students is insufficient, their success will be diminished [44]. In this case, teaching solely through PBL didactic strategies does not motivate students [45]. Therefore, motivational support and scaffolding are required [12].

Figure 1 introduces a conceptual model of the relationships among motivation, engagement, scaffolding, and learning achievements; the theoretical bases of such relations are presented in the following sub-sections.

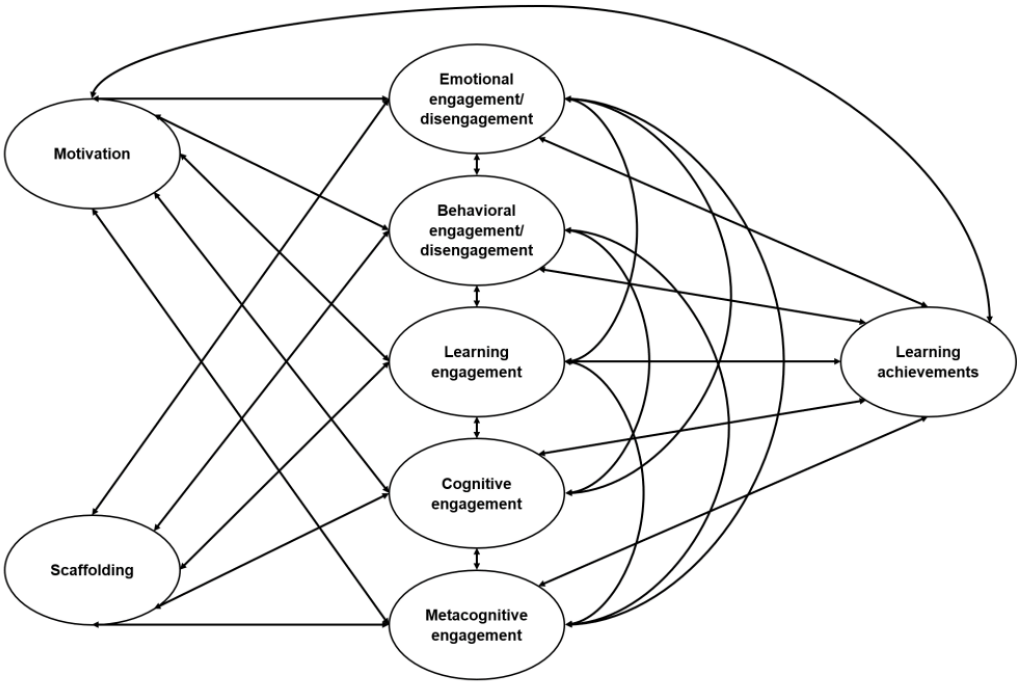

Figure 1. Conceptual model of the relationships between motivation, scaffolding, engagement, and learning achievements.

1.2. The Effects of Motivation

Mayer et al. [1] have found that motivation and emotion may directly influence one another. Motivation and emotion collaborate/cooperate mutually (each other) by evaluating different necessities and balancing one another. Several studies have shown that motivation is critical in explaining engagement [46–50].

This is also observed in the research of Skinner et al. [14] and Reeve [9], who proposed that motivation influences emotional and behavioural engagement. Wang and Eccles [48] studied the effects of motivation, school environment, and academic engagement, analysing the latter by its three components: emotional, behavioural, and cognitive. Their findings revealed that school environment impacts motivation and it, in turn, impacts behavioural, emotional, and cognitive engagement. Similarly, in a study about online courses, Pellas [51] verified the effects of self-efficacy (a component of motivation), metacognitive self-regulation, and self-esteem on a multidimensional construct of engagement (cognitive, emotional, behavioural). Their findings suggested that self-efficacy was positively correlated with cognitive and emotional engagement and negatively correlated with behavioural engagement. Therefore, the relationship between motivation and cognitive, emotional, and behavioural engagement, in the proposed conceptual model, is supported (see Figure 1).

In addition, Sun et al. [52] provide evidence of a positive relationship between use of self-efficacy and students' academic outcomes. In this way, the relationship between motivation and students' learning achievements in Figure 1 is supported. These findings are in accordance with Zhang et al. [53], who found that learning strategies mediate the relationship between motivation and vocabulary acquisition in teaching English (students' learning achievement), underpinning the paths from motivation to learning engagement (use of learning strategies) and motivation to students' achievements.

Furthermore, the research of Butz at al. [54] and Pellas [51] reveal the effect of motivation on cognitive processes, arguing that students who reported higher levels of self-efficacy and intrinsic value also reported higher levels of cognitive strategy use and self-regulation (a sub-construct of metacognitive engagement). Likewise, Sedaghat et al. [55] demonstrated that motivational factors, including perceived ability, perceived instrumentality, and achievement goals, predict cognitive engagement and academic achievement. This evidence supports the paths from motivation to cognitive engagement and motivation to the metacog-

nitive engagement of the conceptual model. Likewise, King and McInerney [56] revealed that there is a reciprocal relationship between motivation and metacognitive engagement.

1.3. The Effects of Scaffolding

According to the self-system model, a supportive classroom context that includes supportive interactions with teachers (pedagogical caring) promotes students' engagement in the classroom [10]. This supports the idea that teachers' scaffolding for interaction (learner–teacher, learner–learner) has a strong connection with students' behavioural and emotional engagement [57]. A study by Askell-Williams et al. [58] indicates that scaffolding (given by the learning protocols) could increase students' levels of knowledge about cognitive and metacognitive strategies for learning. Their findings supported the conjecture that the learning protocol was useful to provoke just-in-time awareness of productive cognitive and metacognitive strategies. Similar results were reported by Dabbagh and Kitsantas [59], who utilised a mixed-methods methodological approach to analyse whether web-based pedagogical tools supported different metacognitive, cognitive, and learning processes, such as self-regulation, goal-setting, self-monitoring, help-seeking, and time planning and management. Their findings provided evidence revealing how teachers could use technology-enhanced environments to provide the scaffolding needed to foster metacognitive, cognitive, and learning engagement to ensure academic success. These relationships are included in the conceptual model of Figure 1.

1.4. The Effects of Emotional Engagement

The role of emotional engagement has been studied in the literature; for instance, Wang et al. [21] and Pekrun et al. [60] found that emotional engagement can predict students' academic performance. Emotional engagement is an important element in a student's academic career, and Wang et al. [21] pointed out that the quality of students' emotional engagement can fluctuate regarding academic time. The authors discovered that, as years pass, students may find school less enjoyable and less valuable; as a consequence, they may become more anxious and overwhelmed. In the same way, Pekrun et al. [60–62] evidenced that students' emotional engagement is related to motivation. This idea is also in line with Kim et al. [63], who argued that students' emotions are associated with motivation and performance in online mathematics classes.

Li and Lerner [64] argued that emotional disengagement is related to lower achievement outcomes. Additionally, the findings of Tze et al. [65] argued that learning strategies are influenced by academic boredom, which includes emotional disengagement and negatively impacts students' learning achievements. These findings suggest that there is a relationship between emotional disengagement and learning engagement, emotional disengagement and motivation, and emotional disengagement and students' learning achievements, as depicted by the conceptual model. Since emotional engagement is a meta-construct that involves single emotions (Skinner et al. [10]), a reciprocal relation between motivation and emotional engagement is proposed. Similar results were reported in the research by Ben-Eliyahu et al. [66], who found that emotional, behavioural, and cognitive engagement predict motivation.

Emotions contribute positively to cognition [1]; however, they can interrupt cognitive functions and adaptively shape mental activity, modifying judgements and distorting reason, and making students less effective to process information [67]. For example, the study by Collazos [68] analysed the challenges teachers and students faced during the COVID-19 pandemic when using e-learning platforms: it was observed that emotions played the most significant aspect during the teaching–learning process through online platforms. When an individual is emotionally satisfied, the effect of emotions is weak; then, the cognitive systems can function well on their own rules of logic and formalism [1]. Although emotions influence cognition, there can be a reciprocal effect. Thus, cognition can turn around and change emotions [69] or motivation [1].

Pekrun et al. [60] revealed that students' emotions are related to learning engagement and metacognitive engagement. Gibbs and Poskitt [70] pointed out that emotional engagement is a necessary prerequisite for cognitive engagement. Such studies form the basis of our understanding of the relationships between emotional engagement and motivation, learning engagement, metacognitive engagement, and learning achievements in the conceptual model (see Figure 1).

1.5. The Effects of Behavioural Engagement

Educational research has shown that behavioural engagement has a significant effect on academic achievements [3,71,72]. Likewise, the literature suggests that behavioural engagement is a cause of emotional engagement [73,74]. In the same line, Wolters and Taylor [75] suggested that behaviourally engaged students are more involved in learning and academic tasks, demonstrating behaviours that utilise learning strategies, such as effort and adaptive help-seeking; therefore, the path from behavioural engagement to learning engagement is underpinned. Additionally, Ben-Eliyahu et al. [66] found that there are high correlations between behavioural and cognitive engagement. This was also found in the study by Li and Lerner [76], who proposed that there is a relationship between behavioural engagement and cognitive engagement. Furthermore, Gibbs and Poskitt [70] proposed that behavioural engagement is a necessary antecedent for cognitive engagement, as is shown in the conceptual model.

It is important to notice that, in the conceptual model, there is a bidirectional relationship between behavioural and emotional engagement [10,76].

1.6. The Effects of Learning Engagement

Sun et al. [52] provided evidence that there is a positive relationship between help-seeking practices—a learning strategy—and students' academic outcomes; therefore, the relationship between learning engagement and students' learning achievements is supported (see Figure 1). Likewise, research on learning engagement has indicated that there is a significant connection between peer support, help-seeking, effort regulation, and time management with students' behavioural practices; for example, Fredricks et al. [77] studied the effects of classroom context—including the factor of peer support as a measure of a supportive social environment—on behavioural, emotional, and cognitive engagement. Their findings revealed that peer support had similar correlations with the three components of engagement, and that peer support was a predictor of behavioural and cognitive engagement. Further, Broadbent [78] indicates that use of time management practices (a learning strategy) predicted subject grades for students enrolled online and in blended courses, supporting the path from learning engagement to students' learning achievements (see Figure 1).

1.7. The Effects of Cognitive Engagement

The influence of cognitive engagement on students' academic achievements has been demonstrated in prior research; for example, Pintrich and de Groot [79], Puzziferro [80], and Broadbent [78] have found that students' cognitive strategy use is related to course grades. Broadbent [78] found that, when online and blended students used cognitive strategies, such as elaboration and rehearsal practices, their subject grade was impacted. This confirms the pathways from cognitive engagement to students' learning achievements on the proposed model. Likewise, a study by Vanderstoep et al. [81] pointed out that college students who obtained higher course grades had higher levels of cognitive engagement in social and natural science courses. Moreover, Chen and Wu [82] found that there is a relationship between students' cognitive practices and metacognitive strategy use.

In studying the factors associated with students' achievement in online mathematics courses, Kim et al. [63] pointed out that cognitive strategy use had a direct influence on boredom, enjoyment, and pride (emotional factors). In addition, Vansteenkiste et al. [83] and Reeve [9] demonstrated how motivation influences cognitive engagement, suggesting

that it can aid in developing deep learning instead of superficial learning. Motivation not only plays an important role in students' choice and usage of cognitive strategies but also in students' learning outcomes [37,64,84]. When students are very interested in what they are doing, they experience a state of cognitive engagement [85].

When students are motivated to choose deep/elaborative engagement, they can be more successful in performance and reliance than those students who applied shallow strategies alone (are not engaged) as these strategies are not sufficient for academic success [37,86]. Several studies have suggested unidirectional pathways from motivation to engagement; however, Ben-Eliyahu et al. [66] revealed that there is a positive reciprocal relationship between motivation and engagement.

Furthermore, the effects of cognitive engagement on learning engagement have been analysed previously; the research by Rotgans et al. [87] examines levels of cognitive engagement in students who attended team-based learning activities. Their findings revealed that students reported that cognitive engagement fluctuated depending on the learning activity. This implies that cognitive engagement can vary as a function of different learning activities. This also is in line with Huang et al. [88], who utilised gamification learning activities in a flipped class to enhance students' cognitive engagement. The results indicated that students in the gamification-enhanced flipped learning group developed higher levels of cognitive engagement than the non-gamified flipped learning group in the pre-class thinking activities. Thus, this study investigated how student cognitive engagement can be developed as a result of using gamification in flipped learning activities.

1.8. The Effects of Metacognitive Engagement

Regarding metacognitive engagement, Chen and Wu [82] found that there is a relationship between students' metacognitive engagement and their performance. Likewise, Kim et al. [63] pointed out that self-regulation processes are critical in determining intrinsic value, self-efficacy, boredom, enjoyment, anger, shame, and hopelessness. This evidence has revealed that metacognitive and cognitive engagement can vary according to students' motivation and emotions. The research of Schumacher and Ifenthaler [89] found that self-regulated learning processes are related to motivational factors. Likewise, Asikainen et al. [90] argued that the paths from self-regulated strategies to students' academic emotions were significant. These findings support the relationship between metacognitive engagement and emotional engagement, as demonstrated in the conceptual model.

Wolters and Taylor [75] assumed that students who exerted self-regulated practices possessed meta-level knowledge, which provides the basis for planning, monitoring, and regulating their emotional, behavioural, and motivational engagement. Thus, the relationships between metacognitive engagement and emotional engagement, as well as metacognitive engagement and behavioural engagement, are underpinned. Similarly, the study of Pellas [51] analysed the effects of metacognitive self-regulation on a multidimensional construct of engagement, including cognitive, emotional, and behavioural engagement. Their results reveal that metacognitive self-regulation was positively related to cognitive and emotional engagement and negatively related to behavioural engagement. These findings support the relationships proposed in the conceptual model between metacognitive engagement and cognitive engagement, emotional engagement, and behavioural engagement.

2. Materials and Methods

2.1. Data Gathering

To validate the relationships proposed in Figure 1, the statistical technique of structural equation modelling (SEM) was applied using SmartPLS version 3 (SmartPLS GmbH, Oststeinbek, Germany).

The sample consisted of 220 university students who were enrolled in traditional courses in science and social science in a public university. The ages of the students ranged from 19 to 22; most of them were women (124). Science courses included industrial engineering and computer engineering. The social science degree was in industrial management. To

pass a course, all students had to complete three paper-based exams and several learning activities. For science students, the learning activities consisted of various exercises; for social science students, the learning strategies involved reading and writing essays. The student's overall grade was reported by teachers at the end of the semester. This final grade was used as a measure for learning achievement (LA). Students were requested to answer two questionnaires, which are described below. Both instruments were administered in the middle of the semester, which lasted from September to December 2018. All students and teachers were informed of the research objectives, and they decided to participate voluntarily. Both agreed that their responses would be used for the project [91].

2.2. Instruments

The questionnaire Student Engagement and Disaffection in school (SED) Skinner et al. [10] was utilised to measure students' emotional engagement—enjoyment (EN), enthusiasm (ET), fun (FU), pride (PR), interest (IN)—and emotional disengagement—boredom (BO), disinterest (DI), frustration (FR), sadness (SA), anxiety (AN). It also measures students' behavioural engagement—involvement (IN), effort (EF), attention (AT)—as well as behavioural disengagement—distracted (DI), mentally withdrawn (ME), passivity (PA). The students' responses were based on a 5-point Likert scale of agreement, with 1 indicating 'strongly disagree' and 5 indicating 'strongly agree'. The following is a sample question: 'When I get stuck on a problem, I feel worried'.

Scaffolding was measured using a one-factor scale based on the instructors' use of scaffolding strategies to promote interactions [57,92,93]. This scale was evaluated using a 7-point Likert scale, in which 1 indicates 'not true at all' and 7 indicates 'very true'. The questions were adapted for a face-to-face context, and the following provides one example: 'My instructor provides basic guidelines to help students become aware of the importance of classroom interaction'.

The motivation was evaluated using the Motivated Strategies for Learning Questionnaire (MSLQ) [38,79]. The MSLQ is divided into two scales, 31 items to assess motivation and 50 items to assess learning strategies. Pintrich et al. [94] proposed their questionnaire considering that the motivational scale was related to academic performance and learning strategies regarding the course grade. Motivation is evaluated through value and expectancy components. The value component includes intrinsic goal motivation (IGM), extrinsic goal motivation (EGM), and task value (TV). The expectancy component is composed of control of learning beliefs (CLB), self-efficacy (SE), and test anxiety (TA). Metacognitive engagement includes self-regulation (SR) and critical thinking (CT). Cognitive engagement is measured by organization (OR), elaboration (EL), and rehearsal (RE); learning engagement is measured through help-seeking (HS), peer learning (PL), effort regulation (ER), and time and environment (TE). The following are sample questions: 'If I study in appropriate ways, then I will be able to learn the material in this course'; 'I try to relate ideas in this subject to those in other courses whenever possible'.

Students answered all questions using a Likert scale ranging from 1 (not at all true of me) to 7 (very true of me).

This scale was used and validated in the same context in previous studies [35,95,96]. All the factors from the instruments were standardized since they were measured by different Likert scales [97].

2.3. Data Analyses

This study aimed to validate the causal pathways proposed in the conceptual model. To accomplish that, all students responded using the scales for the SED and MSLQ, and the instructors used scaffolding strategies to promote interactions. It was taken into account that the sample size was sufficient to calculate the quality of the model. Bentler and Chou [98] mention that the sample size can be calculated by the number of observed variables and suggest that 5 cases per indicator variable would be sufficient when the latent variables have multiple indicator variables.

To ensure the absence of a possible bias of common variance, a time gap (temporal separation) was included to measure the constructs. The independent constructs of motivation and engagement and scaffolding were measured mid-semester; meanwhile, meta- and cognitive constructs were measured at the end of the semester. This means that questions of motivation and scaffolding were gathered first, followed by engagement. A week later, learning strategies, cognitive, and metacognitive strategies were gathered. Likewise, the dependent construct, academic performance, was measured at the end of the semester, when the teachers issued their final grade on a paper list [99].

To validate the relationships proposed in the conceptual model using SEM techniques, it was necessary to reach validity and reliability for all proposed constructs. The values of Cronbach's alpha were determined for all constructs, and values higher than or equal to 0.70 were acceptable to obtain internal consistency. To reach convergent validity, the indexes of composite reliability (CR) and average variance extracted (AVE) were employed. Values higher than 0.7 for CR and 0.5 for AVE were acceptable [100]. To accomplish discriminant validity, it was verified that the values in the diagonal, and those that represent the square root of AVE of each construct, were greater than the squared correlation of the other constructs [101]. To perform the SEM analyses, the software SmartPLS version 3 was used since SmartPLS is based on the partial least squares method. Goodness of fit measures to assess overall model fit are not available. However, CR, Cronbach's alpha, AVE, and the Fornell–Larcker discriminant validity criterion—presented later—are indicators of the goodness of fit of a given model [102].

3. Results

3.1. Reliability and Validity

Table 1 reveals the results of the causal model. It displays Cronbach's alpha, CR, and AVE. The Cronbach's alpha values for all the constructs ranged from 0.9556 to 0.9790, which are acceptable for SEM. In addition, the CR values ranged from 0.9713 to 0.9889, and the values of AVE ranged from 0.8995 to 0.9781; thus, the convergent validity was confirmed for all the constructs.

Table 1. Cronbach's alpha and CR and AVE of constructs (latent variables) of the causal model.

Construct	Cronbach's Alpha	CR	AVE
Motivation (MO)	0.9746	0.9815	0.9299
Scaffolding (SC)	1	1	1
Emotional Engagement (EE)	0.9626	0.9728	0.8995
Emotional Disengagement (ED)	0.9790	0.9835	0.9229
Behavioral Engagement (BE)	0.9556	0.9713	0.9185
Behavioral Disengagement (BD)	0.9647	0.9770	0.9340
Learning Engagement (LE)	0.9596	0.9802	0.9612
Cognitive Engagement (CE)	0.9753	0.9838	0.9530
Metacognitive Engagement (ME)	0.9776	0.9889	0.9781
Learning Achievement (LA)	1	1	1

Table 2 displays the discriminant validity. The diagonal shows the square root of AVE, and the values below it reveal the correlations of the constructs. The diagonal reveals higher values than the correlations; therefore, discriminant validity for all the constructs was achieved.

Table 2. Discriminant validity of constructs of the causal model: motivation (MO), scaffolding (SC), emotional engagement (EE), emotional disengagement (ED), behavioral engagement (BE), behavioral disengagement (BD), learning engagement (LE), cognitive engagement (CE), metacognitive engagement (ME), and learning achievement (LA).

Construct	MO	SC	EE	ED	BE	BD	LE	CE	ME	LA
MO	0.9643									
SC	0.1262	1								
EE	−0.4637	0.2095	0.9484							
ED	0.7166	0.1136	−0.6755	0.9606						
BE	−0.5113	0.1350	0.9334	−0.7209	0.9584					
BD	0.7051	0.0672	−0.665	0.9477	−0.6997	0.9664				
LE	0.9383	0.0527	−0.4870	0.7279	−0.5184	0.7414	0.9804			
CE	0.9480	0.0732	−0.4974	0.7333	−0.5367	0.7384	0.9313	0.9762		
ME	0.9589	0.0635	−0.5092	0.7336	−0.5428	0.7152	0.9453	0.9642	0.9890	
LA	0.1832	0.0891	0.3878	−0.0778	0.4449	−0.0468	0.1822	0.2084	0.1805	1

3.2. Causal Model

The relationships indicated in Figure 2 are significant for the causal model. The findings indicate that motivation has a positive relationship with behavioural disengagement, learning engagement, cognitive engagement, and metacognitive engagement. Scaffolding is positively related to emotional engagement, which, in turn, is related to behavioural engagement and emotional disengagement. Furthermore, emotional disengagement has a negative relationship with behavioural disengagement. Metacognitive engagement has a positive relationship with cognitive engagement, which has an association with learning engagement. Learning engagement is related negatively to behavioural disengagement. Behavioural engagement and cognitive engagement have a significant positive relationship with students' learning achievements.

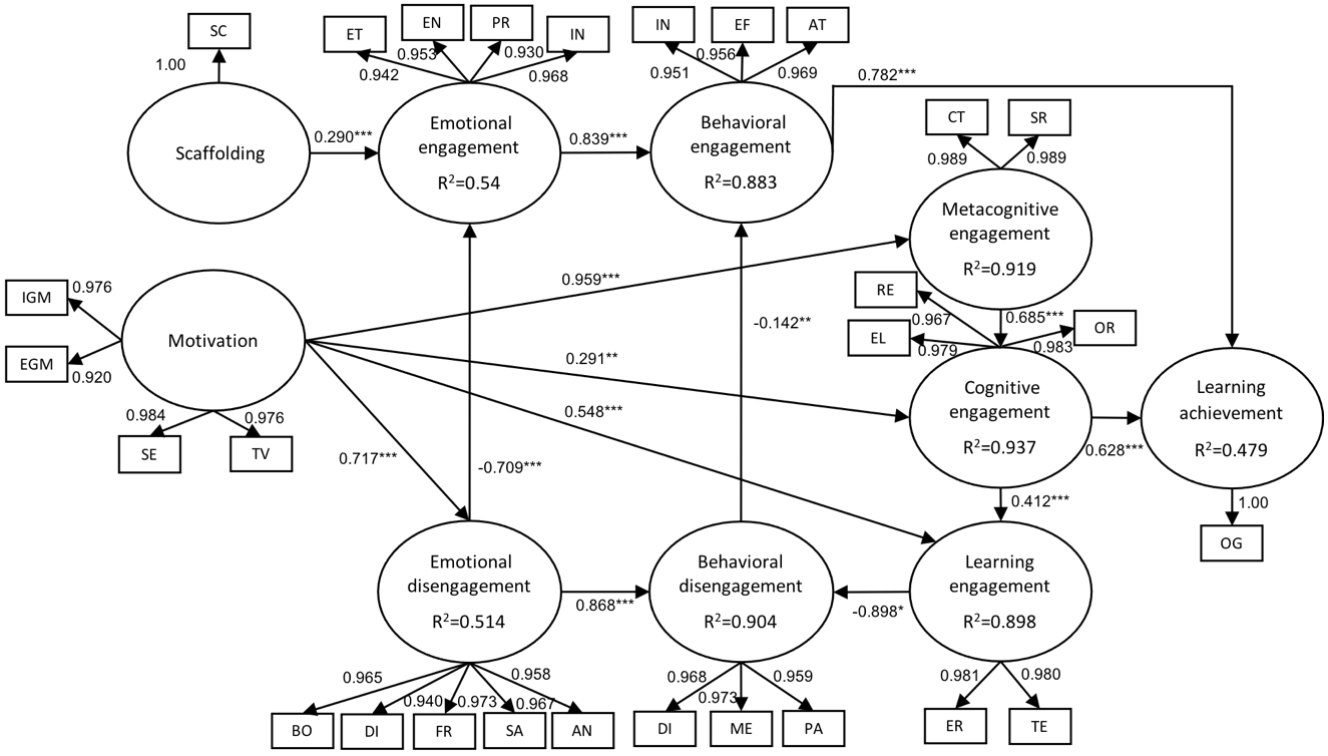

Figure 2. Results of causal model. * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$.

4. Discussion

As observed in Figure 2, there is a positive relationship between motivation and emotional disengagement [60,63]. This suggests that, when students are motivated, negative emotions can be mitigated as there is evidence that emotional disengagement is associated with boredom [103]. This supports the findings by Tze et al. [65], who argued that motivation is influenced by academic boredom, including emotional disengagement, and by Symonds et al. [104], who suggested that emotional disengagement is associated with emotional, personal, and social factors.

The results also revealed that there is a significant positive association between motivation and metacognitive engagement (critical thinking, self-regulated learning) [54,56]. This implies that motivated students tend to seek and use metacognitive strategies, such as planning, monitoring, and regulating their cognition and developing their critical thinking, to build more complex knowledge structures and solve problems [3,15,36,37]. This result shows that motivation plays an important role in student learning. Therefore, designing learning strategies that stimulate and keep students motivated is vital to developing advanced learning strategies.

A positive relationship between motivation and cognitive engagement was also confirmed [48,51,54,105]. This implies that motivated students tend to apply cognitive practices, such as elaboration and organisation, to complete their learning assignments. Motivated students choose deep/elaborative strategies instead of shallow strategies to learn, which allow them to be more successful in performance and academic success [37,86]. Moreover, the path from motivation to learning strategies was found to be significant [53], which can mean that students invest effort in learning strategies of a mechanical nature, for example, in regulation of effort, time dedicated to study, and an appropriate learning environment to achieve cognitive outcomes [37,38]. This means that the physical environment where students study does matter, with available facilities and technologies to achieve better cognitive results.

The findings also revealed a positive relationship between scaffolding and emotional engagement [57]. This means that scaffolding provided by the teacher influences students' emotional engagement [57]. This implies that the help and guidance provided by the teacher can move the emotions of students and encourage them to engage in the learning activity. Therefore, this relationship recognises the significant role of teachers' scaffolding in students' emotions regarding learning.

Furthermore, there is a positive relationship between emotional engagement and behavioural engagement (there is evidence suggesting that behavioural engagement is an antecedent to emotional engagement (e.g., Rose-Krasnor [73], Mahatmya [74]). This result may indicate that positive emotions that students feel drive them to take actions in favour of learning, i.e., emotions such as enjoyment, interest, satisfaction, and pride encourage students to become involved and participate, invest their effort, and provide attention in academic, social, and extracurricular school activities [15,19].

However, a negative relationship between emotional disengagement and emotional engagement was also found in the model. This may mean that, when students feel negative emotions, such as anxiety, frustration, and boredom, these states adversely affect their level of positive engagement and prevent students being involved emotionally in learning activities [10,14], which can also lead to poor school performance [64]. That is, it is necessary to know what the factors are that can produce negative emotions in students and be able to discourage them so that they feel emotionally committed.

The findings also show that behavioural engagement has a significant positive effect on students' learning achievements [3,71,72]. This suggests that students who are more engaged in academic activities would experience more significant learning achievement and be more likely to obtain higher grades. In other words, students who worked hard and were persistent and dedicated in their school activities scored higher.

In addition, it was found that there is a negative relationship between behavioural disengagement and behavioural engagement. Thus, students who show negative be-

haviours, such as passivity, withdrawal, being distracted, being mentally disengaged, and being unprepared [10], show inadequate motivational states, so they hardly participate in school activities.

A significant positive relationship was observed between metacognitive engagement and cognitive engagement [51]. This implies that engaged students can plan, monitor, and control cognitive practices, such as organisation and elaboration, to solve a learning activity [82].

It was also noted that cognitive practices that students choose are related to both the physical environment they have to study and the effort they invest in their study since a significant relationship was observed between cognitive engagement and learning engagement. Moreover, a positive relationship exists between cognitive engagement and learning engagement. This indicates that the level of learning engagement depends on the cognitive assignment. This also involves scheduling, planning, and managing their study time and environment. Such a finding is consistent with Rotgans et al. [87], who found that students' cognitive engagement fluctuated depending on the learning activity, and Huang [88], who revealed how learning activities (that use gamification) enhance students' cognitive engagement.

A negative relationship was also found between learning engagement and behavioural disengagement, which implies that how students manage their time and study environment can provoke negative behaviours, such as distractions, mental withdrawal, and passivity.

The results of the current study suggest that scaffolding enhances emotional engagement as teachers' support and feedback foster students' emotions of being enthusiastic, interested in the class, joyful in learning activities, and proud of their learning achievements. The results also support the conjecture that cognitive engagement is directly influenced by metacognitive engagement, learning engagement is influenced by cognitive engagement, and all of them are triggered by motivation. Thus, metacognitive engagement is on a higher plane than cognitive engagement, and cognitive engagement is on a higher plane than learning engagement. This reveals the complex interactions among them.

This means that students who obtained higher course grades possessed higher levels of cognitive engagement, which is consistent with the findings of Broadbent [78], Pintrich and de Groot [79], Puzziferro [80], Vanderstoep [81], Chen and Wu [82], and Rotgans et al. [87]. This study implies that students' learning achievements may be triggered by increasing cognitive, metacognitive, and learning engagement, including motivational strategies, such as students' effort recognition and promoting students' self-confidence and autonomy.

5. Conclusions

In conclusion, the current research introduced a definition of metacognitive and learning engagement based on the frontiers between metacognition and cognition previously established in the literature. A conceptual model that includes cognitive, behavioural, emotional, scaffolding, and motivation and the two new definitions (metacognitive engagement and learning engagement), showing their effects on students' learning achievements, was proposed and validated. To the authors' best knowledge, a comprehensive model (that includes the constructs mentioned above) has not yet been introduced.

Therefore, it can be concluded that the teacher has a button that can boost the positive emotions of the students, which moves them to get involved in carrying out their school activities; this undoubtedly has positive effects on their academic performance. Likewise, it is observed that, when students feel motivated to learn, motivation is a driver for them to use more metacognitive strategies. It was also noted that the physical environment where the student takes his/her classes or completes his/her homework is essential to prevent behaviours such as passivity and disinterest.

From this research, practical implications can be noted: it has demonstrated that scaffolding strategies positively affect students' emotional engagement, implying that teachers could develop their scaffolding strategies since they can promote positive emotions in students while learning.

As was proved, the role of motivation on students' learning is essential. At this point, educational practitioners and managers could design learning strategies that stimulate and keep students motivated to develop advanced learning strategies, taking into account the physical environment where students learn, with available facilities and technologies to achieve better cognitive results.

5.1. Limitations of the Research

One limitation of this study is related to the sample size and that it was collected from a single university.

Another limitation of the study is that scaffolding was only measured by the students' perception and the opinion of the teachers about it was not considered. Additionally, only self-reports were used to assess academic engagement.

5.2. Future Research

For future research, it might be interesting to analyse the effects of online scaffolding, either automatically issued by a platform or by the teacher during his/her class. On the other hand, since motivation and emotions can vary over time, it would be interesting to analyse their effects considering various measures during a school year. It would be interesting to repeat this study with a larger sample and obtain data from more universities to validate the results.

Author Contributions: Conceptualization, E.A.-G. and A.R.-A.; methodology, E.A.-G. and A.R.-A.; formal analysis, E.A.-G.; investigation, E.A.-G.; resources, E.A.-G. and A.R.-A.; writing—original draft preparation, E.A.-G.; writing—review and editing, E.A.-G.; supervision, E.A.-G. and A.R.-A.; funding acquisition, E.A.-G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Instituto Politécnico Nacional, grant numbers SIP20220747 and SIP20220415.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to thank the Instituto Politécnico Nacional for their support of this research.

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

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