

# Self-Regulation and Other Learning Dimensions in Hybrid Courses: Which Characteristics Matter in Academic Performance?

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## ABSTRACT

Hybrid education has been referred to as the 'third generation' of distance education. An increasing number of universities are including hybrid courses within their academic offer, especially due to the worldwide pandemic that COVID-19 has caused. Therefore, it is very important to understand how students deal with the hybrid experience. Previous studies have been focused mainly in 100% online courses, but little research has been done in hybrid education. It is important to understand how self-regulation and student learning profiles can affect in a positive or in a negative way their academic performance during the course. The data was collected on hybrid courses offered by the Tecnológico de Monterrey in Mexico, through the CEVEAPEU questionnaire to 4,857 students of different careers programs of the 26 different campuses around the country. An exploratory data analysis was performed, as well as a statistical correlation analysis of Pearson and Spearman. Our findings show that the factors that affect the final academic performance of a student more significantly, although with a weak correlation, are intrinsic/extrinsic motivation, anxiety, self-regulation, and information processing. Therefore, we can conclude that, although self-regulation is a dimension that affects performance in hybrid courses, it is not the only dimension, nor it is a determining factor in the final grade on whether a student will pass or fail a course.

**Keywords:** hybrid education, learning dimensions, academic performance, higher education, educational innovation

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## 1 Introduction

Hybrid education has been referred to as the 'third generation' of distance education systems (So and Brush, 2008). The first generation consisted of "correspondence education", which used a one-way instructional delivery method, such as mail, radio, or television. The second generation consisted of distance education with a single technology, such as computer-based or Internet-based education. In this second generation, we find what we now know as online courses. Now, we begin to hear of a third generation of distance education, which is hybrid education, characterized by maximizing the best advantages of face-to-face education and multiple technologies to improve teaching. In other words, using technology resources in an integral and key part for improving school achievement as well as learning experiences. The

concept of hybrid education refers to any combination of instructional delivery methods, usually including a period for face-to-face teaching accompanied by synchronous or asynchronous use of technologies.

The supply of hybrid courses in higher education has increased in recent years, perhaps due to the vertiginous development of digital technologies and the "flexibilization" of education. Some universities have even used hybrid courses to mitigate the shortage of classrooms and other issues, such as shortage of professors, students who cannot easily move to the campus (for example, students who are already working), or courses where, due to the nature of the course, a 100% online course could not be an option, to name a few. On the other hand, other institutions remark that exposing students to an online course is essential to prepare them properly for entering the working world (Young, 2002).

The Tecnológico de Monterrey, a private university in Mexico, has started the implementation of the Tec21 educational model, which is based on four pillars: challenge-based learning, flexibility, inspiring professors and memorable experiences. The objective of the new model is to prepare professionals who have the necessary skills and competencies to be successful professionals. This model is based on the vision of the institution: "We prepare leaders with entrepreneurial spirit, human sense and internationally competitive" (PDP Tec21, 2018). This change of learning model has been taking place in stages, among which are the implementation of the following programs: i-week, i-semester, flexible remedial replacement courses, design of new curricula and of a new model of challenges and competencies (PDP Tec21, 2018). Additionally, as part of this transition towards a new educational model, an initiative was created to offer a new type of career called "Trajectories", which offers the student the opportunity to explore, decide and specialize throughout their training process (PDP Tec21, 2017). Part of the Trajectory model is the need for subjects declared as optional exploration subjects to be available on all the 26 campuses of the institution. However, not all campuses have the capacity to offer all these subjects every semester, since they vary in size. To solve this problem, in 2016, Tecnológico de Monterrey began offering the FIT courses (Flexible, Interactive and with Technology), which enabled the 26 campuses to provide these optional exploration subjects during each term (Spring and Fall), regardless of the number of students in their campus who wish to enroll. This was achieved thanks to the technology used for these courses that makes it possible to create groups of students and professors from different campuses, so, even if a single student wants to take the course, the campus has the facility to offer it through this model (Zepeda, 2017). Since the beginning of this project, Tecnológico de Monterrey has exponentially increased the offer of hybrid courses through different models: courses with international leaders, regional courses, courses using holograms known as Professor "Avatar", and the above-mentioned FIT courses. However, despite the popularity of hybrid courses, little is known about how students deal with the hybrid experience, because most of the technology-based instruction research has focused only on the online part of it (Young, 2002). Recently, a study on how comfortable university students feel when taking online courses and on the evaluation of their experience, reported that personality and some demographic characteristics might influence the student performance (Keller and Karau, 2013). It is noteworthy that little has been investigated on this subject for hybrid courses. This leads us to reflect on the importance of being able to measure and document how students live a hybrid course learning experience, know and detect if there is a type of student who benefits

most from this type of courses, especially if as observed, there will be an inevitable increase in the availability of hybrid courses.

### **1.1 The FIT Course Model**

The FIT model belongs to the hybrid-learning spectrum under the flexible online learning variant. It is a mixture of a 100% online course, and a face-to-face course. The three theories that support the FIT learning model are: authentic learning, situated cognition and social learning (Zepeda, 2017). In a FIT course, students have 90-minute synchronous sessions, twice a week through the Zoom platform. Attendance is mandatory. The groups are composed of a maximum of 30 students from at least two different campuses of Tecnológico de Monterrey. The assigned professor must not belong to any of the students' campuses, so that students can have access to professors they usually do not interact with. This type of hybrid course gives both students and professors the flexibility of being in class from anywhere around the world. In addition, FIT courses enable the possibility of interaction between teacher and students and among students in a synchronous and asynchronous way. (Zepeda, 2017). A multidisciplinary team, consisting of professors, instructional designers, pedagogical advisors, graphic designers and programmers, designs each FIT course. The team of designer professors is in charge of creating all the academic material for each class session and out-of-class work: activities, exams, presentations, and guidelines. This has also enabled the university to standardize the information that the students will be learning, as well as the students' evaluation form among the 26 campuses. Thus, no matter what campus the student is from, a standard level of knowledge required for each subject is ensured. Similar to a 100% online course, students can have access to the schedule of deliveries of activities, tasks and exams from the first day of class, and it is their responsibility to get acquainted with and be aware of the course calendar and due dates of assignments. However, unlike a 100% online course, for students to be able to move forward in the course activities, they require the professor's guidance provided through the weekly sessions, so it is not a 100% self-directed course, as is the case of a 100% online course. In addition, the due dates for task delivery can be modified by the professor, depending on the progress made in the weekly classes. Finally, when the FIT course model was launched, a question began to arise: to what degree did self-regulation affect student performance in hybrid courses?

### **1.2 Self-Regulation of Learning**

In the broadest sense, self-directed learning describes a process by which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, and selecting and applying appropriate learning strategies and assess learning outcomes (Knowles, 1975). Other authors define self-directed learning (or self-direction of learning) as a synonym for self-regulated learning. In this article, we will talk about self-regulation, self-direction, and self-management as synonyms. Self-direction is a generic competence for university education; its usefulness lies in 'the availability to continue learning throughout life'. Likewise, the Mexican Education Ministry also includes learning autonomously as part of its list of generic competences that involve the student's ability to direct, organize and build their knowledge process (Herrera, 2016). As can be seen in the previously mentioned definitions of self-

direction, this term, in the academic context, refers to the ability of a person to be able to meet the objectives of a course or a university career. To do this, one must have skills such as, be oriented to meet objectives, have a capacity for self-motivation, be critical and objective to be able to detect areas to improve, among others.

### **1.3 Self-Regulation in the Context of Hybrid Education**

In hybrid education environments, the importance of self-motivation and self-management increases because there is less time in the classroom and there is more emphasis on self-learning. However, several investigations have found that students have difficulty adapting to hybrid education (So and Brush, 2008). As mentioned earlier, more and more universities offer courses in hybrid mode, so understanding the role that self-regulation plays in this type of courses is transcendental and knowing the strengths and weaknesses of students in this subject is even more relevant for a good learning experience. Young (2002) describes that, "although a hybrid educational environment provides a wide range of tools, not all students are able to use these tools in relation to one another." Similarly, although the hybrid courses contain a variety of ways to get information from students to support them in the learning process, not all students use them or have the ability or maturity to take responsibility for their own learning. This leads to these tools not being used optimally. In addition, when they compared the grades of those who did the activities and used the resources with those that did not, there was a considerable difference between them (Lust *et al.*, 2011). That is why we cannot assume that, just because students have several innovative tools and good quality complementary material in hybrid courses, they will attend satisfactorily or be attracted to this type of courses.

### **1.4 Measurement of Academic Performance in FIT Courses**

FIT courses are designed based on the analytical plans created for each subject. Therefore, the measurement of academic performance in these courses is the fulfillment of the goals set for each course in the analytical plan. This compliance is measured with a numerical grade, which is obtained through performance and compliance with the activities carried out throughout the semester. In particular, the design of the FIT courses has a backbone activity called the core activity, which can be a collaborative project, the strategy to solve cases or a challenge. As the name implies, this activity is the main focus on which the course develops and is the one that sets the standard for the generation of other activities (support activities such as homework, exams, class activities), which they must equip the student with the necessary tools so that he can satisfactorily finish his core activity (PDP Tec21, 2016). The level of development of the core activity, therefore, becomes the primary determinant in the measurement of student performance. If a student does not create the habit of carrying out the support activities, he/she will hardly have fulfilled the learning objectives of the course and, therefore, it will be very difficult to carry out the core activity. That is why self-regulation is vital to be able to perform well in FIT courses.

### **1.5 Approach and Goal of this Study**

Implementation of FIT hybrid courses started in August 2016. Three years after launching this program, some students and professors had stated that FIT courses are not suitable for all students and that some benefit more than others. That is, they believed that students who enroll

in a FIT course must have a certain profile (which meant that they were not suited for everyone), and they usually emphasized on the need to have a strong self-regulation development. However, this has only remained as general beliefs, and no systematic studies had been conducted to assess whether there is indeed a relationship between the level of self-regulation and the academic performance of students enrolled in FIT hybrid courses. Therefore, this article will address the following questions:

Is there a relationship between the level of development of self-regulation of a student and their final grade obtained in a FIT hybrid course? What other variables affect the grade obtained in a FIT hybrid course?

## 2 Methodology

### 2.1. Diagnosis of Self-Regulation Skills: The CEVEAPEU Questionnaire and its Adaptation to Mexico

Several questionnaires seek to measure the level of development of the individual skills of students regarding self-regulation. For the FIT hybrid courses, it was determined that the questionnaire that would be used to measure the self-regulation capacity of each student was a questionnaire derived from CEVEAPEU (Questionnaire for the Evaluation of Learning Strategies of University Students). This questionnaire arises from the self-regulated learning model of Pintrich and Schrauben; based on this model, Gargallo (2009) proposed the following areas to measure the learning strategies that would later give birth to the CEVEAPEU questionnaire: affective, support and control strategies; cognitive strategies (related to information processing). Accordingly, this classification “encompasses the three fundamental dimensions of the human mind related to learning: will, capacity and autonomy (want, power and decision) without neglecting any”. The questionnaire consists of 88 items, which are measured on a Likert scale, that is, with five response options: *strongly disagree*, *disagree*, *undecided*, *agree* and *strongly agree*. This questionnaire was developed thinking in the context of university education in Spain (Gargallo et al., 2009). Later, Neri et al., (2015) applied this questionnaire in the context of university students in Mexico. As part of these adjustments were adaptations to the Mexican lexicon and context, as well as regrouping the 88 questions in the following categories: intrinsic motivation (MI), extrinsic motivation (ME), physical and mood state (EFA), anxiety (ANS), self-regulation (AR), social interaction (IS), strategies information search and selection (EBSI), and information processing and use strategies (EPUI) (for a detailed definition of each category, see the Appendix). The Likert scale was maintained. To interpret the results, if the value is between 1 and 3, the dimension is poorly developed, while if it is between 3 and 5, the dimension is well developed.

### 2.2. Sample Size

The sample consists of 4,857 students from different majors of the 26 campuses of the Tecnológico de Monterrey who took a FIT course during the Spring 2017, Spring 2018 and Fall 2018 semesters. Students belong to the first 4 semesters (freshmen and sophomores) of their program, and all are between 17 and 29 years old, most of them being between 18 and 22 years of age. Students' final grades were used, as well as the results of the self-regulation skills

test, which was applied during weeks 1 and 2 of each semester. An exploratory data analysis was performed, as well as a correlation analysis of Pearson and Spearman.

### 3 Results and Discussion

The findings showed that the factors that have a correlation with the outcome of a student's final grade are intrinsic motivation, extrinsic motivation, anxiety, self-regulation, information selection and information processing. From those, the factors that most significantly affect a student's final grade are intrinsic/extrinsic motivation, anxiety, self-regulation, and information processing. Table 1 shows that, although the correlations are significant, their strength is small. This means that there is a great certainty that there is a correlation between the factors and a student's grade, but the effect of these factors on the final grade is small. That is, the final grade increases or decreases few points.

Table 1.

*Correlation Between Final Grade and Dimensions of Learning Strategy and Self-Regulation*

Dimension of Learning		Pearson	Spearman
<i>Intrinsic Motivation</i>	Correlation	0.041**	0.031*
	Sig. (2-tailed)	0.004	0.030
	N	4857	4857
<i>Extrinsic Motivation</i>	Correlation	-0.095**	-0.124**
	Sig. (2-tailed)	0.000	0.000
	N	4857	4857
<i>Mood</i>	Correlation	-0.009	-0.018
	Sig. (2-tailed)	0.522	0.215
	N	4857	4857
<i>Anxiety</i>	Correlation	-0.070**	-0.098**
	Sig. (2-tailed)	0.000	0.000
	N	4857	4857
<i>Self-Regulation</i>	Correlation	0.068**	-0.090**
	Sig. (2-tailed)	0.000	0.000
	N	4857	4857
<i>Social Interaction</i>	Correlation	0.030*	0.007
	Sig. (2-tailed)	0.035	0.610
	N	4857	4857
<i>Information Selection</i>	Correlation	0.089	0.129**
	Sig. (2-tailed)	0.000	0.000
	N	4857	4857
<i>Information Processing</i>	Correlation	0.075**	0.088**
	Sig. (2-tailed)	0.000	0.000
	N	4857	4857

Note: \* Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).

A negative and weak correlation was found on two factors: extrinsic motivation and anxiety. On the other hand, a positive and weak correlation was found on four factors: intrinsic motivation, self-regulation, information selection, and information processing.

Another finding is that the average and the median of the final grade of students is different when any of the significant factors is at the “Well developed” level. That is, it is likely that a student will do slightly better if they are intrinsically motivated, if they know how to self-regulate and if they have strategies that help them process and organize the information. In addition, a student is likely to perform slightly worse if they easily become anxious when doing course activities or if their motivation depend on factors external to them.



Then, we decided to verify if the level of development of learning strategy and self-regulation dimensions is related to obtaining a final passing grade, the Chi-square test was used. It is observed that the only dimension that shows a relationship between these variables is that of extrinsic motivation. Table 2 shows the Chi-square test to verify if the level of development of learning strategy and self-regulation dimensions are determining factors to pass a course.

Table 2.

*Development of Learning Dimensions as a Determining Factor to Obtaining a Final Passing Grade*

Dimension of Learning		Value	Significance
Intrinsic Motivation	Pearson Chi-square	0.038	0.845
	N	4857	4857
Extrinsic Motivation	Pearson Chi-square	12.152	0.000
	N	4857	4857
Mood	Pearson Chi-square	0.907	0.341
	N	4857	4857
Anxiety	Pearson Chi-square	2.383	0.123
	N	4857	4857
Self-Regulation	Pearson Chi-square	0.591	0.442
	N	4857	4857
Social Interaction	Pearson Chi-square	0.988	0.320
	N	4857	4857
Information Selection	Pearson Chi-square	0.008	0.930
	N	4857	4857
Dimension of Learning		Value	Significance
Information Processing	Pearson Chi-square	1.176	0.278
	N	4857	4857

Through the Chi-square test, an analysis of whether the level of development of learning strategy and self-regulation dimensions is related to obtaining a final grade of 90 or more was performed. Table 3 shows that six out of the eight dimensions do show a relationship between the variables and obtaining a final score of 90 or more, with the exceptions of mood and social interaction.

Table 3.

*Development of Learning Strategy and Self-Regulation Dimensions as a Determining Factor to Obtaining a Final Grade of 90 or More*

Dimension of Learning		Value	Significance
Intrinsic Motivation	Pearson Chi-square	8.611	0.003
	N	4857	
Extrinsic Motivation	Pearson Chi-square	39.905	0.000
	N	4857	
Mood	Pearson Chi-square	0.164	0.685
	N	4857	
Anxiety	Pearson Chi-square	60.145	0.000
	N	4857	
Self-Regulation	Pearson Chi-square	4.605	0.032
	N	4857	
Social Interaction	Pearson Chi-square	0.266	0.606
	N	4857	
Information Selection	Pearson Chi-square	7.128	0.008
	N	4857	
Information Processing	Pearson Chi-square	12.199	0.000
	N	4857	

## 4 Conclusions

The analysis of our results indicate that, although some of the learning dimensions evaluated in the CEVEAPEU questionnaire, have a positive or negative impact on the final grade of a student, these are not key determinants to knowing whether a student will pass or fail a course. In this sense, it can be stated that there are other unknown factors that are of greater weight to determine whether a student will pass a course. In contrast, most of the learning dimensions evaluated in the questionnaire are key to knowing if a student will obtain a grade equal to or greater than 90. Thus, it can be concluded that, although there is a relationship between the results of the self-regulation dimension of the CEVEAPEU questionnaire and the final grade obtained by students, to have a poorly developed self-regulation learning dimension may not be determinant for having a passing grade in a hybrid FIT course. Students, having the results of their questionnaire, can consciously seek to develop the dimensions that they have not yet developed to have more possibilities of obtaining a higher grade than what they would obtain if they did not seek to develop these dimensions. Further research on identifying those external factors that are decisive in student performance in hybrid courses should be performed.

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## Appendix

### *Definition of Each Learning Dimension*

<b>Dimension of Learning</b>	<b>Definition and characteristics</b>
<i>Intrinsic Motivation</i>	The student is intrinsically motivated and has confidence in themselves to commit to studying the subject alone and with enthusiasm
<i>Extrinsic Motivation</i>	The student depends on external factors to focus on studying the subject.
<i>Mood</i>	The student tries to ensure that their physical and mental situations are adequate to obtain a better academic performance.
<i>Anxiety</i>	Level of anxiety that a student expresses.
<i>Self-Regulation</i>	The student is aware of objectives and form of evaluation of the course, plans their activities, controls their space and time for learning, adapts to the conditions of the course and makes decisions to improve their performance.
<i>Social Interaction</i>	The student values teamwork and seeks support from their peers when there are academic difficulties.
<i>Information Selection</i>	The student manages strategies to search, discriminate and select the relevant information for the subject.
<i>Information Processing</i>	The student manages strategies to organize and process the information of their courses, as well as transfer it to other contexts or subjects