

# An exploratory study of university students' regulation profiles and satisfaction with flipped classrooms

## Estudio exploratorio sobre los perfiles de regulación y la satisfacción con el aula invertida en estudiantes universitarios

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### Abstract:

This study, based on the learning patterns model, analyses the relationship between different regulation profiles and satisfaction with a flipped-classroom didactic experience at university. A profile of genuine self-regulation is identified, as well as learning profiles based on external regulation and passive regulation. A total of 178 university students participate, voluntarily answering the regulation strategies subscales of the ILS inventory and another final questionnaire about satisfaction with the flipped classroom and their perceived learning during this didactic experience. The results show a clear relationship between the self-regulation profile and satisfaction with the flipped classroom, although satisfaction was also found in students with an external regulation profile. However, this last group did not show satisfaction with their academic outcome. Another profile that was less adaptive thanks to its passiveness towards regulation was also identified. The results are discussed and the importance of designing personalised learning itineraries based on the specific command of regulation strategies is emphasised. Consequently, the design of educational actions should consider the regulation profile to adapt to students' specific characteristics and guarantee the success of the didactic strategy.

**Keywords:** regulation strategies, flipped classroom, university students, satisfaction, self-regulation.

### Resumen:

En este estudio, sobre la base del modelo de patrones de aprendizaje, se analiza la relación existente entre diferentes perfiles de regulación y la satisfacción con una experiencia didáctica de aula invertida en la universidad. Se identifica un perfil de auténtica autorregulación, pero también perfiles de aprendizaje basados en la regulación externa e incluso en una regulación pasiva. Participan 178 universitarios que, de manera voluntaria, responden, por un lado, a las subescalas de estrategias de regulación del inventario ILS; por otro, a un cuestionario final acerca de la satisfacción con el aula invertida y la percepción de aprendizaje durante esta experiencia didáctica. Los resultados muestran una clara relación entre el perfil de autorregulación y la satisfacción con el aula invertida, aunque también se halló satisfacción en los estudiantes con un perfil de regulación externa. Sin embargo, estos últimos no se mostraron satisfechos con su resultado académico. Además, se identificó un perfil menos adaptativo por su condición de pasividad ante la regulación. Se discuten los resultados y se destaca la importancia del diseño de itinerarios personalizados de aprendizaje sobre la base del dominio específico de las estrategias de regulación. Así, el diseño de acciones formativas debe considerar el perfil de regulación para adaptarse a las características específicas de los estudiantes y garantizar el éxito de la estrategia didáctica.

**Palabras clave:** estrategias de regulación, aula invertida, universitarios, satisfacción, autorregulación.

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## 1. Introduction

Learning at university level requires activation of scientific, critical, reflexive, and self-regulated thought. This self-regulated learning would undoubtedly be identified as an important matter that should be fostered at the start of, during and after university education (Kyndt et al., 2017). However, despite having been identified as an urgent need in the late-20th century (Martínez-Fernández, 1999), autonomous learning by university students continues to be one of the major challenges facing universities. The European Higher Education Area laid the foundations for balancing students' engagement inside and outside class, which has consequently resulted in reconsideration and establishment of measures for regulating autonomous learning (Broc, 2011).

This study explores the relationship between regulation profiles and satisfaction with the innovative flipped classroom (FC) didactic strategy during processes of learning in the university. FC is a didactic strategy that has been incorporated into higher education and is recognised for fostering, among other aspects, students' active participation and autonomous learning (González-Zamar & Abad-Segura, 2022; Kapur et al., 2022; Mengual-Andrés et al., 2020; Sosa Díaz et al., 2021; Strelan et al., 2020). Consequently, it initially seems to be a very desirable option for activating critical, creative, and self-regulated thinking. However, there is a gap in the literature on differences in how students put flipped classrooms to use and their level of satisfaction with them depending on their students' regulation profiles. Accordingly, this study explores the relationship between different regulatory profiles of a group of university students, satisfaction with FC, and perceived learning.

FC is characterised by autonomous study of learning resources supported by digital technology and application and discussion in the classroom of what has been learnt (Sandobal et al., 2021). FC has been recognised as improving learning outcomes, flexible learning, time management, self-regulation, satisfaction, and motivation (Chang, et al., 2020; Galindo-Domínguez, 2021; Memon et al., 2021; Mengual-Andrés et al., 2020; Noguera et al., 2022; Noguera et al., 2023; Torres-Martín et al., 2022). Regarding satisfaction, many studies show that students report greater satisfaction with FC than with more traditional teaching methodologies (Fidan, 2023; Llic, 2021; Sointu et al., 2022; Strelan et al., 2020). However, FC is not without its challenges, as

difficulties have been found relating to engagement before the class session, work overload, digital competence, and resistance to change by the students (Chen et al., 2023; Han et al., 2023b, Sosa Díaz et al., 2021). Therefore, regulation of learning appears to be a key part of FC so that, for example, time spent on independent work, particularly relating to pre-class activities, is effective. In this sense, students must be responsible for their own learning process and carry out the pre-class tasks required (Mahmood & Mohammadzadeh, 2022; Yang, 2021). It is expected that this will release instructional time in class sessions to resolve doubts, develop competences, and co-build knowledge in order to stimulate meaningful learning (Jung et al., 2022; Park & Kim, 2022; Sein-Echaluce et al., 2022).

Nonetheless, activating meaningful self-regulation and co-regulation strategies is identified as a significant challenge for university students. In this regard, Monereo et al. (2013) consider the friction between students' individual characteristics (self-regulation) and how this action connects to cooperation with others. So, while it is true that self-regulated learning integrates individual thoughts, emotions, and actions on the basis of the individual's own (personal) experiences (Zimmerman, 2000), it is a set of beliefs and actions that, in cooperative learning situations, must connect and flow or clash with the beliefs and actions of the other. Accordingly, different people with different levels/types of regulation doing a task together entails a challenge in itself; and the regulatory challenge is even greater if it also relates to the principle of FC (preparing for the class or its content).

In this sense, Vermunt (1998) defines two further categories in addition to self-regulation: external regulation and lack of regulation. Consequently, self-regulation is activated from a framework of beliefs based on the constructive conception of learning with an intrinsic motivation and positive impact on academic performance through deep processing strategies (De la Fuente et al., 2020; Martínez-Fernández & Vermunt, 2015; Vega-Martínez et al., 2023; Vermunt, 1998). A second category refers to learning beliefs that are based on memorising blocks of information and motivated by grades that activate a type of external regulation and superficial processing. Thirdly, if the basis of beliefs is dependence on stimulation by others with an ambivalent motivation, no regulation is activated (neither self- nor external-regulated) and

there would be a lack of regulation, which is a profile associated with higher levels of academic stress, a lack of coping resources, and low performance (Vega-Martínez et al., 2023).

In research into FC, some works have considered in depth the relationship with learning regulation; specifically, self-regulation of learning during independent work time has been investigated. Regarding regulation, Jung et al. (2022) underline a positive influence of guided regulation on the use of higher-level cognitive skills. Cavalcante et al. (2021) have investigated self-regulation and co-regulation in FC, concluding that further research into the different dimensions in regulation of learning is needed. In this sense, various authors are exploring the sharing of regulation processes (shared regulation and co-regulation), with positive learning outcomes (Jafarian et al., 2021; Jung et al., 2022; Kim et al., 2021; Park & Kim, 2022; Zheng et al., 2020).

With regards to self-regulation of learning, the results of the research by Park and Kim (2022) show that it has a positive impact on co-regulation, behaviour, and academic outcomes. On this line, various studies report a direct relationship between self-regulation skills and academic performance (Aslan, 2022; Hyppönen et al., 2019; Montgomery et al., 2019; Nacaroglu & Bektaş, 2023). For their part, Doo and Bonk (2020) have shown that self-regulation has effects on learning engagement and on the success of FC. Furthermore, some studies have found that FC improves students' self-regulation skills. For example, Zarouk et al. (2020) and Bredow et al. (2021) conclude that FC increases cognitive and metacognitive functions.

Latorre-Coscolluela et al. (2021) have found an improvement in self-efficacy (one of the aspects of self-regulation) in the use of FC. However, there is also evidence that university students have limited self-regulation skills (Han et al., 2023a; Klimova et al., 2022; Valenzuela et al., 2020) and so the success of implementing FC might be reduced. Likewise, some authors (López et al., 2019; Moreno-Guerrero et al., 2021) reveal serious shortcomings in teachers for the application of an FC-based learning methodology or focus. The authors essentially identify the use of new technologies, number of devices or digital skills, and teachers' beliefs as obstacles to the success of FC.

In summary, teachers' competences and students' regulation strategies require analysis in FC situations as there is little literature on the role of self-regulation (Alamry, 2017; Rasheed et al., 2020). Furthermore, the literature on other forms of regulation of learning in FC is even more limited, albeit likewise necessary (Luo et al., 2020). In this sense, the contribution of Vermunt (1998), which, from a variables-focused perspective, describes three types of regulation (self-regulation, external regulation, and lack of regulation) is of value. Furthermore, in the case of the first type, it proposes two subscales according to whether the person tends towards regulation of content, of processes, or of outcomes (see Table 1). All of this is in a line of research that has emphasised the high levels of external regulation that university students seem to require (Martínez-Fernández & Vermunt, 2015; Vega-Martínez et al., 2023; Vermunt et al., 2014), and which raises the need to distinguish between the presence of external regulation and self-regulation (De la Fuente et al., 2022).

TABLE 1. Regulation strategies.

<b>Self-regulation</b>	<b>...of processes and outcomes</b> Assessing progress in learning as an attempt to respond to the questions/doubts that the student poses regarding the content of a module.
	<b>...of content</b> As well as the official content/materials of a module, this involves searching for additional information in other sources.
<b>External regulation</b>	<b>...of processes</b> Limiting oneself to studying according to the instructions given in the course materials and/or by the teachers.
	<b>...of outcomes</b> Only evaluating learning from the results of the tasks carried out in a module.
<b>Lack of regulation</b>	Being aware of the difficulty of determining whether someone has command of the content of a module, or of managing the study material.

Source: Vermunt (1998).

On the basis of what is set out above, the aim of this study is to analyse the relationship between regulation profiles in university students and satisfaction in an FC didactic experience. So, we propose answering two questions:

1. What regulation profiles are identified in university students?
2. What relationship is observed between the regulation profiles, satisfaction, and the sensation of learning with an FC-based didactic experience?

## 2. Method

### 2.1. Study design

This article is part of a teaching innovation project called *Seqüències d'aprenentatge actiu i autoregulat en contextos síncrons i asíncrons (Active and self-regulated learning sequences in synchronous and asynchronous contexts)* and funded by the Universidad Autònoma de Barcelona. It consists of a teaching team of eleven people from the faculties of Educational Sciences, Sociology, and Economics, who redesigned eight modules during the 2021–2022 academic year (see Table 2). Their aim was to incorporate the flipped classroom teaching strategy to foster active and self-regulated learning.

TABLE 2. Characteristics of the modules participating in the project.

Module	Programme	Year	N	Duration of FC	Application sessions
1	Early Childhood Education	1	70	3 months	7
2	Primary Education	1	76	3 months	7
3	Master's in Educational Psychology	-	9	2 months	7
4	Social Education	3	48	2 months	9
5	Early Childhood and Primary Education	3	63	2 months	9
6	Economics	3	36	1 month	7
7	Social Education	3	70	1 month	8
8	Pedagogy	3	60	3 months	8

Although the modules are delivered over one semester or a whole academic year, the application of the flipped classroom ranged from one to three months. As a result of the pandemic, in modules 1 and 2, the teaching modality was intermittently face-to-face, alternating face-to-face teaching with virtual or hybrid sessions (with students connecting to the face-to-face class online) as the situation required. The other modules were face-to-face. The instruction design process was carried out over a semester. The objective in modules 1 and 2, which already used FC, was to increase consultation of resources outside class and provide evidence of knowledge acquisition. In the rest of the modules, the focus was on reducing lectures and promoting active

learning in class. It was agreed that all of the designs would include at least one didactic strategy for self-regulated learning, one resource in a format other than the normal one, and one digital technology. A list of strategies for fostering self-regulation was established after a period of document review, training, and teamwork. So, an effort was made to ensure that the students consulted the resources in a guided way and demonstrated their learning. For example, the handouts offered questions for reflection that had to be answered after consulting a resource (e.g., in a forum) or guidelines for summarising content (e.g., through a mind map to be presented in class). Verification tests, one of the most used strategies, required students to answer

a series of questions with short responses during the consultation of resources (by means of short interactive H5P videos) or after it (using voting tools such as Mentimeter). Knowledge verification tests at the end of the face-to-face sessions were also used, requiring students to summarise the key ideas covered in the session. Joint construction of rubrics was used for reflecting on and becoming aware of the assessment criteria, and also as a resource to guide the learning process. In most cases, activities associated with consulting resources were assessed but not evaluated; in other words, they were given a percentage score but not a grade.

Table 3 shows the specific strategies for each stage in the flipped classroom (before, during, and after the synchronous session). The design of all of the modules included consulting resources in advance in a variety of formats (textual, audiovisual, visual, and interactive), associated with carrying out activities to verify and apply knowledge. In most cases, the synchronous time was dedicated to active learning (e.g., role plays, collaborative mindmaps, debates, problem solving, resolving dilemmas, presentations, etc.). In some modules, strategies for verification and application of knowledge were also defined after the synchronous time.

TABLE 3. Didactic strategies for regulation of learning applied during the flipped classroom.

Didactic strategies for regulation of learning			
Module	Before the synchronous session	During the synchronous session	After the synchronous session
1 and 2 *	Handouts Recording doubts about resources Knowledge verification test	Guidelines for regulation of collaborative learning Self-evaluation test	Knowledge verification test
3	Creation of knowledge verification test by students	Knowledge verification test	
4	Handouts Recording doubts about resources		Group construction of a rubric
5		Group construction of a rubric	
6	Verification of knowledge test		Group construction of a rubric
7	Handouts		Knowledge verification test Interactive presentations
8	Handouts Knowledge verification test		

\* Modules 1 and 2 share the same design, although they are delivered in two-degree programmes.

In parallel with the implementation of teaching innovation in the modules mentioned, we carried out longitudinal research, collecting data in each of the groups of students involved. This article presents the quantitative results relating to the regulation profiles identified in the students using the Inventory of Learning Styles (ILS) at the start of the experience. Equally, students' satisfac-

tion with the FC experience and the perceived learning was measured at the end of the experience using an ad hoc questionnaire. The data from the questionnaires were listed and the results obtained were discussed with the participating teachers in the framework of the teaching innovation project, with the aim of contrasting the students' perceptions with those of the teachers.



## 2.2. Participants

The sample comprised 202 university students (86% female, 13% male, 0.5% non-binary, and 0.5% who did not wish to report their gender) aged between 18 and 49, with a mean age of 21.8 ( $SD = 4.3$ ). We received 178 responses to the self-report questionnaire on regulation

strategies, as well as 121 responses to the satisfaction scale. We combined into a single table, identifying each student with a code. Most of the students were taking bachelor's courses in educational sciences, while 4.5% were participants in the Master's in Educational Psychology (see Table 4).

TABLE 4. Composition of sample by programmes.

Programme	Distribution of participants
Primary Education	34.8%
Pedagogy	24.2%
Social Education	21.9%
Early Childhood Education	11.8%
Master's in Educational Psychology	4.5%
Economics	2.8%

## 2.3. Instruments and procedure

The information collection strategy used two instruments. First, the students completed a version of the regulation subscales (Martínez-Fernández, 2012) from the ILS (Vermunt, 1998; 2020). This instrument comprises twenty-eight items answered on a five-point Likert-type scale ranging from "I do this seldom or never" to "I do this almost always". The subscales are distributed into self-regulation, with fifteen items; external regulation, with sixteen items; and lack of regulation, with seven items. This questionnaire was applied in a group setting in class, with participants answering using their

portable devices or mobile phone. A member of the research team explained the purpose of the research, and informed the respondents that the information would be kept in confidence and that the results would be returned in future. The students had the opportunity to decide whether to give informed consent before answering the questionnaire.

A factorial analysis with maximum likelihood extraction and oblimin rotation displays a four-factor structure ( $KMO = .731$ ;  $\chi^2 = 1211,95$ ;  $df = 378$ ;  $p < .001$ ) (see Table 5).

TABLE 5. Exploratory factor analysis for the regulation strategies subscales.

Regulation strategies (items)	Factors			
	1	2	3	4
7. In addition to the syllabus, I study other literature related to the content of the course.	.76			
21. I add something to the subject matter from other sources.	.70			
13. I do more than I am expected to do in a course.	.61			
27. If I do not understand a study text well, I try to find other literature about the subject concerned.	.56			
26. When I am studying, I also pursue learning goals that have not been set by the teacher but by myself.	.42		.30	
1. If a textbook contains questions or assignments, I work them out completely as soon as I come across them while studying.	.37			
24. I use the instructions and the course objectives given by the teacher to know exactly what to do.	.37			

9. I notice that it is difficult for me to determine whether I have mastered the subject matter sufficiently.	.72
6. I notice that I have trouble processing a large amount of subject matter.	.71
20. I realise that I miss someone to fall back on in case of difficulties.	.50
12. I realise that the objectives of the course are too general for me to offer any support.	.48
18. I notice that the study instructions that are given are not very clear to me.	.44
3. I realise that it is not clear to me what I have to remember and what I do not have to remember.	.41
19. I study the subject matter in the same sequence as it is dealt with in the course.	
10. To test my learning progress when I have studied a textbook, I try to formulate the main points in my own words.	.66
17. To test my learning progress, I try to answer questions about the subject matter which I make up myself.	.64
25. To test my own progress, I try to describe the content of a paragraph in my own words.	.64
23. To test whether I have mastered the subject matter, I try to think up other examples and problems besides the ones given in the study materials or by the teacher.	.44
11. When I start reading a new chapter or article, I first think about the best way to study it.	.42
28. If I am able to complete all the assignments given in the study materials or by the teacher, I decide that I have a good command of the subject matter.	.37
14. If I am able to give a good answer to the questions posed in the textbook or by the teacher, I decide that I have a good command of the subject matter.	.32
8. I learn everything exactly as I find it in the textbooks.	
4. I experience the introductions, objectives, instructions, assignments and test items given by the teacher as indispensable guidelines for my studies.	.47
16. I study according to the instructions given in the study materials or provided by the teacher.	.46
2. I study all the subject matter in the same way.	.32
15. When I have difficulty grasping a particular piece of subject matter, I try to analyse why it is difficult for me.	
5. I test my learning progress solely by completing the questions, tasks and exercises provided by the teacher or the textbook.	
22. When doing assignments, I train myself thoroughly in applying the methods dealt with in a course.	
<b>Explained variance (40.38%)</b>	17.12 8.97 8.53 5.76

Extraction method: maximum likelihood.

Rotation method: Oblimin with Kaiser's normalisation.

Source: adapted from Martínez-Fernández (2012) based on Vermunt (1998).

Note: to facilitate interpretation of the factors, we omitted factor weightings with absolute values below .30.

The interpretation of the results (40.38% of the explained variance), based on the content of the items and of the theoretical reference framework, enables us to infer four factors or types of regulation strategy: (1) content self-regulation, (2) lack of regulation, (3) process self-regulation, and (4) external regulation.

The students then completed an ad hoc questionnaire at the end of the FC didactic experience that measured their degree of satisfaction with the FC didactic experience. This instrument was used to find information about: (1) general details, including the module, gender, age and university access route; (2) profile, with three items about the objective for taking the module; (3) valuation of the flipped-classroom process, with seven items; and (4) perception of the learning outcomes, with eight items. All of the items in these questions are answered using a five-point Likert-type scale ranging from “disagree entirely” to “agree entirely”. Finally, one section (5) measures participants’ satisfaction through four questions that combine the open response option with a five-point Likert scale. The questionnaire, hosted on a platform of the university, was completed individually.

### 2.4. Statistical analysis

We performed a series of exploratory analyses to review the behaviour of the data and we cleansed the database. Subsequently, we analysed the resulting

data using exploratory factor analysis (EFA), with maximum likelihood extraction and oblique rotation, to find the structure of the data. To identify the regulation profiles, this variables-centred perspective was combined with an analysis focused on the participants and based on cluster analysis using the k-means technique. When establishing the number of clusters, a certain balance in the number of participants in each group, the existence of significant differences between all means, as well as the consideration of theoretical criteria to interpret the final answer were pursued. After assigning the subjects to each cluster, we used one-way ANOVA to analyse possible differences in student satisfaction between different regulation profiles.

### 3. Results

A first approximation shows that this sample of students distinguishes between process self-regulation (factor 3) and content self-regulation (factor 1). This is a relevant finding, particularly because “content self-regulation” is the clearest factor and the one with the greatest weight when explaining variance. It would also be interesting to observe how this content self-regulation relates to external regulation or the lack of regulation. So, considering the four factors extracted in the variables-centred analysis and taking into account the mean of the items involved, the four respective variables are constructed (see Table 6).

TABLE 6. Descriptions of the regulation strategy subscales (scale 1 to 5) ( $N = 178$ ).

Subscale	Alpha	Min.	Max.	Mean (SD)
Content self-regulation	.77	1.14	4.71	2.63 (.73)
Lack of regulation	.72	1	4.83	2.77 (.71)
Process self-regulation	.72	1.86	4.86	3.56 (.66)
External regulation	.43	1.33	5	3.34 (.75)

Higher means in absolute terms are apparent in both process self-regulation and external regulation. In addition, as is to be expected, there is a significant positive correlation between self-regulation of content and of processes ( $r = .36; p < .00$ ). Also (in line with Martínez-Fernández & Vermunt, 2015), there is a significant positive

correlation between strategies for self-regulation (of content and of processes) and external regulation ( $r = .20; p = .01$ ), even though this may seem paradoxical. Finally, as was also to be expected, lack of regulation has a significant negative correlation with process self-regulation ( $r = -.16; p = .03$ ).

We opted for a cluster analysis on the basis of the data obtained in the analysis of the variables, and with the aim of making the identification of regulation profiles more robust. So, taking into account the fact that there are three major theoretical groups of strategies (self-regulation, external regulation, and lack of regulation), the inclusion of five subscales

across the three main strategies, and the fact that four factors are extracted in the factorial analysis of this study, we tested possible groupings into three, four, and five profiles. From them, and following the psychometric and theoretical criteria mentioned in the procedure, we opted for the five profile solution (see Table 7).

TABLE 7. Regulation profiles.

Regulation subscales	1	2	3	4	5
Content self-regulation (2.63)	2.55	3.05	2.07	<b>3.50</b>	2.14
Lack of regulation (2.77)	2.45	3.25	<b>3.64</b>	2.04	2.54
Process self-regulation (3.56)	3.44	<b>4.09</b>	3.17	<b>3.95</b>	3.26
External regulation (3.34)	2.53	3.65	3.01	3.75	<b>3.84</b>
<i>N</i>	40 (23%)	34 (19%)	32 (18%)	31 (17%)	41 (23%)

Note: 1 (passive); 2 (process self-regulation); 3 (lack of regulation); 4 (self-regulation); 5 (external regulation).

So, one group (1) was identified with values below the mean in each of the four subscales (passive). The second group (2) stands out for its mean score in process self-regulation strategies. The third group (3), in lack of regulation. Group four (4), in self-regulation of content and processes. And group (5), in external regulation strategies.

The sum of the results indicates that only 36% of the students stand out in self-regulation profiles (groups 2 and 4), while the remaining 64% is shared between dependence on external regulation (23%), lack of regulation (18%), or passive regulatory behaviour (23%).

In relation to satisfaction with the flipped-classroom didactic strategy (FC), a small difference was found between the most self-regulated groups (2 and 4) and the students identified as passive ( $F = 2.60$ ;  $df = 4$ ;  $p = .04$ ). In this sense, self-regulated students report a degree of satisfaction (on the 1 to 5 scale) of 4.16 and 4.53, respectively, compared with a mean satisfaction of 3.70 that the group with the passive profile reports (group 1). Equally, another of the differences found corresponds with satisfaction with the learning

achieved. The most self-regulated groups report significantly higher satisfaction (4.07 and 4.17, respectively) ( $F = 3.61$ ;  $df = 4$ ;  $p = .01$ ) than that reported by the passive group (3.45).

Finally, a series of correlations between regulation variables and measures of satisfaction was found. So, content self-regulation is strongly related to satisfaction with the learning process ( $r = .47$ ;  $p < .001$ ), and less strongly with the learning outcomes obtained ( $r = .32$ ;  $p < .001$ ) and the teaching process ( $r = .27$ ;  $p < .001$ ). Process self-regulation also shows significant relationships with the same measures of satisfaction, but with lower intensity with the learning process ( $r = .37$ ;  $p < .00$ ), teaching process ( $r = .22$ ;  $p < .05$ ), and the learning outcomes obtained ( $r = .22$ ;  $p < .05$ ). Process self-regulation is related to satisfaction with communication during the FC process ( $r = .22$ ;  $p < .05$ ). Nonetheless, external regulation is also significantly positively related to satisfaction with the learning process ( $r = .36$ ;  $p < .00$ ) and to the teaching process ( $r = .31$ ;  $p < .00$ ), but it is not related to satisfaction with the learning outcomes obtained. Lack of regulation is not related to any of the satisfaction variables.

#### 4. Discussion and conclusions

This study addressed two questions. Firstly, it considered the regulation profiles of a sample of university students, finding that a low proportion of students have self-regulation profiles (in line with earlier studies, such as Han et al., 2023a; Klimova et al., 2022; Valenzuela et al., 2020). These levels of low self-regulatory capacity in university students seem to prevent satisfaction with active didactic models such as FC. And this information should undoubtedly inspire deep reflection by secondary-education teachers and teachers in the early stages of university study. So, in the academic levels prior to higher education, self-regulated learning should be fostered and its value, promoted, with the aim of reducing the friction in the transition to university studies that require high levels of autonomy (Kyndt et al., 2017). In this sense, the proportion of students who require external regulation or who experience a lack of regulation (at least, with certain level of awareness) is alarming in the case of university students who have little or no preparation to assume an active and independent role in their studies (in line with Martínez-Fernández, 2015, and Vega-Martínez et al., 2023). If we add to them the students who have a passive regulatory profile, the task of “becoming aware and acting accordingly” appears to be a major challenge for today’s university agenda.

In regard to the second question, which addresses the relationship between regulation profiles, satisfaction, and the sensation of learning with an FC-based didactic experience, it is no surprise that the students with self-regulation profiles report the greatest satisfaction with the experience. This raises the need to distinguish between regulation profiles when saying that students report satisfaction (Sointu et al., 2022; Strelan et al., 2020). In other words, it is necessary to identify which students are satisfied from the perspectives of teaching and learning and the outcomes obtained.

Students with a self-regulation profile, when encountering an FC didactic experience, clearly seem to derive satisfaction and a perception of learning from it. Such an assessment is in accordance with Bredow et al. (2021) and Zarouk et al. (2020). It is also in line with authors who emphasise the role of self-regulation in explaining the best results and experiences of learning (De la Fuente *et al.*, 2020; Martínez-Fernández, 2019; Vermunt, 1998), or of the role of autonomy in FC-based learning (Mengual-Andrés et al., 2020). Nonetheless, external regulation is also related with

satisfaction with processes (learning and teaching) (as noted by Jafarian et al., 2021; Jung et al., 2022; Kim et al., 2021; Park & Kim, 2022; Zheng et al., 2020), although not with the results obtained. This requires in-depth analysis to identify genuinely self-regulated learning pathways and also the options that are generated from external regulation (De la Fuente et al., 2022). Students, who require (depend on) external regulation, are likely to have expectations of learning outcomes that do not materialise. It seems clear that a lack of self-regulation would explain this result; and so, we believe it is important that didactic actions take these profiles into account with the aim of offering them the best learning pathways.

Finally, regarding the link between regulation profiles and satisfaction, the low satisfaction (with learning, teaching, and outcomes) that students with a passive profile report could be explained precisely by the fact that this didactic strategy requires high levels of active, autonomous, and self-regulated learning. Passive students must surely dislike this type of methodology as they lack the skills to take advantage of this type of experiences; hence their low satisfaction. Recent research into learning patterns has found that the passive profile is related to low performance, emotional difficulties, and even high levels of academic stress when encountering challenging didactic proposals (Ahmedi, 2022; Vega-Martínez, 2022).

The foregoing should be qualified taking into account the possible limitations of this study: (a) it is an exploration of regulation profiles using a model that has still not been explored in depth; (b) a clearer representation of students at different levels/years of the course is needed; (c) a more uniform measure of the effectiveness of a flipped-classroom didactic strategy is required, one that is understood and accepted as such; and (d) there is a clear need to differentiate learning profiles and itineraries.

Despite these limitations, the results of this investigation seem to establish a need to identify students’ regulatory profiles before implementing active learning methodologies. As Cavalcante et al. (2021), Luo et al. (2020) and Vermunt (2020) claim, it is necessary to expand research into the different dimensions of regulation. Accordingly, the learning pathway will differ depending on the student’s starting point (self-regulation, external regulation, passive profile, regulation of processes, of content, etc.). Therefore, designing

personalised learning itineraries is proposed as a very necessary way to optimise the success of educational initiatives. Still more relevant would be fostering the potential of people who learn in the university, so that they achieve the desired self-regulation and this enables them to be satisfied with their learning processes and outcomes.

Future lines of research should include analysis of different specific commands relating to successful FC experiences, analysis of the processes of change (expectations-results) from a longitudinal perspective, as well as the possible (necessary) transfer of active learning to other modules that are not designed with an FC focus. Equally, and in line with authors such as López Belmonte et al. (2019) and Moreno-Guerrero et al. (2021), we claim the need to analyse the digital competence of the teachers who participate in FC experiences, as well as their technical, pedagogical, and regulatory skills in the face of such a challenge. This is a mixture of variables and relations that undoubtedly poses a very interesting challenge for researchers in the field of teaching and learning processes.

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