Impact of the Flipped Classroom on the Motivation of Undergraduate Students of the Higher Institute of Nursing Professions and Health Techniques of Fez-Morocco

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Abstract—Motivation is the cornerstone of building success. If it is strong, achieving a greater number of objectives will be assured, and therefore a more glorious success can be met. Thus, to promote motivation, it is advisable to pay particular attention to the pedagogical approach adopted by the teacher since it has been proven that there is a positive relationship between the choice of an active approach and enhancing motivation. The situation generated by COVID-19 has been a profitable opportunity to experiment with "Flipped Classroom" pedagogy, to invert the class and adapt learning activities that have been traditionally offered to students through distance (online) and in-person learning alternately. Thus, the present study aims to evaluate this Flipped Pedagogy's impact on the motivation to learn of undergraduate students of the Higher Institute of Nursing Professions and Healthcare Techniques in Fez. Data have been collected from 410 students who were questioned before and after the adoption of the Flipped Classroom, based on a motivation scale validated by Rolland Viau in 1994, translating the determinants and indicators of motivation according to his socio-cognitive model of motivational dynamics. The answering percentage was 90.73%. Data analysis demonstrated a statistically significant association between the Flipped Classroom and students' motivation; the motivational profile, which was 18.54%, became 89.25% after flipping the class. The Flipped Classroom can significantly bring a surplus value to pedagogy, hence the importance of broadening its spectrum and integrating it as a new approach to teaching within health sciences educational institutions.

Keywords—inverted class, Flipped Classroom, reverse pedagogy, hybridization, digital, motivation, teaching, learning, active pedagogy

1 Introduction

In higher education, we find ourselves confronted with the fact that a majority of learners feel demotivated and appear to be disinterested in their learning process, along with the shortage of any objectives regarding their knowledge or skills [1]. Being part of higher education, the Higher Institutes of Nursing Professions and Health Techniques (HINPHT) are no exception. This observation constitutes the primum movens of reflecting on the pedagogical practice at these institutions. As a matter of fact, the question which arises is: How to teach today with a perspective of the inclusion and transfer of learning and find the means to make undergraduate students of the HINPHT of Fez invest in their studies, to make them become actors of their learning, and thus promoting their motivation to inexorably guarantee a sure success in studies?

2 Literature review

Being a "student-centered" has now become "pedagogically right." Thus, pedagogical approaches are at the heart of the issue of the teaching-learning process, insofar as we recognize the importance of the act of teaching and the existence of a master effect on learning and especially on students' motivation [2].

All the studies established in educational science and which deal with motivation in a sociocognitive perspective homologate the fact that a passive pedagogy leads to diminished motivation and consequently to quasi-total annihilation of success-building, encompassing the lack of excellence, performance and discipline, absenteeism, dropping out, and failure above all [3]–[5]. Whereas on the other hand, an active pedagogy which is utilizing diversified methods, nourishes motivation and consequently guarantees effective and meaningful learning [6], [7] which leads to success [8] and achievement of the learner's personal and professional objectives [9]–[11]. Teachers' pedagogical choices can therefore be decisive for students' commitment to their studies. A teacher who adopts pedagogical strategies that promote cognitive engagement contributes to the students' choice to engage cognitively and persevere in the achievement of the task [12].

Confronted with a heterogeneous students population with an eager desire to learn and meet important challenges in their academic careers, and also with the increased demand for training that perfectly responds to societal changes [13], [14], teachers are supposed to innovate in pedagogy and thus, adopt constructivist and socio-constructivist pedagogical approaches, such as the Flipped Classroom (FC) [14], [15]. However, one of the necessary conditions for the successful implementation of a pedagogical innovation is precisely the motivation and engagement of the students. A wait-and-see attitude or rejection on the part of the students would undermine the entire system [16].

Thus, after each pedagogical action or adoption of new approaches; in order to assess the impact that this newly adopted approach has had, identify factors that may be behind a certain demotivation and thus adapt and correct the deficiencies, those teachers are called upon to determine their students' motivation level [17].

To this end, several pedagogues in educational sciences have attempted, through their theories, to define the concept of motivation and consequently to identify its

indicators and determinants, to develop valid scales that facilitate the identification of the motivational profile with the perspective of readjusting and improving the quality of teaching and learning [15].

2.1 Definition of motivation

Despite the recognized importance of the motivation concept, it is not easy to locate a definition since it is an abstract product that can only be inferred from an individual's observable behaviors [18].

Generally speaking, motivation is the source of energy [9], management, or even the perseverance that students experience in their actions as well as in their intentions [5].

According to Viau, motivation is an unstable phenomenon. It is a variable dependent on multiple environmental factors that also vary [19]. It derives its source from the student's perceptions of himself/herself and their environment, which results in choosing to commit to carrying out the proposed pedagogical activity along with persevering in its accomplishment, with the aim of learning. So, the perceptions that the student has of himself/herself and also of his/her environment give rise to motivation in studies on the one hand, and distinguish it from one student to another on another; hence the two types of motivation: the intrinsic and the extrinsic [18], [20].

2.2 Motivation types

Several theoretical perspectives have addressed the types of motivation. These include the self-determination theory (Deci and Richard), the expectancy-value theory (Gaspard et al., 2018; Plante et al., 2013; Schunk, Meece and Pintrich, 2014; Viau, 2009), and the achievement goal theory (Ames, 1992; Dweck and Leggett, 1988; Elliot, 1999; Elliot and Hulleman, 2017; Fryer and Elliot, 2008). According to these theories, students' behavior is stimulated by both internal and external forces. Each of these theories defines these forces based on its theorists' perception, but the in-depth analysis of their definitions converges towards the same principle [5], [12], [20], [21].

When we speak of internal forces, we refer to intrinsic motivation. The latter is defined by the fact of doing an activity for the satisfaction and pleasure that result from it [17]. An intrinsically motivated student studies because this activity is itself interesting. It allows him/her to discover new things and acquire knowledge at the very same time. An intrinsically motivated student would undoubtedly succeed in his/her studies and is more likely to persevere until they graduate and achieve his/her goals [22]. It is, moreover, the type of motivation that is most sought in studies aimed at assessing students' motivational profile, following the adoption of new educational activities [17], such as ours.

However, when we talk about external forces, we are within the extrinsic motivation subdivided into identified and controlled types. The identified extrinsic motivation consists of carrying out an activity not because it is interesting but because it is considered to be important. The students who have this kind of motivation invest in their studies because they represent a means to achieve objectives that are important for their well-being and to develop professional skills. As for controlled motivation, it

has recourse to internal sources of pressure, such as guilt, shame, and fear of failure, and external ones, such as rewards, punishments, competition, etc. Students who are motivated by controlled regulation continue their studies with the aim of pleasing other people or to obtain a promised reward related to their success in studies [19], [23], [24].

For these types of motivation, studies have shown that students with controlled extrinsic motivation generally have a lower level of perseverance and satisfaction with their studies and are less creative than students who are intrinsically or extrinsically motivated by identification. In fact, motivation varies in quality; hence, some types of motivation are more effective than others in promoting academic success [23].

Therefore, whether intrinsic or extrinsic, measuring the motivational dynamics requires recourse to one of the motivation theories models [12].

2.3 Viau's sociocognitive model

Several authors have developed motivation models, including Bandura, 1986; Eccles and Wiegfield, 2002; Pintrich and Schrauben, 1992; and Viau, 1994 and 2014. These models have fed knowledge in the field and contributed to the development of motivation-related theories from a sociocognitive perspective. They all provide a complementary point of view to understanding school motivation. There is no superiority of one model over the other; it all depends on the study's objectives [5], [25].

Within the framework of this research, Viau's model (1994 and 2014) appears to be the most relevant since it describes students' motivational dynamics while taking pedagogical activities proposed by teachers as a starting point (Figure 1), which happens to be at the heart of the research's main query that is covered in this work, and which aims mainly at studying students' motivation with regard to the adoption of the FC. In this respect, Viau considers active educational activities as promoting students' cognitive commitment and perseverance [23], [26].

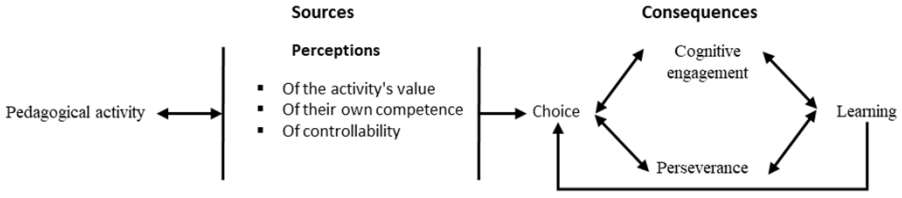

Fig. 1. The motivational dynamics with regard to an activity according to Viau [18], [26]–[28]

Its model, inspired by sociocognitive approaches to learning, is an innovative model in the context of acquiring information and achieving goals. It is based on three types of perceptions, also called determinants or motivation sources, which can influence students' motivational dynamics: their perception of the activity's value, competence, and controllability over the activity [18], [26].

The **perception of the activity's value** refers to students' conclusions about the activity presented to them. If it is sought from the learner to engage cognitively in carrying out the task required from him/her, the cognitive representation of what they must accomplish must be clear to them. As for the **perception of his or her own**

competence, it is a matter of the student's assessment of his/her ability to perform the activity properly before engaging in it. If the student judges that his/her ability to carry out the task properly is high, he/she will be more cognitively engaged and persevere in that task. Finally, the **perception of controllability** is related to the degree of control the learner will have regarding an activity to be performed. This refers to control over the process and also over the come out of the proposed activity [5], [12], [25], [28].

If one of the three types of perception is low among students, the other two will also follow. This model's components are subject to reciprocal determinism [5], [26], [29].

The consequences or so-called learning indicators influenced by these three motivational sources are: choice, cognitive engagement, perseverance and performance. These are consequences of motivational dynamics whose ultimate is learning.

For **the choice**, Viau points out that a motivated student would choose to undertake a learning activity, while one who is out of motivation would tend to avoid choice and wait until he/she is obliged before undertaking that activity. **Cognitive engagement**: This term encompasses students' attention and concentration. It corresponds to the degree of mental effort that the student exerts while carrying out a learning activity. This commitment is reflected in the systematic recourse to learning and self-regulation strategies. A demotivated student has recourse to avoidance strategies that consist of behaviors that he/she adopts to avoid engaging in an activity or at least to delay its completion. **Perseverance** is related to tenacity and work duration. It's the ability that empowers us to accomplish a task without turning away from our purpose. It translates into the amount of time the student spends on learning activities. **Performance** is the consequence of motivation. It refers to learning outcomes, that is, a set of behaviors that indicate an activity's success degree [5], [19], [29].

So, suppose the student's perceptions are high. In that case, the student will be motivated, resulting in the student choosing to cognitively engage in an educational activity offered to him and persevering. If these perceptions are low, he will be demotivated, not engage in this activity, and will not persevere [26].

These determinants (sources) and indicators (consequences) can be measured using Rollan Viau's motivation scale: Motivometer [5].

2.4 Viau's motivation scale: Motivometer

It is a motivation measurement tool that brings together the set of behaviors and perceptions that motivated students demonstrate **(Table 1)** [5], [28], [30], [31].

The perception of an activity's value (e.g., I believe I have the skills and abilities to succeed in my studies), 2. The perception of the student's skills (e.g., I feel competent when I prepare for my courses and exams) and 3. The perception of controllability or the commitment agent (e.g., I believe I have some power over my career path). These perceptions impact the choice of students (e.g.: I am happy to take part in various activities related to my studies or my future professional activities), cognitive commitment, perseverance (e.g., I'm very meticulous about making the least possible delay in my academic tasks) and performance (e.g., I'm satisfied by my academic results) [5], [23], [30], [32].

Table 1. Determinants and indicators of motivation according to viau's sociocognitive model [26], [30]

Items	Most of the Time	More Often	Sometimes	Infrequently	Rarely
Motivational determinant factors (Sources)					
1. I believe I have the necessary skills and abilities to succeed in my studies.					
2. I feel competent when I prepare for my courses and exams.					
3. I believe the training I receive will help me achieve my personal and professional goals.					
4. I have the feeling that the knowledge taught in my classes is or will be useful to me.					
5. I pursue specific objectives in my studies.					
6. I am convinced that success is first and foremost determined by regular efforts and a suitable working method.					
7. I believe I have some power over my career path.					
8. I believe that there is a correspondence between the efforts I deploy and the results I obtain.					
Motivation indicators (consequences)					
9. I gladly participate in various activities related to my studies or future professional activities.					
10. If a question is asked in class, I answer it or try to find the answer.					
11. I seize every opportunity to discuss my courses or future plans with the teaching staff.					
12. I'm satisfied with my academic results.					
13. I think about how to effectively carry out my work, and I adjust my method as needed.					
14. I strive to maintain my attention and concentration in the classroom.					
15. I make sure to make the least possible delay in my school tasks.					
16. I demonstrate perseverance in my school work.					
17. I feel pleasure attending my classes.					
18. I am interested in my studies in general.					

In short, based on the theory of Viau and its motivation scale, it is possible to assess students' motivational profiles and consequently establish the link between pedagogical strategies that stimulate intellectually and motivation to learn [18].

Thus, based on the fact that an active pedagogical practice [33] can nourish motivation [6], [7] and consequently lead to success [8] and achievement of personal and professional goals [9]–[11], the situation generated by COVID-19 was a profitable opportunity to innovate in pedagogy, within the HINPHT of Fez, and experiment a new

active pedagogy (FC) on the one hand, and assess the impact of this FC on students' motivational dynamics on the other hand.

2.5 The Flipped Classroom

The FC is a hybrid pedagogy [34]–[36] that consists of alternating distance learning and classroom learning to draw from the strengths of both approaches [34], [37]. In this model, the teacher inverts and adapts the learning activities traditionally offered to students [38]; the courses' content is made available to learners through online searchable resources, and the in-class time is spent purely on team projects, exchange with the teacher and among peers, practical exercises, and other collaborative activities [2], [34], [35], [39]–[41].

It allows, on the one hand, better use of digital technology [39], [42] and thus responds to the demand of a hyper-connected generation [33]. And on the other hand, it keeps the focus on the learner during the learning process [7], [10], prepares him/her before class to make them more active once in class [2], and gives them the means to be more autonomous and more socio-constructive [43]. It is an insightful method of using the new technologies in support of pedagogy [11], [33], [35], [44].

Theoretical data revealed that this FC is known for its multiple advantages: namely, development of disciplinary and transversal skills by virtue of a better appropriation of formalized knowledge, differentiation between teaching and learning [34], [45], enhanced interactions, and improved student engagement through greater autonomy, exchanges and personalized contacts between students and teachers, and personalized support [46]. In addition, it allows a fruitful combination between a direct transmission of knowledge and a constructivist or even a socio-constructivist approach of learning [8], [47], [48], the use of self-regulated learning strategies by the students themselves, and above all, an increased motivation and improved outcomes for the most disadvantaged students [7], [16], [34], [45].

As for the empirical data, despite their scarcity, especially in higher education, the study carried out by McLaughlin and al; related to the experience of pharmacy students who received lessons through a Reverse Pedagogy, found out that those students were more engaged than others who received lessons according to the traditional method. In addition, according to a satisfaction survey, the same students declared that given the particularity of their professional field, they prefer learn the content online before coming to class, and save the in-class time for applied learning [49]. For their part, Davies, Dean, and Ball obtained similar results by comparing three different teaching strategies in an information-systems-related course. They showed that students who took the course in FC were also more satisfied regarding their learning environment compared to other groups [50].

Furthermore, several studies indicate that the students with the FC appreciate being able to learn their courses remotely (online) and at their own pace more than being taught the traditional way [49]–[55].

Along the same lines of thought, Love, Hodge, Grandgenett and Swift have argued that the FC positively affects success in studies. The results of their studies comparing the academic performance of students of FCs and that of students of traditional classes show that students of FCs obtained much better marks than those of the traditional class [56], [57].

In short, FC is a pedagogical innovation that rejects the methods of traditional teaching and uses the advantages offered by digital technology in order to make the learner an actor in his learning while reversing the space-time of teaching-learning and adopting active methods, seeking to bring out in the field a reflective practitioner rather than a manipulator and passive executor of gestures [16].

Moreover, adopting such an approach is an integral part of the primary objectives inscribed in the strategic vision of Moroccan higher education's 2015–2030 reform. This strategy aims to integrate information and communication technologies (ICTs) into the teaching/learning process in order to improve the quality of learning and promote the transition from a knowledge-based society to a society that produces as well as disseminates it [58].

2.6 Purpose of the study

The present experimental study is carried out to assess the motivation of undergraduate students of the HINPHT of Fez before and after the adoption of the FC. In addition, subsequently to determine the impact of this Pedagogy on these students' motivation. The study is based on Rolland Viau's scale of Sociocognitive Model of Motivation (Motivometer) established in 1994, which contains questions that deal with indicators and other determining factors of motivation.

3 Method

The following work is part of a larger study approved by the Ethics Committee of the Faculty of Medicine and Pharmacy of Fez, which is registered under number 05/20. This is a quantitative correlational analytical study. It was carried out at the HINPHT of Fez, with regard to two levels of undergraduate nursing students (Semester 3 = 217 students and Semester 5=193 students) who have been tracked throughout the academic year (2020–2021).

For these two levels, during semesters 3 and 5 (the autumn session), the courses were conducted in the traditional teaching model, in order to identify the motivational profile. As for the following level, during Semesters 4 and 6 (the spring session), the same students participated in the study, but this time, after adopting an FC-based teaching method. During this reversed method, theoretical courses, assignments, and discussions were carried out online through digital classrooms on the G-Suite platform of the HINPHT of Fez, afterward, those sessions were supplemented by in-person sessions, for all that concerns practical activities and application exercises. Towards the end of the year, the motivation of these students was assessed again using the same collection tool, in order to compare the motivational profile of each of the specialties before and after the adoption of the FC, and enunciate the relation between this pedagogy and motivation.

Thus, the approach adopted for conducting the present study is an interventional experimental approach of the "crossover-test" type; the same cohort is followed in two different experimental situations: the traditional class and the FC. In this methodological approach, each student is a witness to themselves: it is the intra-student variability before and after the adoption of the FC that makes it possible to identify the motivational profile of each learner and therefore, of each option.

Students who was subjected to a motivation assessment before adopting the FC and those who did not want to participate were excluded from the study.

The assessment of the motivational profile, before and after the FC, was based on Rolland Viau's Motivometer sent by email. The questionnaire in question brought together a set of behaviors and perceptions shown by the motivated students. It allows assessing the level of motivation by measuring it, using three factors: the perception of the activity's value, the perception of the student's skills, and the perception of controllability or the motivating agent of commitment [40]–[42].

According to the students' responses, on a scale of response by Likert (1. Rarely; 2. Infrequently; 3. Sometimes; 4. More often and 5. Most of the time), the Motivation could be grouped into three levels: Weak motivation if the responses are mostly rarely and infrequently, Good motivation if the responses are mostly between infrequently and more often enough, and Excellent motivation if the answers are mostly more often and most of the time [4]. It should be noted that, to respect the anonymity of participants, they were asked to identify their two answers using a unified code, in order to assess the motivation of each of them before and after the adoption of the FC.

The analysis of data relating to the motivation questionnaire was carried out using the data processing software "SPSS" and "Excel". All ethical considerations regarding anonymity and confidentiality relative to the participant's identities were respected.

The specialties, which were subject to the study, were Social Assistants (SA), Nurse in Anesthesia and Reanimation (NAR), Intensive Care and Emergency Nurses (ICEN), General Nurses (GN), Neonatal and Pediatric Nurses (NPN), Mental Health Nurses (MHN), Mid-wives, Laboratory Scientists (LS) and Radiology Scientists (RS).

The number of teachers who led the classes according to the traditional method and then in reversed classes was 36 teachers; four per specialty. Each of them teaches a lesson differently from the other.

The steps of the inverted classroom proposed to the teachers, as part of a prior training in the notions of the FC, were as follows:

The assimilation of knowledge outside the classroom, as a first step during which teachers were asked to make online resources available for their students, through the digital classrooms of the G-Suite platform of the HINPHT, to be consulted autonomously at home. The consulted resources considerably vary depending on their chronological order within the learning sequence. Those can be main theoretical notions, a commented PowerPoint presentation, a filmed sequence of the teacher explaining on the whiteboard, a link to a video on YouTube for a practical demonstration, a website to be consulted or an extract from a documentary related to the topic.

Subsequently, the assimilation of the knowledge provided by the resources was verified, either remotely or in class, using a questionnaire allowing the teacher to a posteriori assess of the actual level of understanding of the course's concepts. The questionnaire generally includes factual questions of direct application to the content. The entrance to the course is then generally used to clarify the points of the resources, which would have remained ambiguous.

Finally, there comes the pure classroom practice of the use of knowledge, which is then directly mobilized in practice and extension activities. Practically, that can range from a simple individual or collaborative exercise, completion of a complex task, exercises based on authentic problems, solving application-based exercises within the frame of peer-to-peer learning of Mazur [43], to case studies and hands-on demonstrations.

4 Results

4.1 Characteristics of study participants (Table 2)

The number of participants who have answered was 372 students: 12.40% of them are NAR, 8.36% are ICEN, 38.81% are GN, 1,35% are Midwives, 5.39% are SA, 8.63% are NPN, 6.74% are MHN, 7.01% are LS and 11.32% are RS. 83.83% are women. 93.55% are Moroccans.

4.2 Determining factors of motivation (Table 3)

Before the FC, 47.04% of participants confirmed that they infrequently had the skills and abilities necessary to succeed in their studies, 26.88% rarely possessed them, and those who did more often represented only 0.27%. Whereas, after adopting the FC, 45.97% of them found that they more often possess those skills and abilities, 37.90% possess them most of the time, and only 1.08% rarely possess them **(Item 1)**.

Regarding the perception of competence perceived by the study participants during the courses' and the exams' preparation, before the FC, 45.97% expressed that they infrequently had that feeling, 34.95% rarely had it. Whereas, after the FC, 44.35% had most of the time that feeling, and 30.38% had it more often **(Item 2)**.

Regarding the relationship between the received training and the achievement of personal goals, before the FC, 47.31% used to find that the training did not often help them in the achievement of this type of goals, whereas only 0.27% believed that the training helped them more often. For professional goals, 39.25% expressed that the training helped them infrequently, while for 34.14% of them, the training rarely helped them, and it sometimes did for a small percentage of 1.34%. These results changed completely after the FC as, 21% began to see that the training was most of the time of great help in achieving their personal goals, for 19% it helped them more often, for 38% it helped them sometimes, and only 5% said that it rarely helped them. For professional objectives, after the FC, 38.44% found that the training helped them most of the time in their achievements, almost 29,84% found that it helped them more often, and only 3.23% said that it infrequently helped them **(Items 3 and 4)**.

Before the FC, the distribution of students according to whether they believed that they had a power over their academic progress showed that, 64.78% believed that they infrequently had that power, whereas 35.22% believed that they rarely did. After the FC, it came out that 43.82% of the participants believed they had more often that power, 29.03% had it most of the time, and only 1.88% had it rarely **(Item 5)**.

Regarding the distribution of students according to whether they find that the obtained results match the efforts they provide, before the FC, 34.14% used to find that there was rarely a match, 28.49% said there was an infrequently a match, and 14.79% used to see that there was sometimes a match. With the FC, 40.59% found that there was a match most of the time between the efforts they made and the results they obtained, 40.32% found this match more often, and only 4.84% found that match was infrequently achieved **(Item 6)**.

4.3 Motivation indicators (Table 4)

Before the FC, the data related to the distribution of students, according to whether they willingly participated in activities related to studies or future professional activities revealed that, 48.12% of students, which represents almost half of them, infrequently willingly participated in these different activities, 45.16% underlined that they rarely participated willingly, and a minority of 6.72% affirmed that they did so willingly most of the time. After the FC, more than 33.87% participated most of the time willingly in the various activities related to their studies or their future professional activities, 22.31% affirmed that they participated in them willingly more often, while only a minority of 9.14% infrequently did so **(Item 1)**.

Concerning students' interests in discussing their courses and future projects with teachers, before the FC, more than half of the students (60.75%) accorded infrequently, a particular interest to the discussion of their courses and future projects with teachers, while 27.15% had the pleasure to do so only rarely. Meanwhile, 12.10% did it more often. After the FC, 32.53% more often had particular interest in the discussion of their courses and future projects with teachers, 29.30% delighted in doing that most of the time, while 6.18% did so rarely **(Item 2)**.

Regarding the distribution of students according to the perception of the level of satisfaction with their academic results, before the FC, 41.67% of them infrequently felt satisfied with their academic results, 23.12% were rarely satisfied with them, and a minority of students (0.27%) was sometimes satisfied. After the FC, 47.31% of students were more often satisfied with their school results, 28.76% were most of the time satisfied with them, and only a minority of 5.38% were rarely satisfied **(Item 3)**.

Regarding the segregation of students per their intention to have the least possible lateness during their school assignments, the results reveal that before the FC, 45.16% of the students paid sometimes attention to the carrying out of their assignments with the least possible lateness, 34.41% rarely did so and only 2.42% did so more often. After the FC, 50.45% of the students paid attention most of the time to the carrying out of their academic assignments with the least possible lateness, 37.10% did so more often and only 4.30% rarely did so **(Item 4)**.

As far as the distribution of students, according to the efforts they made in order to maintain their attention and concentration in class is concerned, the study data revealed that, before the FC, 45.70% rarely made an effort to maintain their concentration in class, 33.33% did so infrequently, 9.68% did that more often, whereas, these efforts were made most of the time by only 6.45%, and sometimes by 4.84%. After the FC, 50.81% of survey participants, more often made efforts to maintain their concentration in class, 27.42% did so most of the time, 9.95% sometimes, 7.26% did that infrequently, and only a minority of 4.57% rarely did it **(Item 5)**.

Before the FC, the results relating to the distribution of students according to whether they show perseverance in schoolwork highlighted that, 33.06% rarely showed perseverance in that context, 28.49% did it infrequently, 22.58% manifested it most of the time, 14.79% sometimes did that, and only 1.08% more often manifested perseverance in schoolwork. With the FC, 37.10% showed most of the time perseverance in their schoolwork, 33.60% did it more often, 16.67% did that sometimes, 8.87% persevered infrequently, and only 3.76% rarely persevered **(Item 6)**.

Before the FC, the distribution of students according to whether they found pleasure in attending classes revealed that, 64.78% felt that pleasure infrequently, and only 0.27% had most of the time that feeling. After the FC, a majority of 41.13% more often found pleasure in attending classes, 37.10% had that feeling most of the time, and only a minority of 1.34% felt rarely that pleasure **(Item 7)**.

The distribution of students according to whether they are generally interested in studies showed that before the FC, 28.23% of participants were infrequently interested in studies, 15.05% were rarely interested, and 23.12% were most of the time interested. After the FC, 47.58% were most of the time interested in studies, 40.59% were interested in them more often, and only 0.81% were rarely interested **(Item 8)**.

4.4 Synthesis

The assessment of the motivational profile from the raised data shows that motivation, which corresponded to 18.54% before the adoption of the FC, changed into 89.25% after adopting the teaching approach under study **(Figure 2)**. After the FC, the majority of students of all specialties was motivated in percentages that vary: 100% for mid-wives and SA, between 91% and 94% for MHN, RS and NAR, 85% for GN, and almost 87% for LS and ICEN **(Figure 3)**.

Before the FC, participants' responses were predominantly rarely and infrequently, whereas after the FC, responses are predominantly more often and most of the time **(Table 5)**.

Table 2. Characteristics of study participants

Characteristics	Percentage
Sex	
Woman	83.83%
Man	16.17%
Age	
17–20	82.53%
21–24	17.47%
Nationality	
Marocaine	93.55%
Etrangère	6.45%
Specialty	
NAR	12.40%
ICEN	8.36%
GN	38.81%
Mid-wives	1.35%
SA	5.39%
NPN	8.63%
MHN	6.74%
LS	7.01%
RS	11.32%

Table 3. Determinants of motivation before and after the adoption of the FC

Items	Flipped Classroom	Most of the Time	More Often	Sometimes	Infrequently	Rarely
1. Possession of the skills and abilities necessary for academic success	Before	25.81%	0.27%	0%	47.04%	26.88%
	After	37.90%	45.97%	2.69%	12.37%	1.08%
2. Perception of competence in course and exam preparation among students	Before	18.55%	0.27%	0.27%	45.97%	34.95%
	After	44.35%	30.38%	16.40%	3.76%	5.11%
3. Relationship between training received and personal goals	Before	3.76%	0.27%	18.01%	47.31%	30.65%
	After	21%	19.00%	38%	17%	5%
4. Relationship between the training received and the professional goals	Before	25.27%	0%	1.34%	39.25%	34.14%
	After	38.44%	29.84%	20.97%	3.23%	7.53%
5. Estimate of having power over career pathway among students	Before	0%	0%	0%	64.78%	35.22%
	After	29.03%	43.82%	7.80%	17.47%	1.88%
6. Correspondence between the efforts made and the results obtained	Before	22.58%	0%	14.79%	28.49%	34.14%
	After	40.59%	40.32%	7.53%	4.84%	6.72%

Table 4. Indicators of motivation before and after the adoption of the FC

Items	Flipped Classroom	Most of the Time	More Often	Sometimes	Infrequently	Rarely
1. Voluntary participation in activities related to future studies or professional activities	Before	6.72%	0%	0%	48.12%	45.16%
	After	33.87%	22.31%	14.52%	9.14%	20.16%
2. Interest in discussing courses and future plans with the teaching staff	Before	0%	12.10%	0%	60.75%	27.15%
	After	29.30%	32.53%	11.56%	20.43%	6.18
3. Students' satisfaction with their results	Before	17.74%	17.20%	0.27%	41.67%	23.12%
	After	28.76%	47.31%	9.14%	9.41%	5.38%
4. Minimizing delays in completing school tasks	Before	17.74%	2.42%	45.16%	0.27%	34.41%
	After	50.54%	37.10%	6.99%	1.08%	4.30%
5. Maintaining attention and concentration in class	Before	6.45%	9.68%	4.84%	33.33%	45.70%
	After	27.42%	50.81%	9.95%	7.26%	4.57%
6. Students' perseverance in school work	Before	22.58%	1.08%	14.79%	28.49%	33.06%
	After	37.10%	33.60%	16.67%	8.87%	3.76%
7. Sense of pleasure in attending classes	Before	0.27%	13.98%	1.61%	64.78%	19.35%
	After	37.10%	41.13%	7.53%	12.90%	1.34%
8. Students' interest in studies	Before	23.12%	16.94%	16.67%	28.23%	15.05%
	After	47.58%	40.59%	3.23%	7.80%	0.81%

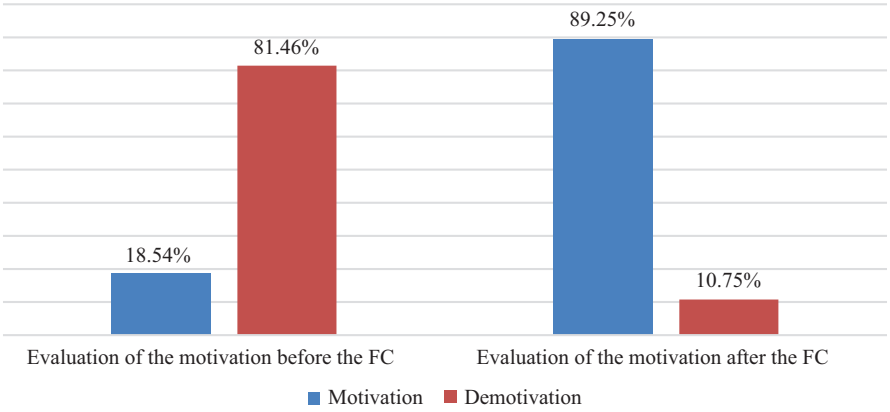

Fig. 2. Motivational profile before and after the adoption of the Flipped Classroom

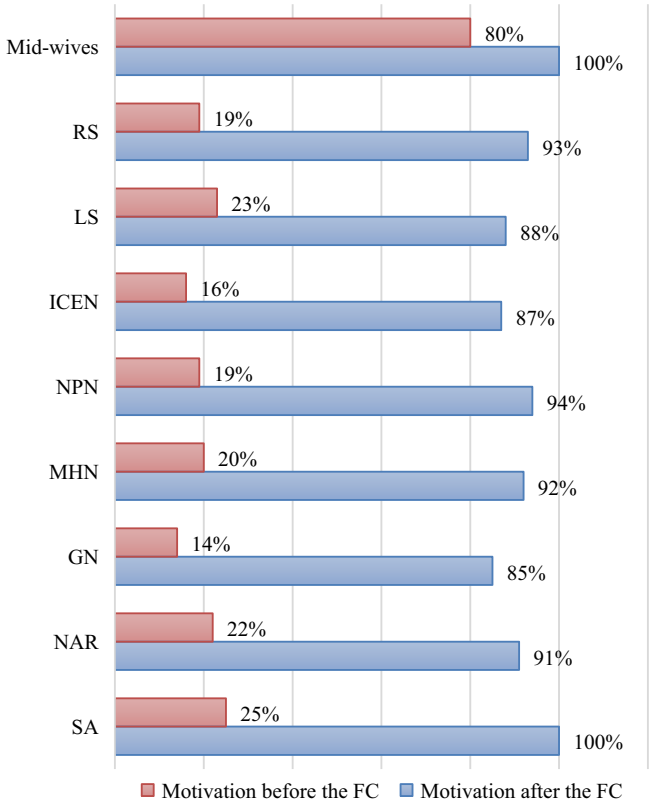

Fig. 3. Motivational profile by option before and after the Flipped Classroom

Table 5. The sum of the students' answers on the Likert scale before and after the FC

	Most of the Time	More Often	Sometimes	Infrequently	Rarely
Sum of the answers before the FC	873	369	329	3269	2228
Sum of the answers after the FC	2475	2576	914	716	387

5 Discussion of the results

We have received 372 responses out of a total of 410 students.

The results of this study, based on Viau's sociocognitive model, show that, with the FC students' perceptions of their academic careers have completely changed.

In fact, in terms of determining motivation factors, the majority of participants declared having, more often or even most of the time, the aptitudes and abilities necessary to succeed in their studies; they felt thus competent during the preparation of the lessons, which according to them, would not only be useful, but it also helped in the achievement and the attainment of their personal and professional goals. In addition, the survey subjects found that, after the FC, a match between the efforts they provide and the results they obtain has been achieved, which was not the case before the FC. In fact, the students' perceptions about the value of the proposed activities, about their competencies and their control over the activities had significantly shifted in favor of the FC.

These results go in parallel with the literature's data, which specify that the FC creates an environment in which, under the teacher's guidance, students consider themselves as people of the front line who are responsible for their learning [8], [45]. Thus, when the teacher adopts such an approach, he/she places the student at the center of the teaching/learning process which arouses their motivation [40], stimulates their cognitive and metacognitive capacities, facilitates the achievement of their personal and professional objectives, and, by extension, guarantees them success in studies [33], [45], [49], [51]–[53], [55]. In addition, adopting the FC provides self-confidence, makes it possible to deepen all kinds of knowledge and understand the covered concepts more easily, enhances the provided work and develops the ability to share, collaborative work, and curiosity [35], [40], [51].

Along the same ideological lines, Jacob adds that the FC is a pedagogical innovation that certainly leads the student to become more engaged in their learning since they find a match between their efforts and the obtained results [1], [33], [57]–[61]. Since the learner can consult the lessons at any time and repeat them as much as necessary until they have a good grasp of them, they are more likely to follow better the content of the course [35], [40], [51]. In addition to that, with the FC, students have the feeling of being able to complete their learning, becoming more competent, able to adapt, and creative [42].

In this regard, this first portion of the analysis, dealing with the determinants of motivation, reveals that the FC is more enriching than a pure behaviorist transmitting approach and allows learners to assimilate the courses at their own pace, which gives them some power over their academic progress.

Conjointly, this FC significantly influenced the level and choice of participation and collaboration of students in class, on the cognitive involvement, perseverance, and performance of learners. Indeed, for these indicators, the majority of participants noted that, after the FC, they, more often or even most of the time, choose to participate voluntarily in different activities in relation with their studies or their future professional activities, that they take as little delay as possible in their school tasks and that they show commitment and perseverance by seizing the opportunities offered to them to discuss, with the pedagogical team, courses or future projects. Equally, the participants showed most of the time, an intense satisfaction with their results, persevered and were generally interested in their studies, which was not the case before the FC.

Consequently, these results on the indicators show that the positive perceptions of students after the FC had positively influenced their choice, cognitive involvement, and perseverance in carrying out their assignments.

These results fit perfectly the interventional studies that focus on the analysis of the effects of the FC on the motivation and performance of students and which have revealed that, in general, the adoption of this method has entirely changed students' perceptions of their academic career. After being taught based on the hybrid pedagogy, students have become more active, most of the time ready to willingly carry out their activities, interactive, and willing to discuss anything that could improve their academic learning or professional practice with teachers and peers [35], [40], [42], [46].

In addition, according to the same studies, a strong increase in motivation and results alike was noticed from the first FC assessment for the majority of students which was not the case before. Students have become more involved, more persistent, and showing a particular interest in their studies.

Bishop, Verleger, Abeysekera & Dawson proved, according to their study and also based on the students' perceptions of the FC, that the general contributions were almost coherent and that the remarks were positive about this new method [42], [62]. For their part, Busebaia & John added that the motivation linked to the introduction of this reverse practice is due to the attraction of novelty which stimulates the involvement of learners during courses and their commitment to learning [63], especially since students are the first to express that they are more motivated during educational sessions that are done through using information and communication technologies [1], [7]. All those interventions go hand in hand with the results of the present study which shows that, after the adoption of the FC, 50.81% of participants more often make efforts to maintain their concentration in class, 27.42% do it most of the time, 9.95% do it sometimes and only a minority of 7.26% do it infrequently, added to 4.57% of them who do it rarely. That wasn't the case with the traditional educational approach.

All in all, it appears that the adoption of the Reverse Pedagogy nourishes motivation [1], [50], [57], [64], [65], guarantees effective and meaningful learning for the learner [66], [67], and, therefore, leads to success [8], [56], [57] and achievement of personal and professional objectives [9]–[11], [51]. As the figures show, these data perfectly corroborate with the results of the present study which highlights the fact that the motivational profile of undergraduate students of the HINPHT of Fez, which was 18.54% before the adoption of the FC, became 89.25% afterward.

In addition, before the FC, participants' responses were mostly rarely and infrequently, which classifies them as poorly motivated. In contrast, after the FC, their

responses were mostly more often and most of the time, which classifies them as highly motivated.

The findings of the study are promising and encouraging. There is a strong and significant correlation between the adoption of the FC and the improvement of the motivation of the undergraduate students of the HINPHT of Fez. As a result, the practice of the FC approach brings about changes; it focuses on the learner and combines many psychological, educational, techno-educational approaches, of which some are new while others are older, including written, theoretical, and empirical ones that have demonstrated positive effects on learning. A better knowledge of this one will make it possible to build a more effective and realistic professional practice.

Therefore, admitting that one of the ways offered to teachers to maintain student motivation is the pedagogical approaches they adopt. These approaches must positively influence the value that students attribute to them (perception of usefulness), their perception of their competence to accomplish them, and their feeling of control of their progress [26].

In short, in order to be able to meet teaching requirements, teachers are expected to innovate in pedagogy and question their classical approaches that are based on monopolized learning. Thus, they are expected to adopt specific gymnastics allowing them to use varied approaches, in order to offer learners a conducive, significant, and motivational environment with the ultimate objective of producing competent professionals, capable of meeting the needs of a demanding population.

6 Recommendations

Given the impact that FC had on the motivation of learners, several recommendations are proposed, which can be summarized as follows: (a) Organize, for teachers, periodic continuous training sessions by pedagogy-experts in order to enable them to understand the importance of adopting active approaches. (b) Train and assist them in the introducing of new technologies in information and communication in the training of students. (c) Provide them with quality platforms in order to facilitate the adoption of new approaches. (d) Recruit resource staff in active pedagogy to help teachers prepare training videos. (e) Incorporate co-teaching that will allow for collaboration and sharing, facilitate the diversification of pedagogical strategies and minimize work overload. Moreover, to obtain probing results, it is desired to (e) blend in other studies that emphasize the impact of traditional and new approaches on success and on the development of professional competencies.

7 The study's limit

Although this study had a significant response rate to the questionnaire, the study setting and the size of the sample based on which this research was conducted may limit its scope. In order to validate the results and draw reliable conclusions, it would therefore be necessary to extend this research to a larger sample that would include participants from all of Morocco's institutes.

The Viau's motivational dynamics model (Sociocognitive model) is practical and functional for practitioners. It relates the minimum of components that, according to sociocognitive studies, are essential in studying motivation in a school context. However, it is "micro-contextualized" since it is interested in the motivational dynamics when performing an activity, so it does not take into account all the determinants, including emotions and external factors that influence the motivational determinants (factors relating to society, the personal life of the student..).

Despite these limitations, the results of our study fill a clear gap in understanding the links between the use of an active pedagogical approach such as FC, by teachers at HINPHT in Fez and their students' motivation to learn. This seems to support what educational researchers have said about the importance of diversity in teaching strategies. On this basis, further research to identify the impact of these active pedagogies on success and on the development of professional skills would be highly desirable.

8 Conclusion

Above all, the Flipped Classroom is not only a space and time inversion compared to the traditional one, but it constitutes a pedagogical innovation that involves a change in the pedagogical paradigm. The present study carried out on undergraduate students at HINPHT in Fez, which was based on Viau's sociocognitive model of motivational dynamics and his motivation scale, clearly demonstrated that this hybrid strategy had a positive impact on the change in students' perceptions of their learning. In other words, the motivational profile of all specialties has changed significantly from poor to excellent after adopting this reverse pedagogy. In this regard, it is necessary to conduct continuous trainings for the benefit of teachers of Morocco's HINPHTs so that they could be able to adopt it as a new active teaching method and not as a pedagogy for the crisis.

In short, the present study does not constitute an end per se. It is an invaluable track to motivate access to new pedagogical approaches, grafting other studies, putting more emphasis on the impact of the FC on success and the development of professional skills.

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