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Ramires Heringer, Markoni; Rodrigues Guimaraes, Eloisa Helena; Mafra Pereira, Frederico César; Ramos Neves, Jorge Tadeu; Junqueira Fagundes, Augusta Isabel

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INOVAÇÃO NO ENSINO SUPERIOR PRIVADO
BRASILEIRO: UMA PROPOSTA DE APLICAÇÃO DE
METODOLOGIAS ATIVAS COM BASE NA SALA DE
AULA INVERTIDA

Markoni Ramires Heringer mheringer@gmail.com

Faculdades Integradas Pitágoras, Brasil

Eloísa Helena Rodrigues Guimaraes

eloisarodrigues@gmail.com

Faculdade Pedro Leopoldo, Brasil

 <https://orcid.org/0000-0001-7050-0105>

Frederico César Mafra Pereira frederico.mafra@fpl.edu.br

Faculdade Pedro Leopoldo, Brasil

 <https://orcid.org/0000-0002-1971-8069>

Jorge Tadeu Ramos Neves jtrneves@gmail.com

Faculdade Pedro Leopoldo, Brasil

Augusta Isabel Junqueira Fagundes profaugusta@gmail.com

*Coordenadora Pedagógica do Instituto de Formação Profissional e
Pedagógica, Brasil*

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Abstract: This article aims to describe the application and adaptation of the traditional classroom model to the so-called semi-flipped classroom model. In semi-flipping, differently from the flipped classroom, students can watch the videos in the classroom as well. The research was done a private HEI. The methodology adopted was qualitative and quantitative. The quantitative data were collected through a questionnaire from google forms tool, applied to the students of the IES, in its Venda Nova unit. For the qualitative approach, participant observation was used. This study was based on an earlier research applied in the same institution, when there was an attempt to implant the flipped classroom model. The application of the semi-flipped model aimed to remedy the main obstacles presented by the implementation of the flipped classroom model. The results reveal that the semi-flipped model had adherence and retained the advantages of the flipped classroom, obtaining better results.

Keywords: Innovation, Active Learning Methodologies, Flipped Classroom.

Resumo: Este artigo tem como objetivo descrever a aplicação e adaptação do modelo sala de aula tradicional ao modelo sala de aula denominado semi-invertido. Na semi-inversão, diferente da sala de aula invertida, os alunos podem assistir aos vídeos também em sala de aula. A pesquisa foi feita uma IES privada. A metodologia adotada foi de abordagem qualitativa e quantitativa. Os dados quantitativos foram colhidos por

meio de questionário disponibilizado na ferramenta google forms, aplicado aos alunos da IES, unidade Venda Nova. Para a abordagem qualitativa, utilizou-se a observação participante. Partiu-se de uma pesquisa anterior aplicada na mesma instituição, quando houve uma tentativa de implantação do modelo sala de aula invertida. A aplicação do modelo semi-invertido teve como proposta sanar os principais obstáculos apresentados pela implantação da SAI. Os resultados revelam que o modelo semi-invertido teve aderência e manteve as vantagens da sala de aula invertida, obtendo melhores resultados. **Palavras-chave:** Inovação, Metodologias Ativas de Aprendizagem, Sala de aula semi-invertida.

INTRODUCTION

Innovation

Innovation, in common sense, is associated with creativity and entrepreneurship and can and should be studied and applied in organizations, using the appropriate methodology, as stated by Bessant and Tidd (2009). According to these authors, from methodology and study it is possible to innovate in the development of new products and services; processes - changing the way you do something; changing the context in which the products or services are inserted; or to innovate in paradigm, changing the basic mental model that guides the business or institution.

Educational models generally have as the basic operant mode the student's presence in a classroom whose layout (for example, the positioning of the desks and the teacher's table) prioritizes the teacher and places him or her in the center of attention. Such model has proved to be less productive, especially with the advent of new technologies and the arrival of these resources in the classroom. The technological innovations introduced in the world change the way people communicate and provide a series of distractions and hobbies in the classroom, especially with increasing access to the internet, and have significantly altered the student behavior in the last two decades.

In this context, at first glance, making the teacher or the class more interesting than the cell phone seems to us a lost fight, without solution. But a closer look brings us back to the game; for this, a more radical innovation, defined by Bessant and Tidd (2009), is necessary. According to the authors, a radical innovation means a significant different change in products, services or processes - doing what we do differently. Technology can be used as a support, a valuable ally and an important tool to change the concept of the classroom and, in this way, to rescue students' attention. In this scenario of innovation and application of technology, a particular format stands out: the Flipped Classroom (FP).

The FP is a teaching modality that uses tools of distance learning (e-learning). In this model the contents are made available online for the students, who must study them before the face-to-face meeting in the classroom. In this way, the classroom becomes the place where exercises, lab activities and discussions will be done. The lectures are usually taught in videos that students access from wherever they are (Morán, Souza, &

Morales, 2015). It is a reversal of the traditional model of teaching, which assigns the classroom to the lectures and proposes activities to be carried out at home, for the most part. Starting from this model, it was decided to start a pioneering experiment, which is described in this article, applying a differentiated methodology in the classroom, which was called the semi-flipped classroom.

It is a methodology that is based on the principles of the FP but innovates when proposing changes in the presentation of the content. The proposition is to the lecture videos available so that the students can watch them at home, as well as in the FP, but also allow them to watch these videos in the classroom.

Thus, it is expected the maintenance of benefits such as the student's chance to learn at his or her pace; more time to teacher's support and attention to the exercises in room; and the opportunity for the student to be able to watch the recorded lectures as often as necessary.

Based on this scenario, the following research objective was defined: describe and evaluate the adaptation of the traditional classroom model to the semi-flipped classroom model. In order to reach this objective, a descriptive case study with qualitative and quantitative approaches was carried out in a private higher education institution, with a group of students that experienced the implementation of the semi-flipped classroom methodology.

The study was applied by one of this article authors, in one of his disciplines. In this experience, the videos were recorded by the teacher himself.

To describe this study, this article is structured in 5 sections: this introduction; section 2, which presents the concepts that theoretically support this research; section 3, which describes the methodology proposed for this study; section 4, which presents and analyzes the results of the research and section 5, which presents the final considerations, the limitations of the research and suggestions for future studies on the subject.

Innovation is a necessity, according to Bessant and Tidd (2009). These authors affirm that the term is present in all discourses and missions of companies. The innovation appears in many places, in hair spray or in the services provided by Uber. Our history is also filled with innovation. Takahashi and Takahashi (2011) argue that innovation refers to change and novelty and that these may be in relation to product, process, organizational structure, technology, market and business. In their book, authors Bessant and Tidd (2009) state that If we do not change what we offer to the world (goods and services) and how we create and offer them, we run the risk of being overtaken by others who do. In fact, a number of companies have been superseded, and various business models simply cease to exist when they stop innovating.

Bessant and Tidd (2009) evaluate that in the process of innovation, it is not possible to have a passive stance, just waiting for an inspiration: it is necessary to create an innovative process and to manage it in an active way. These authors define that the innovation is centered in three factors:

generation of new ideas, selection of the best ones and implementation. Trott (2012) highlights Shumpeter's work (1934, 1939, 1942), pointing him as one of the earliest economists to draw a parallel between new product development and economic growth. Shumpeter says creating new products has more economic impact than lowering the price of existing products in order to boost sales. In other words, economic growth is more positively impacted by the development of a new computer or iPhone than by the simple reduction of the price of the marketed goods.

Innovation applies to several areas, both in products and in services. In education there are innovative proposals that are focused on a new process and model of teaching and learning, which will be described in the following sections.

Literature review

In this section, the theoretical concepts that form the basis of this research are presented, as follows: Innovation, Active Learning Methodologies, especially Flipped Classroom (FP) and Learning Management System (LMS).

Active learning methodologies

According to Berbel (2011) the active methodologies consist in the application of interactivity in learning, analysis, study and research to find solutions to a problem. The author emphasizes that the teacher acts as a guide or leader of the student, so that the student does his or her research and is able to reflect and decide, by himself or herself, the best way to achieve the objectives. This is a process that offers the means to make it possible to develop the capacity for scenario analysis. The active methodologies, according to Berbel (2011), are based on the form of learning development, applying simulated or real experiences, seeking to solve questions of social practice in different contexts.

Morán et al. (2015) reinforce that these methodologies use the problematization as a strategy for learning and aim to motivate the student through the problem. According to the authors, through the problematization the student is led to expand the contact with information and knowledge generation, mainly with a focus on solving impasses and his or her own growth. Since the problematization brings issues of his or her area of study or interest, the involvement is greater and the student becomes active in the formation of his or her development. Some of the active methodologies in the teaching- learning process have been highlighted; therefore, the following will be presented and briefly described, with emphasis on the flipped classroom methodology.

Problem-Based Learning (PBL), according to Berbel (2011), is an approach that involves the entire curriculum organization, as well as all faculty, academics and administrators. PBL demands that those involved change their traditional role. The problems are developed through a

committee set up for this specific purpose and should be related to issues essential for the fulfillment of the curriculum, which should be thought and dealt with in an integrated way. Paiva, Parente, Brandão and Queiroz (2016) affirm in their article that the methodology is well accepted in the academic environment and seen as a modern method that arises at the University of Maastricht from the creation of McMaster University. According to Berbel (2011) the methodology is applied from the presentation of a case to the students, who then work in groups to identify the problem, debate, make interpretations and produce solutions or recommendations. In the end discussions are held on the investigations, culminating in a presentation, written or oral.

The methodology of the problematization (the Arc Method, by Charles Maguerez), according to Paiva et al. (2016), can be applied when convenient, constituting an alternative for the teacher. This method has a step scheme, which is based on a fact or from the creation of a problem. Paiva et al. (2016) explain that the development of the method occurs in three stages, the first being the formulation of the problem. This stage focuses on recognizing the issue, seeking connections, defining the problem, formulating questions and setting the focus. The second step is the resolution of the problem, the first activity being the search for more references and sources; these sources can be empirical or scientific and finally investigations are carried out. The third step is the discussion of the problem, in which the research conclusions, the reports and result debates are presented.

Berbel (2011) reports that this method does not require great changes in the materials or structure of the educational institution, it only requires a change of posture of the teacher and the apprentice in search of a critical perspective of the subjects and a certain flexibility of the classroom.

Peer Instruction (PI) is a method applied since 1991 by Eric Mazur, a professor at Harvard University and now widely replicated in several universities around the world (Paiva et al., 2016). According to Mazur and Watkins (2013) the moment in the classroom is preceded by a previous reading made at home; in the classroom, the teacher will give a short summary on the subject. Then the students answer some more general questions in order to gauge the general learning. Classes follow the following script: ten to fifteen minutes of explanation by the teacher; two to four minutes to individually carry out a multiple-choice conceptual test - ConcepTest (responses are computed by simple student-raised card systems or by specific electronic systems such as clickers); if less than 30% of students agree on the conceptual test, the teacher reviews the concepts explained and the students repeat the test; if between 30% and 70% of students agree on the conceptual test, they have three more minutes in small groups to try to convince one another (peer instruction) about the right answer, while the teacher walks among the groups observing and encouraging the discussion so that the students repeat the test at the end; if more than 70% of students agree on the conceptual test, the teacher comments on each of the test options, using new tests if necessary or starting a new topic. The results obtained after discussion among

students are always better than when they do the activity individually or when compared to traditional teaching methodology (Mazur & Watkins, 2013).

Just-in-Time Teaching (JiT'T) was developed by Gregor Novak and colleagues in 1999. This method aims to adjust the lessons to the needs of the learners; these demands are diagnosed through the responses given by the students on a topic, before the lesson. The authors state that this method is not so well-known as PI, but it is a good option that considers students' prior knowledge and helps to form the habit of study before classrooms (Araújo & Mazur, 2013). Novak (2017) defines that the JiTT teaching strategy seeks to achieve three objectives: to maximize the effectiveness of the classroom session, when teachers are present; structuring time out of the classroom for maximum learning benefit; create and maintain team spirit.

The Case Study is based on the presentation of real or fictitious situations with the purpose of stimulating the student to think about decisions for the case studied (Barseghian, 2011). Applied for the first time at Harvard, at law school, this methodology predicts that students will take pre- lesson readings regarding the case prepared by the teacher and then develop classroom activities with teacher mediation. In the end the results will be evaluated by the teacher (Araújo & Mazur, 2013).

Finally, the Flipped Classroom (FP) is a relatively new term that was first used around the 2000s. Its concepts were established from the experiences of teachers who came to use technology in the classroom, possibly thanks to the popularization of broadband internet and the increasing access of the general population to personal computers, PCs. Bergmann and Sams (2016) argue that such technologies enable the student to attend lectures from anywhere and at any time.

One of the first publications to point out new possibilities for reversing the traditional teaching model was the work of Eric Mazur in 1991, professor of physics at Harvard University. According to Valente (2014), Mazur did not use the term flipped classroom, but this was the first time the proposal was established. Mazur observed that many students presented difficulties in qualitative conceptual matters; but in the quantitative ones they had better performance. His conclusion was that these students were concerned about solving problems from pre-defined solutions and recipes and did not have full understanding of the concepts involved. The teacher concluded that this was caused in part by the model of applied teaching, called the traditional model, whose classes are based on oral exposition of the teacher and fixation exercises, mostly done at home or outside school hours (Valente, 2014).

In this traditional model, classes are more theoretical and less practical: the teacher exposes the subject and the student, passively, with very little interactivity, watches. Even striving for the expository classes to be fruitful and to have the best possible result, this was not enough, demonstrating that perhaps this was not the best format, or at least not the most efficient. Mazur and Watkins (2013) described the experience exemplifying that if the classes they taught were about Shakespeare, they would certainly

ask students to read the pieces in advance for further discussion in the classroom, taking the time to discuss them and deepen the understanding and appreciation of students by Shakespeare (Mazur & Watkins, 2013).

As said earlier the flipping term, or another of near meaning, was not used by Mazur; on the other hand, Lage, Platt, and Treglia (2000) have published an article on the theme titled Inverting the Classroom: a Gateway to Creating an Inclusive Learning Environment. The authors intended to ascertain whether there was an alternative model of learning for students in an introductory Economics course that made use of technologies.

In search of a methodology that worked, they researched two classes of the same course at the University of Miami. In one of these classes, the apprentices took the course following the traditional model of teaching, with lectures and doing the work and exercises of fixation at home. In the other they read the materials and watched the videos indicated by the teachers before the lessons.

The studies of Lage et al. (2000) showed that most of the students preferred the inverted model instead of the traditional one, feeling more motivated to be in control of their learning, since the rhythm and flow of study were determined by the student himself or herself. It was also found that the students were more motivated to elaborate questions in the classroom, since they had better knowledge of the subject; since they could see the class calmly before, they could interact more with their teacher. Both teachers and students said that this model motivated them more.

In a more practical way, we can say that the FP is a teaching model in which the explanation about a theme is recorded by the teacher on video and made available on the internet, on video playback platforms such as Youtube, Vimeo, DailyMotion, Metacafe, Veoh, ZippCast, Flickr, Blip.tv, Viddler, among others. This way videos are always available to students and other interested parties at any time and can also be accessed from anywhere. With the published videos and the student having watched the expository classes at home, or at least out of class time at school, the teacher's available time in the room for other activities increases, since he or she does not need to allocate part of the class for exposition of new content.

This allows a change in the classes format since more time can be allocated to complementary activities, exercises, problem situations, laboratory practices, etc. Usually, the attachment exercises would be done at home, but when done in class, they allow the student to clear up any doubts as soon as they arise (Bennett, Kern, Gudenrath, & McIntosh, 2012). In this way the student watches the video at home and can repeat this action as many times as necessary, paying more attention to the content with which he or she has more difficulty and less to those he or she already has. It is also worth emphasizing that diverse contents are already widely explored by teachers from all over the world, and there is now a vast amount of good quality materials available.

However, the FP model goes far beyond simply recording videos, making them available and making the teacher's moment in the room a space for learning activities. From the moment that the times and scripts of the classes change, also the way of learning and teaching changes. The flipped classroom, according to Bergmann and Sams (2016), improves the interaction between the students and the teacher; the students become responsible for their own learning, being able to advance in subjects of their interest at that moment, according to their pace and path. Content is available at any time and can be viewed as often as needed. The authors further affirm that this method is not a shift between the teacher and video lessons, or even that this model reinforces the isolation of the student; for them, it takes a broader look, since this model changes the order, but the format still depends a lot on the time in room, only that this time starts to be used more efficiently.

For the implementation of the Flipped Classroom model, according to Bennet et. al. (2012) it requires commitment and the knowledge that it will not be an easy process due to the inexistence of a tested model that can be replicated. The authors report that the application of the FP should have some specific characteristics that should be observed, such as: the student's classroom discussion and how this contributes or interferes; whether apprentices are reaching critical thinking with the model; whether collaborative work among students is actually taking place and being productive; if the students are challenged by the progress and thus are motivated to progress; whether leaders will naturally emerge as mentoring agents or whether the teacher will need to promote this leadership, and whether the student's transformation from passive to active is actually occurring.

Berbel (2011) emphasizes that there are other active methodologies with the potential to promote students' autonomy, with the aim of helping them to take more responsibility for the self-sufficiency. Valente (2014) emphasizes that strategies like experiments, games and simulations can also be introduced along with the active methodologies.

The success of teaching proposals that use new technologies also depends on a good support of the learning management systems described below.

LMS - Learning management system

The LMS system is a computer program whose purpose is teaching and learning, therefore it has a well-defined educational objective and aims to facilitate the learning of contents, development of skills and abilities through the use of a computerized interface. According to Sousa, Moita and Carvalho (2011), the system must have resources that facilitate the learning process, promoting situations that stimulate the students; for this, the pedagogical contents must be clear.

According to Oliveira, Cunha and Nakayama (2016), a LMS (Learning Management System), characterized by the use of multiple languages and resources of different technologies, presents information

in an organized, complete and easy way. It promotes learning on the part of the student through interaction. There are a number of LMSs on the market, including no-cost systems or tuition fees, such as Moodle, which has recently been made available in a totally free online model. The authors highlight the LMSs developed in Brazil by private companies, universities and public entities. Among the systems are the WebAula, private system, Teleduca, developed by the University of Campinas, EduWeb and Aulanet, both developed by PUC of Rio de Janeiro. E-Proinfo is an LMS used by the federal government.

For Oliveira et al. (2016) there are several factors that will determine the quality of an LMS. Everything begins at the very development of the system, passing then by the growth of the number of users and performance in machines that have the most varied features and speeds.

According to the authors, some requirements deserve special attention when acquiring a system, such as: reliability, scalability, security, stability, ease in adapting to international standards and resilience. Regarding the criteria for adopting an LMS, the authors emphasize that it is necessary to consider some factors, such as the need to restrict access, so that only students enrolled in the course or discipline can access content and activities. There is also a need to verify the need to promote communication with students through e-mail, forums, chats, etc. It should also be possible to know where students "walk", what they access, what they read, when and what they are doing in the LMS, and finally, it should also be possible to evaluate that student.

Methodology

Considering the criteria proposed by Vergara (2016), this research can be classified as descriptive. Regarding the means, a case study was chosen, considering that the object of study will be a private higher education institution (IES) in Belo Horizonte, located in the region of Venda Nova, Minas Gerais, belonging to the Kroton group, an institution that has about 1 million students in the country. As for the approach, it is a quantitative and qualitative research. The quantitative approach was used to characterize the individuals involved in the process; this method allowed the quantification of the information and facilitated its analysis and classification, from the statistical point of view. The qualitative approach was used in order to guarantee greater depth in questions related to the research, using the method of participant observation, once the researcher is inserted in the process as a teacher. These observations were made through notes during class to ensure proper record.

The unit surveyed is located in the northern metropolitan area of Belo Horizonte and currently has 2,900 students in undergraduate courses in technologist or bachelors. It also has postgraduate courses (lato sensu) and languages. The unit of observation was the students of the undergraduate courses, in all the engineering courses, who attended the discipline of Computer Aided Drawing (CAD). The forms were applied using the

CAD classroom itself, which has a computer for each student and access to the internet, thus enabling the application of the online form.

Initially, the lectures were previously recorded on video, using the Camtasia software, which captures the computer screen and audio, both the sounds emitted by the system and the voice of the content producer, creating a video that can be edited. The editing of this video was done in Camtasia itself because the application has a simple interface. During editing, it's possible to cut parts of the video, merge and insert other videos, insert images in more conventional formats such as JPG and PNG. In addition, the program allows animation creations and effects that make exposure more self-explanatory and palatable to the user.

After editing in the software, the video was rendered to be digitally assisted in several platforms such as PC, Smartphones, Smart TVs among others, in resolution and formats. The rendered video was posted on Vimeo platform (<http://www.vimeo.com>) and set to display only on the desired sites.

As soon as the videos were published, Vimeo provided a link, video address, for viewing. The videos were then be organized according to the order of viewing within the Maestrus distance learning platform (<http://www.maestrus.com>); there it was possible to publish the classes with diverse contents, in videos, archives, documents. Each class had its content variable according to its purpose and organized in order to provide a path to be covered by the student.

The student's performance was recorded by the software management screen, allowing the researcher to monitor the progress of each student individually and thus allowing punctuated actions to be taken when necessary, in cases where the student has his progress below the expectation for the moment of the course.

After the publication of the course, the student made his / her registration in Maestrus and had a password and own login. He could attend lectures during his or her term in the institution or from another location such as home or work. What changed in relation to the flipped classroom proposal made by Bergmann and Sams (2016) was that the classes were made available and also watched in the classroom. Exercises and other activities were done in the classroom and at home, and each topic proposed by the teacher was planned for the student to watch the video exposure and do the exercises of fixation.

This format was applied in three design classes with computer aided, totaling 150 students during the first half of 2017. This course was chosen because it is taught in laboratory with availability of microcomputers for each student and access to the internet with good speed. The student took his or her own headset, so that the sound of one video did not disturb the other. They could watch the videos and perform the activities at their own pace, not having to be all in the same stage, thus allowing the class not to be stuck to an average development. At the end of this period, a structured form was applied through google forms. A survey was carried out, applied in online form within the room two weeks before the end of

the semester to obtain the greatest number of possible answers. The data were tabulated in database for analysis of statistical software.

The quantitative analyzes were performed in Excel, dispensing the use of more complex quantitative software, due to the number of interviewees. The obtained data were compared, tabulated and analyzed, seeking to find patterns and relations between the answers. The qualitative data, obtained through textual response, were classified according to the response and tabulated, in the search for identifiable and tangible patterns. Vergara (2016) stresses that data can also be treated non- statistically, for example by coding, presenting them in a more structured way and analyzing them.

Results and analysis

The research instrument, a questionnaire with 23 questions, was applied to 122 students of the educational institution. Using a statistical calculation, for a population sample of 150 individuals, in order to obtain a 5% margin of error, 109 responses were necessary. The present research obtained 122 responses, exceeding the limit necessary to use this margin, thus, obtaining confidence higher than 95%. Table 1 shows the sample sizing.

Table 1
Sample sizing

Confidence	95%
Margin of error	5%
Population size	150
Research sample	122

Source: research data (2017).

The next subsections of this chapter deal with the specific objectives of this research, which will be compared and analyzed with the obtained data.

Impacts of semi-flipped classroom methodology on the involved students

The institution researched, as mentioned before, is in the outskirts of Belo Horizonte, in a region with a large population with predominantly low and middle income. For better understand the impact of the methodology used in the classroom it is necessary to understand the profile of this apprentice to relate the greater or lesser ease of use and interaction with digital platforms.

As for the age group, 69.7% of the students are between 18 and 24 years old; 15.6% are between 25 and 30 years old; 10.7% between 31 and 40 years old and the remainder between 41 and 51 years old. In these classes

there are no students over 51 years old. In total, 85% of students are 30 years old or younger and 96% of them are 40 years old or younger.

Because classes are in videos due to semi-flipped model, it's of great deal if the student has a computer at home for better interface with the system and visualization of the classes. When surveyed in 2015, by Milhorato and Guimarães (2016), 5.7% had no computer; this number in 2017 fell to 4.9%.

The degree of the students' occupation (that is if he or he works and/or studies) was another researched point. When asked about their current occupancy rate, 32.8% of students only study, do not work. In the survey by Milhorato and Guimarães (2016), conducted in 2015, 26% did not work, a significantly smaller number. This change may be a reflection of the economic retreat that Brazil has been suffering in the last two years. It can be observed in this research that 67.2% of the interviewees work and study and 56.6% of them work eight or more hours.

Regarding family income, 89.7% of the respondents have a less than R\$ 4,485.00 income, of which 64.3% have a less than R \$ 2,811.00 income and almost half, 45.7%, have an income lower than R \$ 1,874.00. Basically, the unit surveyed meets classes C, D and E. According to IBGE (Brazilian Institute of Geography and Statistics), Brazilian families have an average of 3.3 people.

The data presented in this subsection shows that most students are young people up to 30 years old, have a computer at home, work or internship, and have low or average income. The fact that they work, some more than eight hours, should be highlighted, since the free time of these students is very small, which makes it difficult for them to have the time or the willingness to attend classes beforehand at home.

Difficulties and facilities perceived by students in the implementation of the semi-flipped classroom

When asked if they had access to broadband internet at home, 92.6% of the students answered yes. Another relevant point is the speed of the connection, since the visualization of videos demands a good band. Of the students who have internet, 7.8% have a connection of up to 1 Mb, relatively low capacity to run videos; but the vast majority, 92.2%, has a connection of 2 Mb or more.

Of the students who do not have internet, 37% do not intend to have, 63% intend to have in a two-year time and 44.4% say they intend to have in a year. It was verified there is a reduction tendency concerning individuals who do not have internet at home, in a future projection. Based on this information it is possible to see that less and less this will be a problem or limitation for the implementation of the semi-flipped classroom, since, over time, there is a tendency for all the houses to have broadband access. When asked if they had internet access for their work, 55.6% of the students do not have access during the working day. A small part, 9.8% of the students, has access and can study, watch video lessons, in their free time. Therefore, it can be concluded that for only a small

portion this access may be useful for out-of-room studies, but this benefit is not significant; therefore, watching previously is limited only to the residential environment.

One of the advantages of the semi-flipped model, as conceived, is that lessons are videotaped and available in full at any time. The IES allows students to enroll after the start of the school semester. The apprentices were questioned about when they started the course and 37% of them started after the first week, 10.6% started after the second week. This is relevant information, as 27% of students lost content early in the course. In addition to the other problems during the course, such as illnesses, work-related absences, pregnancy, among others, the loss of classes by students increased in the course of the semester.

Therefore, an advantage is observed in the semi-flipped model because, in this format, students can update themselves in relation to the lost content, through the classes recorded and made available in the LMS. When verifying if the material used in the semi-inverted model, especially the videos, is suitable for learning and within the proposal of the model, 82.6% of respondents said yes, 10.7% were neutral and 6.6% believe who does not. More than half, 59.5%, thinks the material is fully adequate, as expressed in Figure 1.

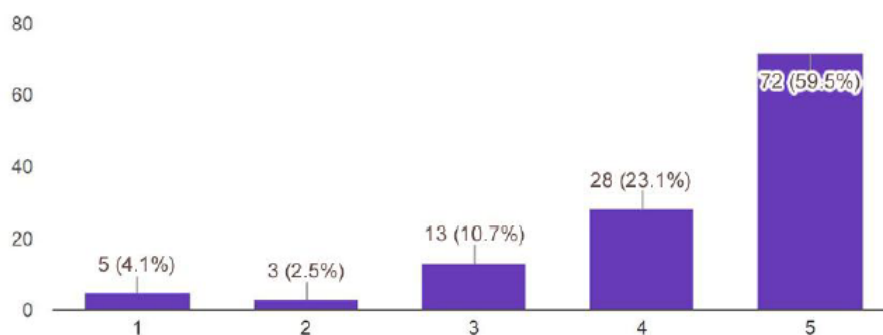


Figura 1
Quality of available material (videos)

As it turned out, internet access outside the classroom environment is not a problem for most students, as demonstrated. However, most of them work and do not have internet access in their organization. Part of the students, but not the majority, enrolls after classes start.

In their opinion, the material available in videos was of good quality, that is, the recorded lessons were able to transmit the knowledge in a satisfactory way and, thus, to replace lectures in a satisfactory way.

Degree of student involvement in the semi-flipped classroom process

To measure the student's degree of involvement, it is important to compare the previous results obtained during the implementation of the flipped classroom, a study done by Milhorato and Guimarães (2016), with the data obtained with the semi-flipped model. According to the

referred authors, concerning the researched students only 20% always or usually accessed the material, 32% sometimes and 48% never or rarely.

The Maestrus LMS, used for the application of the semi-flipped model, provides a performance and monitoring report of the student, as shown in Figure 2













































220		moraesuf91@gmail.com LUCAS NUNES DE MORAES	AutoCAD Module I	03/16/2017	40%	Single	Active	  
219		andredsa3@yahoo.com.br André Diniz Sá	AutoCAD Module I	03/15/2017	100%	Single	Active	  
218		caique.pereira.107@gmail.com Caique Pereira	AutoCAD Module I	03/15/2017	97%	Single	Active	  
217		rrg034@gmail.com RICARDO DA ROCHA GONZAGA	AutoCAD Module I	03/15/2017	91%	Single	Active	  
216		jhonataanebrant@hotmail.com Jhonata Gabriel Anebrant	AutoCAD Module I	03/15/2017	54%	Single	Active	  
215		randalmanfrini@hotmail.com RANDAL MANFRINI CLAUDIO	AutoCAD Module I	03/15/2017	90%	Single	Active	  
213		igorbreno22@hotmail.com igor breno ferreira gomes	AutoCAD Module I	03/14/2017	59%	Single	Active	  
212		cid.eleiro@yahoo.com.br Cid Ramos Cordeiro	AutoCAD Module I	03/14/2017	100%	Single	Active	  
211		nataanaelvector2010@hotmail.com Nataanael Victor de Souza Alves	AutoCAD Module I	03/14/2017	91%	Single	Active	  
210		valdirsmj@live.com Valdir Servulo Maciel Junior	AutoCAD Module I	03/14/2017	100%	Single	Active	  
206		viniciuspaulo985@hotmail.com Vinicius De Paulo Coelho	AutoCAD Module I	03/10/2017	100%	Single	Active	  

Figura 2

Maestrus performance management panel

Source: platform maestrus <http://www.eudesenhando.maestrus.com> (2017).

From the analysis of these data it was observed that 83% of the students did all the proposed content and on average the students completed 93% of the available content, an index far superior to that obtained in the research of 2015. This increase is due to the availability of visualization of the classes also in the classroom and by the type of material available, videos, since in 2015 the main base of the material were handouts and exercises online. The videos are more appropriate to the students' language and closer to the traditional expositive classes, since they bring together sound and image.

With the purpose of ascertaining if the students had actually understood the semi-flipping proposal, they were asked about their degree of understanding of the applied methodology. Concerning the respondents, 82% fully understood, 12.3% declared themselves neutral and only 5.8% did not understand the proposal, as shown in the graph of Figure 3. Only the comparison of the models, by respondents, becomes valid if they understand the proposal of semi-flipping.

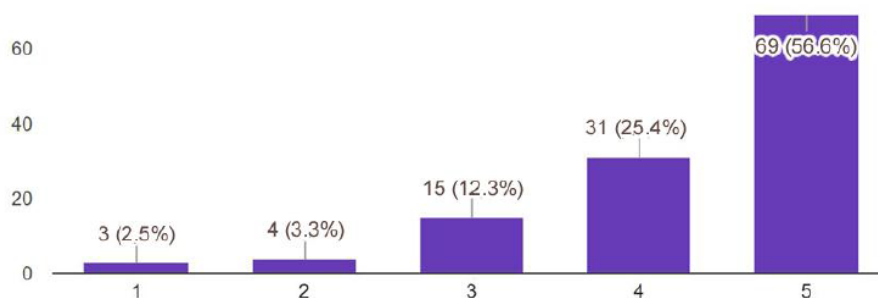


Figura 3
Understanding of the proposed teaching model
Source: research data (2017).

A relevant point concerns the student's outside classroom dedication to studies, exercises and video watching. Only 5.8% do not dedicate themselves, but 71.1% of the interviewees dedicate more than 30 minutes per week to study the discipline studied. In the classes the researcher taught previously, it was observed that a weekly dedication of less than one hour, in addition to the time in the classroom, is insufficient for learning AutoCAD. This tool demands a tacit, as well as explicit, learning.

Another point studied is whether the semi- flipped model motivated the student to come to face-to-face classes. When asked about this, 52.5% of them said yes, 24.6% were neutral and 22.9% stated that they were not motivated, as shown in Figure 4. Thus, it can be inferred that the model creates a double situation: if on the one hand it favors the studies of those who have some difficulty or prefers to study in the classroom, it encourages students more used to study alone to carry out, preferably, the activities at home.

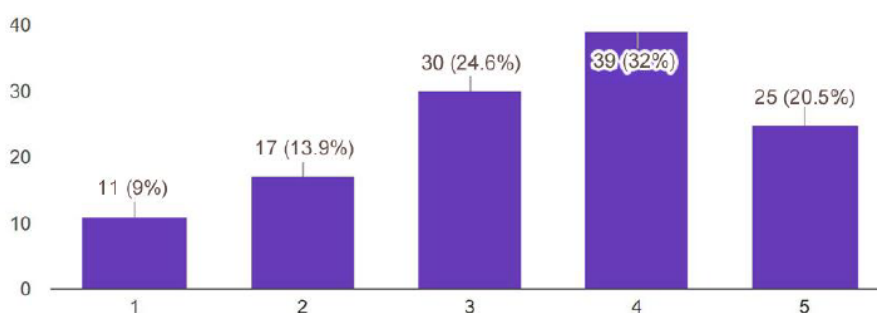


Figura 4
Motivation to attend face-to-face classes
Source: research data (2017).

As stated earlier, in the study by Milhorato and Guimarães (2016) it was proved that students did not have the appropriate contact with the classroom material prior to the meeting in the classroom. Seeing or reading the pre-lesson material is the principle and premise of the flipped classroom, a model that was attempted to be implemented at that time (2015). This material, made available to students mainly as a pdf file to be printed, was intended to be read by the learner prior to class. The students

justified themselves in Milhorato and Guimarães (2016) using several reasons not to read the material previously, but the main one was the lack of time, since most of them worked more than eight hours and besides studying. Therefore, in this research it was necessary to verify if there was a change in this profile; as shown in Figure 4, the involvement in doing the activities was quite satisfactory, but it was important to understand whether they attended classes in the classroom, at home or in a mixed way. The data showed that only 4.9% of the students watched videos exclusively at home; as there were 122 interviewees, this means that only six students behaved like this, demonstrating that they do not have the time or habit to carry out this task. On the other hand, 95.1% of the students watched at home and in class. In the interview it was shown that 55.7% attended all the videos and 40.2% watched some videos.

Not watching all the videos is not exactly a problem; students can conclude the video before they reach the end, in Maestrus system. This possibility has been configured in the system because some contents or commands are learned by the student through their peers and it is not necessary to make it compulsory for the video to be played in full before giving the class as a lesson, otherwise the student will be forced to watch content that already dominates, promoting disinterest. In addition, there are videos that are correction of exercises, tips or tools of support and do not need to be watched by all students, only by those who wish or need to do so.

When producing a material in video form for the flipped classroom, the researcher had as objective to make available the content in a media and language closer to the apprentices, including visual resources like animations. In addition, CAD is extremely difficult to learn from books or handouts, since it requires tacit learning. Since the videos were made from screen capture software, they allow the student to see exactly the commands, shapes, lines, icons, location, navigation and settings made for that specific lesson.

Another reason for the material to be made in video, not in a book or pdf format, is that all the literature about the flipped classroom speaks of video experiences, since only the text is not capable of fully replacing the lectures of a teacher. In fact, a video is not capable of replacing either, since it does not allow interaction between the student and the teacher. However, in a flipped classroom, the moment after a video is about doing exercises and clarifying the doubts and at this time the student counts on the availability of the teacher to help him or her solve those doubts. The applied semi-flipped model showed an increase in the student's involvement when compared to the previous inverted one. The reasons, as demonstrated, are the fact that the classes are in video, that it allows the students to watch the lectures recorded in the classroom, the availability of a management system, LMS, with organized content, available completely in the first class. The content availability from the following classes is an important advantage as it allows the student considers the subject easy to move further and not necessarily follow the average pace of class.

Comparison between the semi-flipped model and the traditional model, from the perception of the students involved

This section is intended to compare the semi- flipped model with the traditional model of teaching from the perception of the students interviewed. When the active teaching methodologies and the flipped classroom are presented, it is common for comparisons to arise and, especially, to discuss how the traditional model is archaic and almost immutable. When asked whether the traditional model is suitable for learning, 69.7% of the respondents said they agreed partially or totally, 23.8% were neutral and only 6.6% disagreed partially or totally. It means they see no problem in this model, they are even satisfied with it, as shown in Figure 5.

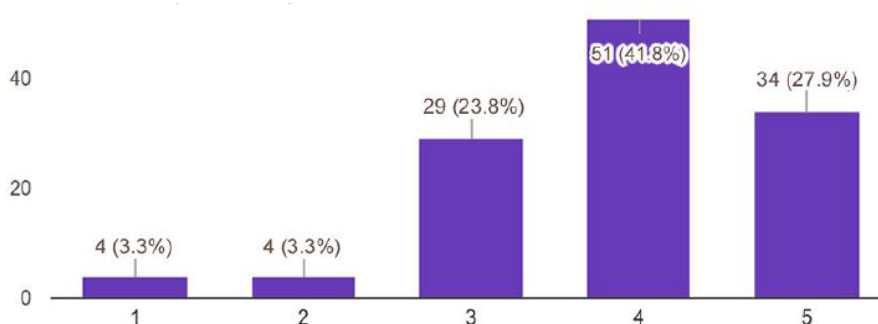


Figura 5
Degree of satisfaction with the traditional model
Source: research data (2017).

When questioned whether the semi-flipped classroom model is better than the traditional classroom model, 65.6% of the respondents said they agree totally or partially, 22.1% were neutral and 12.3% disagree totally or partially. This result is quite curious: the students are not dissatisfied with the traditional model but liked the proposed model. It is possible that, because they did not know other models of teaching or because they did not participate in classes with different formats, they only know the traditional model and that is practically their only reference of class. In the absence of other proposals or because of their lack of knowledge, the interviewees feel comfortable in the situation they are in and with the traditional classes they have participated in for decades.

The main practical difference of the semi- flipped class in relation to the traditional one is the use of video in substitution to the expositive class. Students were asked if video lessons motivated them to study more than in the traditional model. Of the participants in the survey, 77% reported that they partially or totally agree with the statement, 13.1% were neutral and 9.9% disagreed partially or totally. This indicator reinforces that the model had a positive impact on the classes and the way of studying.

An important finding for the research is that, although they feel more encouraged to study and find the semi-flipped model better than the traditional one, only slightly more than a third, 36.4% of the students

would prefer an institution if they knew that it only applied the flipped model. In part, this number can be explained by question 23 of the questionnaire: in this question, the interviewee could freely describe his observations. Some of the students pointed out that the semi-flipped model is good, but they do not believe that it can be applied in all disciplines. In their opinion, some disciplines would have no adherence to the model.

As none of them had contact with the semi- flipped model before, as well as had no contact with the flipped classroom, such statements can be a sign of insecurity or lack of knowledge. However, it can not be said that the semi-flipped model adheres to all disciplines, since this research was applied only to one subject for the same course.

In their book Bergmann and Sams (2016) describe their experiences regarding the implementation of the flipped classroom. In this work they reinforce that among the advantages offered by the FP is the fact that the apprentice does not have to say in front of everyone that he or she did not understand the subject; you can simply rewind the video, or as they say "rewind the teacher". A similar report was made by Khan (TED Ideas worth spreading, 2011). In his lecture, the former fund analyst stresses that one advantage of the video is not having to accuse the student by pointing to him or her and asking the following question: did you get it? In this research students were asked if they have any embarrassment to ask questions to the teacher in front of the class and 27.8% said yes, if they feel constrained. This is an important part of the class, there are at least one in four students. If these learners in fact fail to clarify their doubts by shyness or fear of embarrassment, learning can be compromised at some level and for them only the expectation of learning alone or with a colleague would remain.

The researched HEI has adopted the practice of enrolling students after the beginning of the academic semester, within the limit of absences allowed by the Brazilian Ministry of Education and Culture. In addition, it is common for the student to miss some classes for a variety of reasons (health, work, pregnancy and personal / professional commitments). In the experience of Bergmann and Sams (2016) they report that many students miss classes to participate in other activities of their school, mainly exercising and less common participating in theater groups.

One of the advantages of FP is that classes are recorded and available; this way the student can, even losing some classes, watch the videos and even with other colleagues. In the research, it was found that 90.3% of the respondents believe that the videos help them catch up on the content.

In the literature selected and which served as the basis for the theoretical reference of this work, several authors point out certain advantages that the FP offers. Among the advantages are the ease of studying at home, being able to return the video, being able to watch as many times as necessary, not having to ask the teacher about their doubts in front of everyone, the fact that the lecture is seen at any time or place , greater availability of the teacher in the classroom and being able to study

at his own pace. These questions were chosen because they stood out in the literature and entered the research instrument (Figure 6).

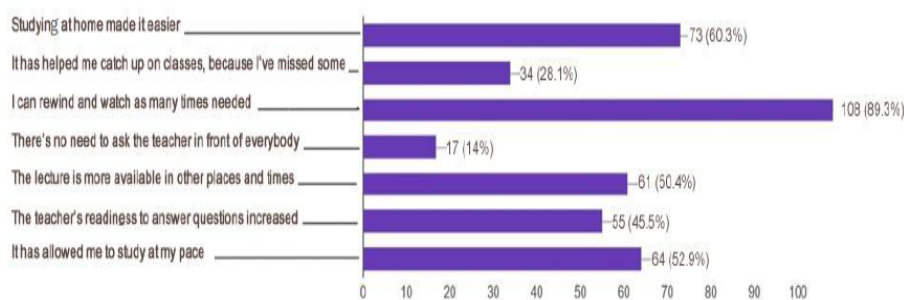


Figura 6
Advantages perceived by the semi-inverted classroom
Source: research data (2017).

By asking this question the intention is to ascertain which of these questions have moderate relevance for the student. It was also sought to verify if these notes were reality in the semi-flipped model, in other words, if in this model the advantages perceived in the FP would be maintained. The interviewees were asked about the main advantages they perceived in the implementation of the semi-flipped room; it was allowed that no advantage was selected or that all options were chosen. It can be observed that the main advantage, chosen by 89.3% of respondents, is "I can rewind and watch as many times need", followed by "studying at home made it easier", with 60.3% of the choices.

"There's no need to ask the teacher in front of everybody" was pointed out by 14% of respondents. It can't be said that it is not an important advantage, because less than 1/6 of the interviewees made this choice; for these students who really have difficulty positioning themselves in the classroom, video-lessons probably made a difference, otherwise they would probably remain in doubt. With numbers close to 50% are the availability of lectures, the increase on the teacher's readiness and the possibility of studying at their pace.

The survey found that 27% of the students did not start classes the first week; the maximum number of students' meetings with the teacher is 16, lasting three hours. This occurs when there are no holidays or other planned activities in the academic calendar, two of which are for evaluation. The number of students who marked "helped me catch up on content" was 28.1%, very close to 27% of the students who did not start classes in the first week, along with the classmates.

When students were questioned whether the traditional teaching model is a good model to study, almost 70% of them said they agreed in whole or in part; in other words, they have no problem with the traditional model. However, when asked whether the CAD classes in the semi- flipped model were better than the Technical Design classes in the traditional model, 69.7% of them said that they agree totally or partially, with 41% fully agreeing.

This clearly demonstrates that the model was adherent and that the value of this change is perceived by the interviewees. It is important to

note that both the CAD and the Technical Drawing classes were taught by the researcher, so other factors that could influence the students' decision were eliminated, such as, for example, the predilection for a given teacher.

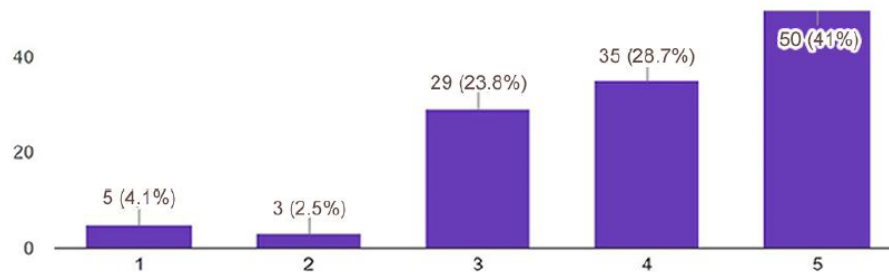


Figura 7

The semi-flipped model was better than the traditional one

Source: research data (2017).

In this section a comparison was made between the semi-flipped model and the traditional model. A relevant aspect pointed out in the research is that students, unlike experts and scholars, are not dissatisfied with the traditional model and believe that this is a good format for studies. They can perceive value and find the semi-flipped model better, but they would not choose an HEI just to apply this model. Part of this reason may be the lack of knowledge of other forms of learning and teaching and of little or no contact with other formats.

Adapting the traditional classroom model to the semi-flipped classroom model

The proposal of adaptation of the traditional model to the semi-flipped model starts from the following premise: the student may have contact with lectures, video, in the classroom and not only at home before the lessons. In this case the advantages offered by the FP are maintained. In addition, the idea is to solve the main reason for failure when implementing the FP in 2015: due to the students' lack of habit or time, they did not see the material in advance, as is foreseen in the FP.

The first issue to be adapted was the preparation and availability of the material, videos, to be watched at home or in the classroom. One of the barriers to be faced was the quality of the Internet of the IES. In this unit (and seems to be a common fact to other institutions) the internet available in the room is over Wi-fi, it hardly works well, especially for video playback. In addition, students do not count on computers in the classroom. Specifically, in the case of this research, we chose to apply the semi-flipped model in the CAD classes, since these classes were done in a laboratory that had a wired internet network, working better when compared to the wireless network, and was able to fulfill the class needs. In addition, in the CAD classes students have a available computer, with compatible performance for playing the videos and access to the LMS.

When the student was allowed to attend the exhibition in the classroom and at home, there was a risk of not having a traditional neither a flipped class where the advantages of both models were lost. However, it was observed that the time of video exposure did not have a great impact or reduction in the time available for exercises, since the students preferred to do the exercises in the room because they felt safe: if they needed, they would have the material to watch at another time. During the semester, the students themselves spontaneously increased the time of viewing the classes at home, a factor that was proven in the LMS, when checking the hours of access and viewing the classes. In principle, only 21.5% of classes were attended outside of school hours, but in the final weeks the number has increased to 33.2%.

The student's adaptation to the change to the semi-flipped model occurred without major disturbances after a few weeks. However, a period of adaptation was necessary, with the first two weeks being particularly difficult. In the first few days it was necessary to register all the students in the system and to follow the beginners during the following weeks, so that they did the same.

The apprentices had a printed booklet with activities to be carried out during the semester and in the early days some of them tried to do it themselves or asked their classmates or teacher instead of watching the video lessons. It was necessary to change the position of the teacher / researcher; when the student asked something that was in the videos the first question asked was: have you watched the video? If the student had not watched it, the teacher would access the system with him or her and instruct him or her on how and where to find the desired content.

Some apprentices confused this position with the teacher's bad will, but with time they realized that the videos were almost always enough to provide them with the necessary knowledge. In this way the teacher was dedicated to answer doubts and resolutions of exercises and could focus on teaching the unspoken questions more difficult to be transmitted by only a video lesson. Some CAD commands require double- clicking and positioning the mouse to function properly, as well as understanding logic.

During the implementation, one of the main differences from traditional classes is that the more agile students stood out from the rest of the class and quickly were close to completing the content, still missing a good part of the semester. It was possible to perceive a difficulty and an opportunity. The difficulty in implementing the semi-flipped model is that the teacher must have full mastery of the entire contents of the semester, since students can move forward when and how they want to. The opportunity, especially for the CAD course, was to offer this student extra content, which was normally left out due to lack of time for the appropriate teaching to all. If you do not have to keep up with the average pace, some students can go even further. Especially in the discipline of CAD this was a great opportunity, because in the previous classes the teaching was limited to 2D CAD and in these groups, semi- flipped, it was possible to also offer 3D CAD, which some students got to learn.

For the teacher, the investment in the preparation of the classes was especially high. It was necessary not only to plan all the classes, but also to script the videos, record the contents, edit, publish and organize in the LMS system. For every ten minutes of lecture, it took 180 minutes of work in all. It can be verified that the initial investment, in the question time, is quite significant. However, the content produced will be available for the following semesters and the use of time for production will be less.

According to observation made by teachers at the end of the semester, they are commonly affected by health problems related to voice, which are common complaints. The researcher observed a significant reduction of those problems with himself, since it was not necessary to speak to sixty students in a large room, so as to be audible to all, including those more distant.

Teaching the semi-flipped classes was also more satisfactory and less monotonous compared to the traditional model. In the traditional model, with three classes in the semester, for at least three times in the same week it would be necessary to do the same content exposure three times, sometimes on subsequent days. Normally, in the first lecture this is done with a lot of enthusiasm, the third time the subject becomes tiring and the quality of the class may fall. For teachers who teach only one discipline in more classes this problem can be even greater. With video lessons the quality is guaranteed and does not change, even if viewed thousands of times. In addition, during the classes, the researcher needed to attend to the most diverse subjects and contents, which demands mastery of the subject, but also makes the service more pleasant, since it diversifies the lines and almost always these were made for a student or a small group.

There was a greater interaction of the students when the teacher was near them; when walking around the room and passing close to the students, they felt more comfortable asking questions or asking for help. This posture is recommended in order to ensure better results and interaction.

Final considerations

The present research had as general objective to describe and evaluate the adaptation of the traditional classroom model to the semi-flipped classroom model. For that, a case study was carried out in the HEI of a large educational group, with a quantitative and qualitative approach. The quantitative research focused on the students of the unit participating in the CAD discipline, who were submitted to the application of the semi-flipped model. The qualitative one was made through participant observation, since the researcher was an active part of the project. Based on the results obtained, it was possible to identify and evaluate the adaptation of the traditional model to the semi-flipped.

One of the positive aspects observed is the profile of the students, basically formed by young people who mainly did not present difficulties or resistance to the use of technology. On the contrary, they were

encouraged and anxious to use it. Another positive gain is related to the learning and possibility of the students to go beyond the content taught in the previous semesters, since in this model the students followed their own rhythm.

The teacher and the students' gain concerning the lesson quality is a point to be highlighted. For the teacher, the lesson became more interesting, challenging and less repetitive. Another relevant point is that the students, by watching the video lectures, reduced the use of the cell phone.

With the use of the LMS, there was a significant gain in the punctual interventions made by the teacher. As in the system it is possible to verify the point where the student is, the teacher made personal calls to those who needed, increasing the assertiveness. In the traditional class, the focus becomes the more developed student, as discussed by Bergmann and Sams (2016).

Among the difficulties faced, the preparation of classes was a highlight. The level of demand for lesson planning and the time needed to prepare them is quite significant, requiring great effort and determination.

The initial adaptation of the students to the model required a teacher's effort and a change of attitude. When faced with a request it was necessary to find out if the student had not understood the content of the videos or if he or she had not watched the video, otherwise he or she would risk the classes if they lost or were closer to the traditional content, with live lectures. Milhorato and Guimarães (2016) point out as a negative point in the implementation of the FP that the content presented by the institution was not adequate to the expectations of students and teachers. This content was essentially in handbooks / electronic books. In the semi-flipped model, with video lessons, this obstacle was completely overcome, with good adherence of the apprentices. The students were more comfortable preparing the exercises because they could count on the teacher's help, or they could, if necessary, use the videos.

Another important point is to review the content and measure the knowledge of the students before publishing them, because in some cases problems were found with respect to the basic content. This problem was solved by publishing, along with the material produced by the researcher, videos of support already produced by other teachers or platforms.

Finally, it is possible to highlight the need, in case of adoption of the proposal by the HEI and large-scale implementation, of training and qualification of the teaching staff for such procedure. In addition, it is necessary to adapt the classrooms, equipping them with good quality wi-fi internet and bandwidth. As for computer equipment for viewing content, it is possible for students to watch videos on their own smartphones with the use of headphones.

The semi-flipping has shown to be adherent to the superior private education, in which the student usually works, besides studying. Unlike the FP, in which the student needs to spend much of his time at home to attend lectures, a condition that not all students have, in the semi-flipped model the student can watch at home or in the classroom. Over time, and

according to the need and profile of each one, the students themselves began to see the videos more spontaneously before the lessons.

The research was limited to the application in the classes of CAD, due to availability of internet and computers in the classroom. This matter has a completely practical character; thus, it is not possible to generalize and ensure that the model obtains the same results in a theoretical class. Another limitation is the possible competitive advantage of the model, from the point of view of the market and student acquisition. Because private institutions rely on payments for their operations and these resources come from enrolled students, semi-flipped can be used as a strategy for better results. However, in the research it was not possible to verify if this model is suitable for HEIs that have as strategy the mass formation, with large classes. The adoption of this strategy, since eventually the model may require class size limitations, may require larger investments and oblige the institution to work with higher monthly fees, passing on to students the increase in operating costs. It is possible that this model is better suited to smaller and more flexible institutions that focus on a specific market.

It is also emphasized that the present research was carried out in only one HEI, not representing a cut in all the institutions and units of the group. However, it can be stated that, in Venda Nova unit, the data presented represent the reality of the unit regarding the project. Another limitation was the number of disciplines analyzed, considering that at the moment no student has studied all the disciplines in this format. If the model is implanted in all disciplines, it will certainly increase the student's demand, and this can generate results different from those presented in this study.

As a suggestion of future research, one can verify if the semi-flipped model adheres to theoretical disciplines, in which laboratory practice is not necessary. It can also be verified if the semi-flipping applies to large-scale and mass-scale institutions and also to institutions that adopt the specific market as a strategy. The inclusion of other technological resources and the possible impacts are also a good option for future research, such as online exercises to measure proficiency and gamification.

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