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Challenges and Possibilities of the Flipped Classroom With Active Methodologies, Blended Learning in Technical High School

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Abstract: The new paradigm of information technology provides technological resources and digital media that privilege communication and access to information. However, digital technologies have little explored potential in the teaching-learning process. Flipped classroom and rotation by learning station methodologies are blended learning modalities that combine online teaching with classroom activities. The present work aims to analyze the main challenges, difficulties and the good points of the application of the flipped classroom methodology and the rotation by learning stations by a group of IFTM high school and technical teachers, based on the records made by these teachers. Among the biggest difficulties encountered by teachers are the preparation of appropriate material to make available in the virtual environment, the time taken to prepare the activities, lack of motivation and lack of commitment of some students (20–30%) who did not access the virtual environment. Some teachers had difficulty managing time at each of the learning stations and also noted the difficulty of working in groups for some students. However, these blended learning methodologies proved to be effective enabling more autonomous moments of online study, allowed better use of class time with practical activities and better learning outcomes. Flipped classroom and rotation by learning station methodologies favor innovation in teaching practices and allow the development of student's new skills.

Key words: blended learning, flipped classroom, station-rotation model, activities methodologies.

1. Introduction

Education with conventional instruction based merely on the transmission of content is outdated and has been facing difficulties in the face of changes in society. The standardized school, which uses traditional methods, teaches and evaluates everyone in the same way and demands predictable results, ignores that the knowledge society is based on cognitive, personal, and social skills, which cannot be acquired in a conventional way (Moran, 2015). Students are increasingly disinterested in school and content so that the mere transmission of information without adequate reception would not characterize an efficient and effective teaching-learning process (Santos & Soares, 2011).

Pierre Lévy (1999), in the book Cibercultura, points out that many events and publications portray the “impact” of new information technologies on society or culture. Likewise, the influences and implications of

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Information and Communication Technologies in different social practices are increasingly evident and intense in contemporary times, in this information society, which lives in a network (Castells, 2011).

The new infrastructure, which emerged with the development of digital information technologies along with the internet, has changed the global economy and society. A new organization of the morphology of society appears with the modification of politics, economy, work, culture, time/space relationship, and social relations. Digital technologies are not merely instrumental tools, but they are incorporated and are capable of changing our relationship with nature and social relations. These emerging technologies modify how man relates and acquires information and knowledge.

Digital communication technologies evolve continuously and very quickly. At all times, the industry produces newly differentiated and sophisticated products, such as cell phones, software, and multimedia computers. The speed of changes in the information universe creates the need for permanent updating of man to keep up with these changes.

In education, the greatest challenge of the 21st century is the growing search for innovative methodologies that enable pedagogical praxis capable of exceeding the limits of purely technical and instructional training to effectively achieve the integral formation of the subject as an ethical, historical, critical, reflective, transformative, and humanized. Schools need to favor the integral education of the student based on a transformative and meaningful education that breaks with the conceptual framework of traditional pedagogy, seeking to move away from the instruction paradigm to the learning paradigm.

Moran (2015) mentions that there is a consensus that students and teachers have the impression that several classic classes are out of date. The classes are getting outdated, and these need changes so that our students can feel motivated to learn the content. The demotivation in the classroom goes beyond the difficulties of students, who are often stuck in a methodology that does not lead them to be active and proactive in the teaching-learning process.

Active methodologies are teachings, techniques, and planned activities that involve students and actively engage them in all their learning processes. These methodologies bring benefits such as student leadership, the apprehension of mediated information, communication skills, advanced reasoning skills, teamwork, motivation, and new learning resources. In the application of active methodologies, planning is an important educational act to organize the action of educating. Planning, a function that must precede teaching lessons, requires study, analysis, collaboration, and direction, which allows for greater predictability and feasibility of all academic stages. In this perspective, active teaching practices need to gain meaning and achieve significant learning, as they innovate in the direction of proposing a break in traditional pedagogical procedures. According to Moran (2015, p. 27):

> The active methodologies are a proposal to integrate the fundamental aspects of student learning. Active methodologies are teaching strategies centered on the effective participation of students in the construction of the learning process, in a flexible, interconnected, and blended way. Active methodologies, in a connected and digital world, are expressed through hybrid teaching models, with many possible combinations.

The active methodologies emphasize that it is necessary to take the student out of the passive stance towards knowledge, which seems to be induced by the traditional expository form by placing the teacher as a transmitter of ready truths and the student as a mere receiver. Such active methodologies seek to favor autonomous motivation and have the potential to arouse curiosity, as students become involved in theorizing and bring new elements, not yet considered in classes or in the teacher's perspective (Marin et al., 2010). Using other forms of

organization of pedagogical work, which lead to reflection and the development of higher levels of understanding of reality, the student will be able to give meaning to the theoretical references studied. In this way, active learning occurs when the student interacts with the subject under study, listening, speaking, asking, discussing, doing, and teaching, being encouraged to build knowledge instead of receiving it passively from the teacher. In an active learning environment, the teacher acts as an advisor, supervisor, facilitator of the learning process, and not only as a single source of information and knowledge (Barbosa & Moura, 2013).

The methodologies need to follow the intended objectives. If we want students to be proactive, we need to adopt methodologies in which students engage in increasingly complex activities, in which they have to make decisions and evaluate the results, with the support of relevant materials. If we want them to be creative, they need to experiment with countless new possibilities to showcase their initiative (Moran, 2015, p. 17).

Scientific and technological advances require reflection on teaching methods that promote new challenges for students. It is necessary to modify the profile of the class to instigate the student so that he becomes active in the teaching-learning process. The ease of access to computing devices and the advances in communication networks and accessibility to the Internet facilitated the exchange and obtaining of information and the speed of communication between people. Technological resources are already part of everyday life and have been rapidly changing the way of acting, thinking, having fun, and especially studying. The use of Digital Information and Communication Technologies is indispensable in actual society and also in the classroom, as the school needs to find new forms of teaching and learn so that it can prepare the citizen for the modern world (Alves et al., 2015).

In this sense, blended learning combines distance learning activities or online teaching, carried out through digital technologies of communication and information, with face-to-face activities (Staker & Horn, 2012). Bacich and Moran (2015) state that education has always been hybrid because it has always combined various spaces, times, activities, methodologies, and audiences. Talking about hybrid education means assuming that there is no single way to learn and, therefore, there is no single way to teach. There are different ways to learn and teach. Collaborative work can be combined with the use of digital technologies and provide moments of learning and exchange that go beyond the barriers of the classroom. Thus, the name Blended Learning, in which blended, in the English language, means to combine, to mix, one word to explain a model of teaching and learning that combines classroom (traditional) and online teaching (e-learning). The term blended learning is related to semi-presential or hybrid teaching (Andrade & Souza, 2016a, 2016b).

One of the ways to combine face-to-face and distance activities is the methodology known as the flipped classroom. According to this approach, the content and instructions on a given curricular subject are not transmitted by the teacher in the classroom. The student studies the material available in a virtual learning environment (VLE) before attending the classroom, which becomes the place to actively learn, carrying out problem-solving or project activities, discussions, laboratory practices, among others, with the support and mediation of the teacher and collaboration of colleagues (Suhr, 2016; Valente, 2014). This inversion is much more than a change in schedules and physical spaces. It is a learning process that actually takes place in a different way, with the advantage that the student learns in a more personalized way, with the autonomy to draw, to program his learning in the valorization of his skills and competences, having the teacher as a facilitator of the learning process (Andrade & Souza, 2016b).

According to Valente (2014), the flipped classroom is an e-learning modality based on the online study of the content and instructions before the student attends the classroom. In-person, the classroom becomes the place to work on the contents already studied, carrying out practical activities such as problem solving and projects, group

discussion, laboratories, among others.

The development of the flipped classroom process requires the intensive use of Digital information and communication technologies for the transmission of concepts to the student, giving space for the teacher to use more interactive and practical activities in the classes, which develop more complex reasoning skills. The instructional material created by the teacher is made available to students in several ways: tutorials, study guides, video lessons, reading instructions, among others. In all cases mentioned, it is material specifically developed for this purpose and which the student accesses through teaching platforms or virtual learning environments (Bergmann & Sams, 2012).

Increasingly powerful in resources, speed, programs, and communication, the computer allows us to research, simulate situations, test specific knowledge, discover new concepts, places, ideas. Produce texts, evaluations, experiences. The possibilities range from following something ready (tutorial), relying on something semi-designed to complement it until you create something different, alone, or with others. (Moran et. al., 2000).

The methodology of the Flipped classroom delegates greater autonomy to the student who chooses the schedules and dictates the pace of his own study. In addition, the methodology seeks to train more active people, since, in the present moment, the student acts actively to perform the tasks proposed by the teacher, who mediates the process. For Schneider et al. (2013) in the flipped classroom, there is the possibility of differentiated curricular organization, which allows the student the role of subject of his own learning, recognizing the importance of the mastery of the contents for the broader understanding of the real and maintaining the teacher's role as a mediator between the elaborated knowledge and the student.

Another methodology of blended learning, applied by teachers during the process, is called rotation by learning stations. In this category, as shown in Figure 1, the teacher organizes the room in specific points or stations, and at least in one of these points, there will be an online activity. There is a fixed schedule so that students can rotate through these stations at a time that can be established by the teacher or until the student meets the station's learning objective. One of these specific points determined should be a station for online learning. The others may include activities, such as instructions for small groups or the whole class, group projects, individual tutoring, or even written tasks (Staker & Horn, 2012).

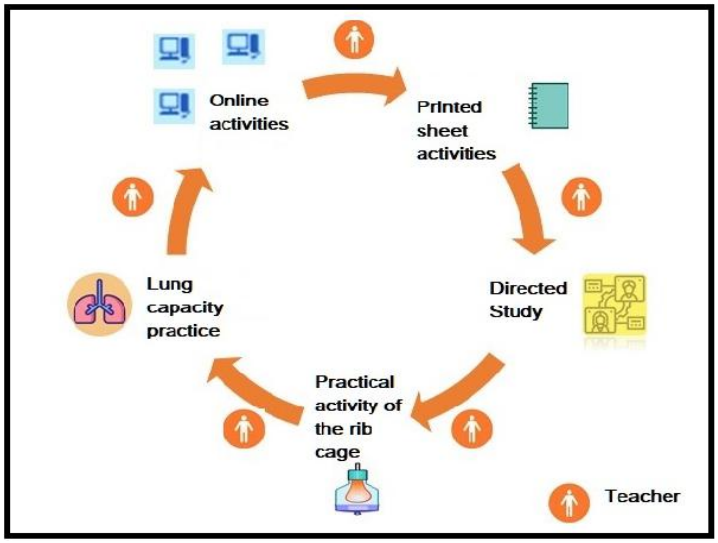

Figure 1 Rotation by Learning Stations

The Workstation Rotation model brings several benefits. The teachers can work with smaller groups of students and allows teachers to provide timely feedback. There is an opportunity for students to learn both individually and collaboratively; and, finally, access to various technological resources that may allow, both for teachers and students, new ways of teaching and learning (Andrade & Souza, 2016b). It is necessary at least one station with collaborative activities. Learning from peers becomes even more meaningful when there is a common goal to be achieved by the group. Few studies discuss the use of blended learning associated with active methodologies aimed at elementary education. Despite being a trend, the use of digital technologies in learning is still a little researched topic.

The present work aims to analyze the main challenges, difficulties, and positive points of the practical application of active methodologies of blended learning, flipped classroom and rotation by learning stations, by a group of high school and technical teachers from the IFTM Advanced Campus Uberaba Parque Tecnológico, based on the records made by these teachers.

This proposal also intends to verify if the application of blended learning methodologies can optimize the class time to deepen a specific theme, expanding the learning conditions, in addition to reframing the role of the teacher, who leaves the center for the function of the advisor or facilitator of the learning process.

2. Methodology

In the first semester of 2018, the pedagogical team made a proposal directed to us teachers, participants in the Continuing Education Workshop called Personalization and Technologies in Education. We could try new ways of acting, reflecting on them and, at the same time, checking up on how these new ways of conducting classes could improve our results. A group of 11 (eleven) teachers from the Federal Institute of Triângulo Mineiro, an advanced campus Uberaba Parque Tecnológico, learned about the pedagogical approaches of personalized teaching, among them, blended learning and active methodologies. These teachers were encouraged to prepare and develop blended learning methodologies, with the pedagogical practice of the Flipped classroom associated with rotation by learning stations. All teachers had time to plan and apply the Flipped classroom methodology and Workstation rotation model in their classes, engaging with the teaching process of their subjects.

The applied methodology was practically the same for all eleven teachers who were part of the group, following the method described by Bergmann and Sams in, 2012. The teachers fed the virtual environment, called virtual IF, or used the Moodle software to post files, abstracts, videos, and exercises. The students accessed the virtual environment, called virtual IF or Moodle, at their homes, internet cafes, or by their smartphones, where they could watch the video lessons, read texts and perform some activities online. Thus, students were able to plan their studies, with the convenience and autonomy of studying where and when they wish.

In a later class, during the face-to-face session, there was the application of practical situations, problem-solving, and organization of didactic sequences that sought to promote reflection on the contents. Each of the group's teachers applied another active methodology, rotation by learning stations. To carry out this dynamic, the teachers organized the classroom and set up three or four stations, according to the number of students per classroom. In this methodology of rotation by stations, students move from station to station performing practical activities, and at least one of the stations presents online activities. The time in each station was determined by the teacher observing the development of activities in this new teaching model. At that moment, the teachers were able to mediate the activities and assist in the reflections.

The evaluation of the activities, in the face-to-face moment, consisted of observing student participation and using a tool, the Plickers application. The students' responses on cards, can be scanned by the teacher using a mobile device, such as a smart phone. The result is obtained instantly, in real-time, since the application generates and saves the individual performance of the students, creating graphs and data. Thus, it was possible to evaluate the activity and obtain feedback with the students' responses, instantly.

Teachers noted their impressions using the Cornell Annotation Method. Then, they answered a questionnaire through Google docs. The questions involved several evaluative aspects of the methodologies: What did you find most difficult when designing the activity? What did you find most difficult or complicated when applying the activity? What do you think is positive about this experience about to relation to your pedagogical practice? What do you think is positive about this experience about to with concerning student involvement, participation and learning? What would you do differently next time? The questionnaire responses were analyzed and grouped.

After a few weeks, at another time, the teachers came together to report, point out and discuss the positive aspects and the main challenges in the practical application of the inverted classroom methodology. The statements and points in common were recorded for further analysis.

3. Results and Discussion

The first challenge highlighted by all teachers was the lack of preparation and motivation of some students for the activity. Some students expect and desire lectures. The school taught them that the teacher explains and coordinates the activities while the student listens and performs. There is resistance from these students to leave the traditional method. However, with the development of activities, the students became involved and engaged in activities, which allowed them to feel part of the process, making it possible to break such resistance.

All teachers pointed out a great difficulty in producing or finding material with appropriate texts and videos that are more suitable for students. It takes time to write content and record video lessons. The internet has a range of video lessons and texts. However, it also takes a long time to choose the content and videos that have an appropriate language and correct approach, that are motivating, and that can fulfill the learning objectives. One of the teachers mentioned: The main obstacle in the elaboration of the material to be made available to students is about to with concerning making it attractive, since I will not be present to motivate them when reading documents, watching videos, among others. This initial effort in planning, preparation of materials is very important for changing classes and leaving the traditional model.

Another challenge is that part of the students has not fulfilled their self-study. They do not read, do not watch video lessons, and do not do activities in advance posted in the virtual learning environment. Although all students have some form of online access, by analyzing the participation of students, it was possible to estimate that an average of around 20% to 30% of students did not do the previous activity and did not access virtual environment, before the face-to-face class.

One of the teachers reported: "My teaching experience led me to believe that there would be no gains without the full participation of the students, which at first really happened. In the first classes, many students stopped doing their homework, and consequently, there was a drop-in class performance. What should have been just a question and activity class has almost returned to the traditional method".

The students, who did not study before class, had a lot of difficulties and often were unable to debate the contents and carry out the activities proposed in the learning stations. It was the greatest difficulty in

implementing the flipped classroom methodology in the class (Frota, 2018; Suhr, 2016; Valente, 2014). However, some teachers noticed a tendency of those students who did not study online to adapt to the situation, changing their attitude, and starting to study online in a second moment.

The workshop meetings were productive and were successful in training for the training and improvement of teachers with active methodologies and the use of applications. Most teachers did not mention great difficulties in working in the virtual environment and the handling of digital applications. However, two teachers reported problems during the process with the operation of the Plickers application as an assessment tool. Many teachers used Plickers to assess their activities during the process. The observation of figure 2 using a QR code application shows the Plickers' material and cards prepared by one of the teachers.

Figure 2 Plickers Cards and a Test of the Season (To Access Use a QR Code Reader App).

During the rotation in the learning stations, in the group activities, some teachers reported the difficulty presented by some students to work in groups. Some do not socialize, and those who want to solve everything alone on behalf of the group. The teachers knew how to get around these issues by conducting their work at the collaborative activity stations. Collaborative work should always be encouraged because interactions give full meaning to co-participation in the learning process.

Collaborative work can be combined with the use of digital technologies and provide moments of learning and exchange that go beyond the barriers of the classroom. Learning from peers becomes even more meaningful when there is a common goal to be achieved by the group (Bacich & Moran, 2015) .

Some teachers had difficulty managing time at each of the learning stations, especially teachers who had a weekly class. In this case, planning is necessary to make the classes, equating the number of stations with the minimum and maximum time for the student to meet the learning objectives.

There is a consensus that the exercise of these methodologies has improved teaching practice, demonstrating that these teachers believed in the proposal of the inverted classroom and the rotation by learning stations. One of the teachers mentioned: [...] From the moment I ventured into the methodology of the flipped classroom, I convinced myself that the path is to continue with the experiences. Another teacher also stated: It was possible to put the teaching and learning process into practice in a fun, dynamic, and efficient way.

Another positive point for teachers was the better use of the time available in class since the student will research on the subject before the teacher's explanation. According to one of the teachers: "[...] it saves a lot of time and embraces more concepts that you want to work on in a meeting of two classes. It also makes it possible to teach more intensively with exercises and other activities at the stations".

Active methodologies favor innovation in teaching practices and the protagonism of the student by the

development of student's new skills. Students were proactive in the development of activities. They had to think, evaluate problems, and make decisions dynamically. All these actions allowed the appropriation of knowledge in a meaningful and profound way, guaranteeing the student's learning. According to the report of another professor in the group: "[...] the student absorbs the content better, shows more interest and participates in the construction of knowledge in a more autonomous way." These reports corroborate the data published by Suhr (2016) and Fautch, (2013)in which the inverted methodology was effective in a classroom composed of few students.

An advantage of the flipped classroom is the fact that the student will be able to study at his own pace, make the most of the content, and review the videos when he deems it necessary. In short, the process has the advantage that the student has contact with the didactic material before the classroom lesson (Valente, 2014). In this case, students become co-responsible in the educational process by collecting data before conceptual approaches and studying through interactive resources. In turn, the teacher starts to act as a mediator of knowledge to answer questions, deepen the theme, and stimulate discussions in person.

These experiences with blended learning methodologies were very productive provoking reflections on what to do in the classroom, on the role of the teacher, what paths and possibilities exist to teach. In this way, the flipped classroom methodology and the rotation by learning stations are teaching practices that remove the teaching process from quotidian inertia and potentially can contribute to learning.

4. Conclusion

The present study discussed the main challenges reported by a group of teachers who applied the flipped classroom methodology and the rotation by learning stations, blended learning methodology that combines formal education or activity synchrony with online teaching. These methodologies have to complement classroom activities, to enrich the content, and promote interaction between teacher and student. These approaches also provide students with the possibility to follow the content at the right time and their learning pace and to develop individual or group practical activities.

The ubiquity of digital technologies and media has become a social phenomenon, and the insertion of virtual culture in the educational process is growing widely due to increased acceptance by students and educators. In personalized teaching formats, to meet the individual needs of learners, there are challenges. In this work, the educators analyzed their pedagogical practice and try attempted to find the best combination of online study in the virtual environment and face-to-face activities with learning spaces that could offer good learning experiences. The application of this methodology offers some challenges to teachers: the dedication and time needed and for planning, preparing face-to-face activities and material to be made available in the virtual environment; the difficulty of motivating and breaking with the resistance of students who are used to traditional teaching and need to wake up to new methodologies; the difficulty in dealing with students who do not the online study or do not carry out self-study because they do not previously access the material in the virtual environment, difficulty managing time during the seasons, and difficulty making some students work in groups.

However, in the view of the teachers, classes were more beneficial with better use of class time with practical activities, which made up for the time spent on preparing videos and on-line and in-person or synchrony activities. There was a perception that the vast majority of students performed the self-study and participated actively and autonomously in the process, contributing to the success of the methodologies. Thus, despite the challenges encountered, the practical application of the inverted classroom methodology associated with the rotation by

learning stations proved to be effective in the learning of high school students. These blended learning practices allowed the development of student's new skills and change the "natural order of things" by mobilizing students to be the authors of building your knowledge by appropriating digital resources.

There is a tendency towards the expansion of blended learning, combining asynchronous online moments with synchronous moments, in which the student connects simultaneously with the teacher, as well as the face-to-face moments. Soon, the development of new educational applications will allow us to expand the study options. The biggest challenge will be to find the best strategies to develop student autonomy and generate knowledge. This work proposes moments of discussion on this relevant theme of the use of blended learning and methodologies in the teaching-learning process and opens the way for further research in this context.

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