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The use of Blended Learning for the development of statistical literacy in High School from the Investigative Cycle[1]

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ABSTRACT

This article aims to analyze a Blended Learning experience for introducing Descriptive Statistics through the investigative cycle with 3rd year high school students. The teaching sequence goes through the stages of the investigative cycle, considering the problematization, planning and execution of a research. The development of projects based on the cycle resulted in a delivery carried out by each group with the aid of technological tools in each of the stages of scientific research. The results of this experience show that the integration of Digital Information and Communication Technologies (DICTs) to Blended Learning contributed to the flexibility of places and periods for learning statistical content, such as population, sample, graphs, measures of central tendency and the development of stages of the investigative cycle.

KEYWORDS: Blended Learning. Statistical Literacy. Investigative Cycle. High school.

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A utilização do Ensino Híbrido para o desenvolvimento do letramento estatístico no Ensino Médio a partir do Ciclo Investigativo

RESUMO

Este artigo objetiva analisar uma experiência de Ensino Híbrido para introdução à Estatística Descritiva por meio do Ciclo Investigativo com alunos do 3º ano do Ensino Médio. A sequência de ensino perpassa as etapas do Ciclo Investigativo, considerando a problematização, o planejamento e a execução de uma pesquisa. O desenvolvimento dos projetos com base no ciclo resultou em uma entrega realizada por cada grupo com auxílio das ferramentas tecnológicas em cada uma das fases da pesquisa científica. Os resultados dessa experiência evidenciam que a integração das Tecnologias Digitais de Informação e Comunicação (TDICs) ao Ensino Híbrido colaborou para a flexibilização dos lugares e períodos para aprendizagem dos conteúdos estatísticos, como população, amostra, gráficos, medidas de tendência central e o desenvolvimento das etapas do Ciclo Investigativo. Em consequência, foi propiciada uma formação para o aluno com uma Estatística que lhe seja pertinente, para atuar na sociedade como um cidadão crítico e ativo.

PALAVRAS-CHAVE: Ensino Híbrido. Letramento Estatístico. Ciclo Investigativo. Ensino Médio.

El uso de la Aprendizaje Combinado para el desarrollo de la alfabetización estadística en la Educación Secundaria desde el Ciclo Investigativo

RESUMEN

Este artículo tiene como objetivo analizar una experiencia de Aprendizaje Combinado para introducir la Estadística Descriptiva a través del Ciclo de Investigación con estudiantes de 3er año de secundaria. La secuencia docente pasa por las etapas del Ciclo Investigativo, considerando la problematización, planificación y ejecución de una investigación. El desarrollo de proyectos en base al ciclo dio como resultado una entrega realizada por cada grupo con la ayuda de herramientas tecnológicas en cada una de las fases de la investigación científica. Los resultados de esta experiencia muestran que la integración de las Tecnologías Digitales de Información y

Comunicación (TDICs) al Aprendizaje Combinado contribuyó a la flexibilización de lugares y períodos para el aprendizaje de contenidos estadísticos, como población, muestra, gráficas, medidas de tendencia central y el desarrollo de etapas del ciclo investigativo. Como resultado se brindó una formación al estudiante con una Estadística que le es pertinente, para actuar en la sociedad como ciudadano crítico y activo.

PALABRAS CLAVE: Aprendizaje Combinado. Alfabetización Estadística. Ciclo Investigador. Escuela secundaria.

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Introduction

The popularization of using Digital Information and Communication Technologies (DICTs), associated with the growing presence of statistical data disseminated in different media, has enabled individuals to have a greater understanding of the world. For that matter, it is necessary to enhance the possibilities of socialization, participation and search for information in pedagogical practices complemented by Blended Learning. The term hybrid has its meaning associated with terms such as mixed, merged, blended, in English. From this perspective, learning and teaching can happen in countless ways and combinations, in the most varied times, technologies and in multiple spaces (MORAN, 2018). Blended Learning can offer educational institutions the advantages of various combinations that can be made between in-person and virtual.

The use of Blended Learning can promote experiences in Mathematics classes that encourage the student to investigate facts in their context and develop skills that expand their training for personal and professional life, making them more aware and active in problems existing in society. Furthermore, it promotes the students digital inclusion through the use of new technologies, favoring the learning of Statistics concepts.

The Statistics approach through Blended Learning can contribute to exploring elements of statistical literacy. Statistical literacy has a particular characteristic, which consists of promoting the ability to visualize the process in a global way, with the understanding between the relations and representations of variables and perceiving information beyond the explored data, which allows formulating previously unforeseen questions and speculations. (CAMPOS; WODEWOTZKI; JACOBINI, 2018).

The construction of statistical literacy allows any individual to have greater opportunities to exercise their citizenship, therefore, it is considered an essential and desirable skill to be encouraged in Basic Education students. In this context, the National Common Curricular Base (BNCC) indicates the concern with pedagogical practices that relate Mathematics and everyday life, which is necessary to be part of all levels of education (BRASIL, 2017).

The approach to statistical content allows the student to have broad education, which highlights the need and growing presence of these concepts in Elementary and Secondary Education. With the growing presence of Statistics in society, we see emerging the need and urgency for educational institutions to value the work with the contents and skills of this area in School Mathematics. From this perspective, students need to be encouraged to acquire skills in reading, interpreting data and reflecting on problems encountered in society (HETTWER; NUNES, 2011). Furthermore, obtaining this competence allows a person to be able to decode and interpret simple and direct data, up to understanding more complex inference processes that involve everyday life (LOPES, 2003). That said, the relevance of teaching sequences which emerges from the reality of schools becomes evident, in which students take an active role in the learning processes and result in the development of statistical literacy (CAZORLA; UTSUMI, SANTANA, 2020).

The experiment was carried out in a Public State School located in the urban area of Baraúna/RN in the 4th (fourth) bimester of the 2019

school year during 8 (eight) classes of 50 minutes each. Only regular high school education is offered at the institution. When carrying out the teaching sequence, the delimitation of the study object includes 22 (twenty-two) students in the 3rd year of high school as subjects. From this perspective, the following section shows the development of a Blended Learning experience to introduce Descriptive Statistics, raising a possibility for teaching this content to the detriment of traditional practices.

Development and analysis of the Blended Learning experience to introduce Descriptive Statistics through the investigative cycle

A perspective for exploring the contents of Statistics in School Mathematics, as an alternative to practices such as lectures about the subject and exercises, involves proposing scenarios for investigation. That said, students are challenged to establish problem questions and carry out research supported by statistical tools and methods, being encouraged to participate in the discovery process in a more active way and in a protagonist position in their learning.

These attitudes are also defended by Gal (2002) from the perspective of statistical literacy, built from a critical and investigative stance, involving basic knowledge of Statistics and Mathematics, linked to reading and analysis skills, beliefs, attitudes and knowledge about the individual themselves and the place where they live.

Blended Learning can help the teacher to lead this investigation process and be a guide to digital tools that facilitate the understanding and school projects construction. The teacher can share files online with students and monitor the activities development, make research materials available and provide guidance that can be accessed by students at different times and spaces.

To provide an investigative scenario for students, this teaching sequence was organized with activities that mix face-to-face and virtual

aspects, with elements of a scientific research, through situations that promote more meaning to the concepts studied, based on the principles of the proposed investigative cycle by Cazorla and Santana (2010). This way, students were close to the thought processes that involve solving statistical problems, in the sense that it leads to the formulation of problems until their resolution is completed. Given this fact, it contributed to the evolution of one of the specific skills for Mathematics included in the BNCC of High School, which allows for articulating mathematical knowledge in pedagogical practices in order to propose actions to investigate challenges in the contemporary world and make ethical and socially responsible decisions (BRASIL, 2017).

This experience description and analysis follow the scientific investigation stages defined by Cazorla and Santana (2010), which cover the following steps: i) Research problematization; ii) Research planning; and iii) Research execution. The development of projects based on the investigative cycle resulted in a delivery carried out by each group with the aid of technological tools suggested by the teacher or of their own preference in each of the scientific research stages. The analyzes of each of the 3 (three) stages of scientific research implemented with and by students are explained below.

1st stage of the Investigative Cycle: Research problematization

Preliminarily, a dialogue about the development of school projects based on the content studied in previous classes happened, in which the investigative cycle stages were presented, as well as the structuring elements of each stage.

Then, the discussion to choose themes for the project investigation was started. At that moment, listening to students was fostered, allowing them to express and suggest themes of their preference to be the object of investigation, in order to provide a more

attractive educational scenario for the student, considering that they would act more motivated by their interests than by teacher's imposition. To instigate participation, some possibilities and situations that could be investigated in the themes were shown, aiming to broaden their vision for more ideas. In this way, other themes were mentioned by them, such as: social networks, consumerism, school meals, urban violence, harassment, accessibility and bullying.

Afterwards, time was given for the 4 (four) groups to decide the topic from those that were already mentioned. When announcing the choice, impasses arose due to the fact that three groups chose to investigate bullying, while another chose harassment. Even being reminded of other possibilities, the students were incisive in staying with the themes. When asked about their preference for these, some reported:

> **Student O:** Teacher, there has been a lot of bullying here at school. Two students who live in the quilombo gave up because there were students bullying them because of their hair. I think it's a subject that needs to be talked about to make students more aware and we still learn the subject [Mathematics].
>
> **Student M:** Teacher, we chose harassment because it is a very current situation in Brazil, there is no shortage of complaints from women who have suffered harassment by their bosses. There are only women in our group and they have all experienced harassment. We would like to research more about this topic with students at the school.
>
> **Student T:** We decided to research bullying because it causes many tragedies in schools, like the case of the man who returned to the school where he studied to kill teachers and students.
>
> **Student N:** That fight last week was because the student was being bullied and couldn't take it anymore, so he fought and had a knife in his backpack. Sometimes we practice bullying without

> realizing it. That's why our group wants this topic, to open everyone's minds more, to understand that it's not a joke and that this has ruined many people's student lives.

When defining the theme, students presented their feelings in relation to the topics covered, issuing emotional responses of approval or denial for the choices being made, complementing them with individual ideas or opinions. The perception expressed by the students demonstrated that the exercise of choosing a topic for an investigation helps in mobilizing elements of disposition towards statistical literacy, especially in the beliefs and attitudes recommended by Gal's model (2002). For Cazorla and Santana (2010), the topic choice must promote the active participation of students, an ethical stance, respect for others' opinions, the rational use of environmental resources, etc. As can be seen, such characteristics were present in the experiment reported here.

To resolve the impasse, as no group gave in to change their topic, a student suggested that each group that chose bullying investigate different types, a suggestion that was appreciated and accepted by the teacher and groups involved in the impasse. After surpassing this obstacle, the themes were defined as shown in Chart 01.

CHART 1: Topic chosen per group.

Theme	Group number
Physical bullying	Group 1
Sexual harassment	Group 2
Psychological bullying	Group 3
Cyberbullying	Group 4

Source: Author's archive (2019).

After finishing the theme definition in the classroom, students were instructed to take their mobile devices and search on the internet to gather more

information about the chosen topic. At this time, the rotational laboratory hybrid model was used, which constitutes an alternative for pedagogical practices at school, which allows online teaching to study a subject, using computers in the informatics room or mobile devices (HORN ; STAKER, 2015).

In the initial stage of the Investigative Cycle, which deals with problematizing the research, the first step is to contextualize the problem situation about the theme that is the object of study (CAZORLA; SANTANA, 2010). Therefore, research actions to select data and information that can bring students closer to the subject and deepen their knowledge are essential, as it allows them to identify the problem with greater precision and establish a relationship with the investigated context.

In the laboratory, with the use of mobile devices and computers that were there, the students, gathered in groups, began the process of selecting information to contextualize the problem. On that occasion, an interesting discussion took place about the origin of the information for appropriation on the topic, when a student asked:

> **Student R:** Teacher, where do I look for this data? Should I just search for the theme on Google, then I choose it and that's it?
> **Student E:** Of course not! You need to check if the website is trustworthy. I remember the video that the teacher showed in another class, he said that there is a lot of manipulated research and that we cannot believe everything that is on the internet. One suggestion is to look on official government websites, such as the Ministry of Health, Education and so on... Although the president likes to release manipulated news, the information on these websites can be believed.
> **Student T:** You can look on the websites of institutes that already work with only this, such as IBGE, IBOPE and Datafolha, which are always shown in the newspapers and we also see a lot of them in books. Another way is to search the most reliable and well-known news portals. There is a lot of research and fake news,

> which is why we have to pay attention to the source, even in the newspapers sometimes corrections are made to data that was published incorrectly.

In a digital society, schools have received a large number of digital natives (PRENSKY, 2001). The fact of getting the first information from Google or just pasting and copying it, without checking the veracity or checking the source, is something common for many of them in school activities, regardless of the school level, and even desired as the statement of student R from group 1 shows. However, the teacher must mediate situations in which students learn to find reliable websites and, especially, critically question the content searched (BACICH, 2018).

The dialogue between students E and T showcases skills of a critical stance that composes the development of statistical literacy, as they realize the importance of basing the problematization on reliable sources. Furthermore, they state that messages in the media in general are produced by sources, such as journalists, research institutes, websites, politicians and public entities, raising the concern for a critical analysis of this information. Depending on your needs and goals, these sources do not always present straightforward and organized results so that readers can make discoveries or make appropriate decisions, which requires critical skills integrated with other elements of statistical literacy so that the individual understands the content and its intentions (GAL, 2002).

The student's mention of the video from another moment in the teaching sequence indicates that the mix of resources used in the school environment, provided in a hybrid context, contributes to complementing concepts learning, having the teacher to assume the role of learning mediator (VALENTE, 2015). In this context, the positive aspect of integrating DICTs into the school space can be noted,

diversifying access to sources of information and providing opportunities for the debate of ideas.

To consolidate this stage's activities in the Investigative Cycle, the groups were asked to produce a video to socialize the research problematization, based on a script that included: theme conceptualization; data that justify the importance of investigating the topic; and dissemination of research questions. At the time, it was suggested that students use a platform called Powtoon, which allows them to create animated, creative videos and interactive visual experiences that improve communication.

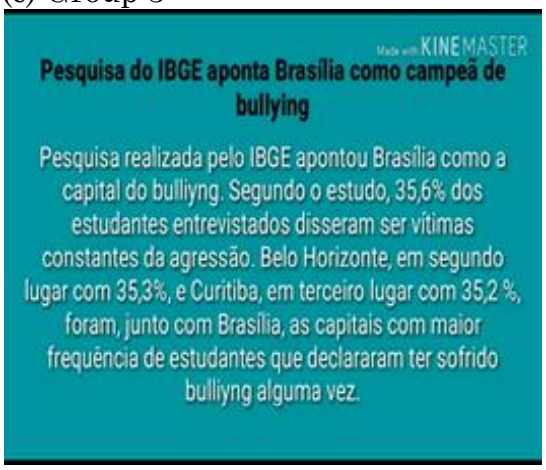
When collecting and selecting information and data to contextualize the problem, several statistical literacy skills were invoked. Reading different formats of information, which requires text interpretation or the relationship between words and statistical data, activates the literacy skill, which is so important for statistical literacy, since understanding statistical messages requires the reader to be able to extract and generate meaning for information (GAL, 2002).

Furthermore, visualizing different data representations mobilized statistical and mathematical knowledge when reading numbers, projections and percentages present in graphs and tables. In this way, the student is given the opportunity to activate the ability to place messages in a context, which is the essential source of meaning and the basis for interpreting the results obtained (GAL, 2002). In Picture 1, you can find some clippings from recorded videos.

PICTURE 1: Register of statistical information contained in the videos.

(a) Group 1

(c) Group 3



(b) Group 2

(d) Group 4

Source: Author's archives (2019).

In this way, when teaching situations that mix face-to-face and online happen, such as those carried out in this experiment, the student expands the possibilities and multiple formats of access to sources of information and knowledge beyond the textbook and printed material, guided by the teacher (HORN; STAKER, 2015).

Next, we asked the students to define the research questions that would guide the study intentions and objectives, given the need to define the context and population for the investigation. At this time, they struggled with creating clear and objective questions that could reflect their research interests on the topic, asking questions such as: Do you think bullying is important in this

school? How does the school view harassment? Is psychological bullying a bad thing? With this in mind, the teacher's help and mediation was necessary in recreating the research questions. At this stage, it is important to note that "the research questions, in turn, require the appropriate variable choice (population characteristics) that will allow their operationalization, answering the question raised" (CAZORLA et al., 2017, p. 18).

On this occasion, the students discussed the importance of developing a good research question through a specific inquiry that aims to be answered on the topic, observing whether it is specific, clear and feasible, explaining the context or target audience. Chart 2 shows the research questions for each group, after correction.

CHART 2: Research questions per group.

Research question	Group number
Is physical bullying experienced by students at Escola Estadual João de Abreu?	Group 1
Have students at Escola Estadual João de Abreu ever been victims of sexual harassment?	Group 2
What is the perception of psychological bullying at Escola Estadual João de Abreu?	Group 3
What factors lead people to commit cyberbullying?	Group 4

Source: Author's archives (2019).

For this stage of the research, students demonstrate the development of statistical literacy for critical questions, as they are provoked to define the object of study by a question about the topic. The identification and formulation of the research question is a creative process, it also requires the student to have an element of critical stance, considering that they need to have a questioning attitude in relation to quantitative messages (GAL, 2002).

Finally, in the following class there was an exhibition of the video productions and socialization of the problem situation contextualization and the research questions presented by each group. Blended Learning models have the potential to balance experimentation with deduction. In this sense, the Flipped Classroom model is opposed to the traditional order, in which it shows the theory and then has exercises on the content, with the student being encouraged to experiment, understand the theory and then make a connection with real life (MORAN, 2018). With Flipped Classroom, instead of having the teacher work on content, they will seek to resolve and discuss activities in the classroom, allowing the student more time to have their doubts answered (BERGMANN; SAMS, 2016).

This formative moment contributed to the knowledge exchange among students with the entire class, on each topic. After choosing the object of study to be investigated, it is important to widely debate its context and the topics that define it, considering where it occurs or if it has already occurred, the population involved in the problem and raising hypotheses about the possibilities of occurrence in this population (CAZORLA; UTSUMI; SANTANA, 2020). Once the discussion was over, the research planning stage began in the following class.

2nd stage of the Investigative Cycle: Research planning

The research planning stage began with a preliminary conversation that addressed the relevance of defining the population to be investigated, with the possibility of investigating all individuals in the population or a sample of them. Through the research questions, students indicated their desire to investigate, as a population, students at their own school. Cazorla et al. (2017) mention the importance of discussing data collection with students, when defining the investigation by census or a representative part of the target audience, after delimiting the investigated population.

On that occasion, the teacher asked the students about the feasibility of undertaking census research investigations. Immediately, some students took a stand, saying:

> **Student K:** Teacher, doing it with some students is more feasible, everyone will need a lot of work and there are also few components to research.
> **Student M:** Yeah, teacher, it has to be by sample. Researching all the students will take a lot of time and we are already close to finishing classes. It would also be very difficult to get the contact details of all students to ensure that it was by census or it is also very difficult to have a day when no one was absent.
> **Student P:** Teacher, to do it as a census, it could only happen if it was through the students' cell phones, but even then there will be students who don't have a cell phone and there's no way for us to know that beforehand. If it were to be done with just one shift, it would even be possible to apply via census, but as mentioned, you would need more time and ask for help from the coordinators to ensure everyone's participation.

The students' statements indicated evidence of the development of statistical literacy for statistical knowledge skills, as they demonstrate familiarity with basic terms and ideas related to Statistics, given the mentions of the concepts of sample and census, voicing their concerns about time, size and sample composition given the researchers' ability to safely investigate the research (GAL, 2002).

Next, sample planning was carried out. Due to the time taken to apply and collect data from the questionnaires, a sample of the investigated population was stipulated, with at least 50 students from morning shift classes, representing around 14% of the total number of students in the morning shift at the school targeted by the research. Given this progress, the groups were instructed to prepare a questionnaire containing 8 to 15 questions.

The first questions were related to socioeconomic aspects and the others were specific to the chosen topic, which would help to answer the research question. This way, it was possible to explore quantitative variables (continuous and discrete), which can usually be measured using a measuring or counting instrument, respectively. In addition, multiple choice questions were formulated, resulting in answers with qualitative variables (ordinal or nominal).

For socioeconomic aspects, the groups presented questions about gender, ethnicity and grade as examples of qualitative variables and then height, weight and monthly income as examples of quantitative variables. As for questions related to themes, questions about the types, actions and places where these practices took place were common, with the occurrence of qualitative variables predominating. In general, the groups did not struggle with classifying the variables.

In the stage of preparing the questions and structuring the answer options, some reformulations were requested, as there were confusing questions and many answer options with only yes or no choices, which would limit the opportunities for discussions about the qualitative variable types. The data collection instrument, which involves qualitative and quantitative variables, constitutes a broader scenario for learning statistical concepts. To this end, a clear and precise definition of these variables is essential, as well as their characterization, as this will indicate the type of statistical treatment to be used. To do this, pertinent questions must be formulated for the set of data observed (CAZORLA et al., 2017).

In the process of preparing the questionnaire, students are exposed to statistical knowledge skills, as the concept of variables, their classification, operationalization and the relationship of these variables with the research questions are revisited (CAZORLA et al., 2017). Furthermore, dealing with the development of statistical messages demands literacy skills, as

constructing confusing or poorly written questions can interfere with research performance (GAL, 2002).

To make the questionnaire, Google forms was suggested and presented as a tool for creating forms. Students reported that they were unable to create the questionnaires on their cell phones. As a result, the teacher had to use the computer to create 4 online forms and then share them with each group to facilitate access through their own smartphones, or laptops, as others preferred to use. This action ensured that the document was linked to the teacher's Google account, optimizing access for analyzing the material prepared by students and monitoring activities inside and outside the school space. With this, it collaborated to evaluate performance in different environments, characterizing yet another contribution of Blended Learning in this experiment. At one point, a student reported his experience with the tool.

> **Student R:** Teacher, this tool for research is great! It's easy to organize a questionnaire with many features.
> **Teacher:** I'm glad you liked the tool suggestion! Also, have you noticed other uses for it?
> **Student R:** The coolest thing was sharing it with the group members and the teacher, because if this activity were to be carried out outside of class hours, having to meet later, many students use the excuse of not being able to go at that exact time and not having a proper means of transportation. In our group, everyone had a chance to contribute this time. I even showed it to the Social sciences and Biology teachers, who like to use questionnaires in their work at the Science Fair. They really liked it and said they would bother you at the next Fair so you could help them.

This report points out that students were able to interact collaboratively, inside and outside the school, being responsible and

protagonists in the process of developing the data collection instrument, as it is necessary to develop a more participatory stance in which they create opportunities to build their knowledge, leaving the role of mediator and learner consultant to the teacher (VALENTE, 2015).

In the final stage, data collection and processing was planned, in which it was agreed that, in the next phase of the research, the groups should seek the contact of each class leader, so that they could share the link for the questionnaires in WhatsApp groups and members of each research group would reinforce the request to fill out the form in the classrooms. Furthermore, it would be taken advantage of the data processing that was made available by the tool itself to document owners and editors. With the research planning structured, we moved on to the execution stage, described below.

3rd stage of the Investigative Cycle: Research execution

The research execution began with the collection, starting with disseminating the access links to the questionnaires for each class investigated, in their respective WhatsApp groups.

On the second day, students reported that they were afraid of not reaching the minimum number established for the sample, as the forms had registered few participants. However, at the end of the deadline, everyone managed to reach the minimum number of participants.

> **Teacher:** How do you evaluate the data collection process with the electronic form?
> **Student P:** Teacher, it was interesting, we didn't have that much work. Certainly, if we were to use printed questionnaires, it would be more work to administer them in three days to 50 people.
> **Student B:** Teacher, I also found it very interesting, especially because you can see the number of participants who responded, I was counting. There was also no effort to gather the

questionnaires with each member of the group, since only one person is responsible for keeping these answers. Everyone in the group can have a good look in there!

Student J: Teacher, I think the most positive aspect was that we didn't need to spend money to print 50 sheets of paper, besides the fact that someone could erase them and we would need to make more copies, and also the fact that these sheets would later be discarded, harming the environment. I saw on television that many universities no longer carry out research due to lack of investment, so finding tools to collect data that don't need to spend a lot is always important.

Student E: Teacher, it was an important tool to achieve the planned sample. As seen in the first classes, we must choose ways to make data collection easier. And as has already been said, we must consider time, saving money, etc.

The comments presented show the understanding of the online instruments relevance for optimizing data collection, given the need to observe the time for collection, the struggles with gathering results, budget and concern with the environment. When individuals have a logical understanding behind research projects and the need to reduce data in order to identify key features and trends, they are activating statistical knowledge (GAL, 2002).

After data collection, the information was systematized, using the electronic form itself, which simultaneously collected the data and processed it. However, some questions were open ended questions, which required the students to organize the given information. For this research stage, in addition to generating graphical representations, it was requested for some statistical measures to be observed, such as: frequencies (absolute and relative), mean, median and mode.

With the students' answers, it was possible to verify that it didn't matter that a tool creates the graphs, the students still develop their

statistical literacy skills. At this stage, it was possible to identify, through some notes in their notebooks, records from the white board and student arguments in group discussions, that they advanced in the development of other concepts in Statistics, such as central tendency measure, interconnecting mathematical knowledge and statistics exploration. The use of resources for creating online questionnaires allows time to be saved in the learning mediation to discuss what is statistically exposed and make class periods more flexible, which points out to yet another advantage of inserting digital technologies in educational practices from the Blended Learning perspective (BACICH, 2018).

To help in the data analysis stage, it was requested for the students to create a research report. At this time, the use of Google Docs was suggested, which contributes to collaborative work between students, encouraging the teacher to monitor the collective construction of the data organization and the information collected by each group. That said, it was possible to customize the guidelines as the time and space to answer questions was extended to outside of the school, which facilitated the mediation process of preparing the final report and also the exploration of statistical concepts embedded in the document.

The report creation was a reflective exercise for the students, allowing them to get back to the research and visualize it in a more general manner, in which the process required skills from the set of elements, defined in Gal's (2002) statistical literacy model. In this way, elements were explored, such as those elements related to knowledge, which are easier to detect because they are operational skills, and the elements of disposition, more implicit in the individual's consciousness, revealed by their positioning, critical thinking, beliefs and attitudes.

Finally, the students were asked to prepare the presentations to display in the room among the other groups, as can be seen in Picture 2.

PICTURE 2: Results presentations.**Source:** Author's archives (2019).

Source: Author's archives (2019).

The communication of the results make it possible to have a moment of interaction between the class, having the students once again being placed at the center of the educational process, explaining the data, the points that drew the most attention and perspectives necessary to solve the problem. Adopting the Investigative Cycle linked to the use of Blended Learning revealed potential for the development of statistical literacy skills included in Gal's model (2002), especially regarding the elements of disposition (beliefs, attitudes and critical questioning), which are so difficult to be stimulated in traditional pedagogical processes, which prioritize the content exposition and exercises related to the content.

Cazorla and Santana (2010) explain the need that the teaching sequences that advocate the development of statistical literacy in Basic Education should not be limited to understanding the world, but must transcend to stimulate the scientific spirit as a knowledge builder.

In school Mathematics, it is necessary to create situations that allow students to establish relations, in which reasoning and learning are developed based on the discovery of solutions (MAIA, 2016). From this

perspective, Blended Learning supported by DICTs in the dimension of social and educational processes allows the transcendence of spaces and times in which social relationships and practices occur (RICHIT; MOCROSKY; KALINKE, 2015).

Conclusion

The experience reported in this article, built along the lines of Blended Learning models integrated with the use of DICTs, allowed face-to-face and online moments, providing statistical literacy development through a different class approach in which the research subjects were used to participating. Understanding of the statistical concepts covered was stimulated by activities with information and data that involve connection with the students' daily lives and themes suggested by them. Statistical inference was explored during tabulation, construction and presentation of reports based on data found in research carried out by each group.

The dynamics of Blended Learning, Flipped Classroom and Rotational Laboratory models made it possible to identify the problems intrinsic to learning statistical concepts, such as variables classification, population and sample, as the models expanded time and space, contributing to the identification of main difficulties and doubts. From this perspective, the student is understood as an active and autonomous being in the process of obtaining knowledge, with the teacher assuming the role of mediator in this procedure. Group activities contributed to an environment favorable to student-student and student-teacher interaction, as well as encouraging cooperation, collaboration and communication.

Regarding the work with projects from the Investigative Cycle, it is noted that it strengthens the construction of statistical literacy, as it presupposes that the student can actively participate in dealing with situations arising from reality in a meaningful context and, especially, with data collected by them. Furthermore, it makes it possible to articulate actions to investigate, formulate

problems, define hypotheses, make discoveries, analyze and reflect. The student can disseminate the project results and be evaluated through a seminar, oral and written presentation or video production.

The incorporation of Blended Learning into pedagogical practices aimed at learning Statistics promotes essential and useful literacy skills to act in society, considering that Blended Learning can contribute to digital literacy and Statistical Education can support statistical literacy, so that these integrated skills and abilities make it possible to understand the problems of today's society.

Therefore, it is noteworthy that using Blended Learning methodology along with the incorporation of DICTs are important allies to facilitate students' understanding, engagement, collaboration and participation in developing their understanding of statistical concepts. Based on this experience, new research possibilities in the field of Statistical Education in the light of Blended Learning can be carried out to stimulate the development of innovative practices that promote digital culture and scientific knowledge in High School. For this matter, this work contributed to this demand based on an experience developed in the countryside of the state of Rio Grande do Norte.

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