CHAPTER 95

Contribution of peer instruction in the understanding of knowledge in morphology classes for medical students

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ABSTRACT
The objective will be to analyze from the literature how the Peer Instruction (PI) technique can increase the performance and understanding of students in morphology classes. Qualitative, exploratory, and interventionist research. The research will be in the morphology classroom, at the Faculty of Medicine - Integrated University Center, Campo Mourão - PR. Students will be in the sixth period of medicine. The estimated sample will be 80 students. Initially, an expository class will be administered with the help of PowerPoint, and after applying questions based on clinical cases regarding the subject already taught, by the Socrative Student platform. Students will answer the multiple choice questions individually, after discussing among themselves why they chose this alternative without knowing the correct answer. The same will be reapplied to evaluate the income gain. Data collection will be carried out through a questionnaire. The questions will be open for participants to express themselves freely. For the analysis, the Iramuteq software will be used. The IP has been adopted as an alternative for collaborative learning, being considered a teaching method that aims at greater interaction between students during classroom discussions, providing a space for arguments and relationships between students. In this perspective, the diversity of results found shows that the IP is a highly recommended proposal, especially when seeking to engage the student in the learning process. It is believed that the PI can be a timely intervention to develop skills and abilities during morphology classes.

Keywords: Peer Instructions, Active Methodology, Teaching-Learning

1 INTRODUCTION

The active methodology has received considerable attention in recent years. It has attracted strong advocates, among them, teachers looking for alternatives to traditional teaching methods. This expression "active learning" is recognized as an approach to the classroom, where the teaching method is planned to teach students during the learning process, making it the main element in the search for knowledge, in contrast to traditional teaching, characterized by eminently exhibition classes. (Prince, 2004)

Currently, there is a growing active search, by educational institutions, for innovative methods in undergraduate courses, enabling students to develop a critical, reflective, and ethical pedagogical practice. Thus, there are several discussions about active methodologies that can encompass different practices,to increaseg the student's attention and curiosity to grant an essential learning (Garcia et al., 2019)

In observation of the teaching of higher education, Emmel and Krul (2017), in addition to seeking integration between teaching and teacher education, point out that university teaching and its domains are revealed in pedagogical relations and the problematization of practices. In order to increase engagement in knowledge, due to the exchange of experiences through the search for knowledge, sharing ideas among

peers, bringing the formation of a critical and reflective thought, considering divergent opinions. The active exchange of ideas in small groups in addition to increasing interest, also promotes critical thinking.

One of the alternatives used to try to change medical education has been the inclusion *of Peer Instruction* (PI) or Peer Instruction (Garcia et al., 2019). *Peer Instruction* has been adopted as an alternative for collaborative learning, which can be defined as instruction or peer learning, being considered a teaching method that aims at greater interaction between students during classroom discussions, providing the ability to actively engage students during the learning process, in addition to developing social and cognitive skills. (Crouch et al., 2001).

It is known that it is necessary to innovate in the teaching process – learning, so that it becomes more interactive, attractive and practical during learning, facilitating the acquisition of knowledge, involving the student in order to develop skills and reasoning. On the other hand, the student's perception has rarely been evaluated for the choice of the methodology to be applied.

In the course of medicine, the discipline of morphology is inserted from the first year, and until the fourth period this discipline has a more conceptual view and from this begins to have a focus with more problematizations, with the purpose of stimulating students to the intimate relationship between concepts and clinical practice so that there is understanding and connection of pathophysiology, diagnosis and therapy.

In view, considering that the formulation of hypotheses and problem solving is one of the competencies necessary for the graduate of the medical course, it is of paramount importance to evaluate the perception of the student in relation to the methodology applied in the teaching process - learning.

In the midst of the diversity of existing active methodologies, it is feasible to choose the most appropriate to the course stage. The use of problematization processes, case analyses and project-based learning provide better implications for training in more advanced stages of the course, while in the initial semesters demonstrations, classroom discussions, presentations, conceptual and mental schemes are more pertinent (Oliveira et al., n.d.)

Peer Instruction is an active teaching-learning methodology that helps teachers quantify, in real time, students' understanding and understanding of the topics presented in the classroom. Thus, both the student and the teacher will be *able to obtain immediate feedback* about the learning on a particular topic taught in class (Crouch et al., 2001).

This methodology, also known as Peer Instruction (IpP), which provides greater interactivity in the classroom, was developed by Professor of Physics Eric Mazur, Harvard University (Müller et al., 2017). Since its creation in the 1990s, IpC has been presenting relevance in the international teaching method due to its ability to facilitate development, cognitive skills and means of interaction, with a positive impact on the teaching- learning process (Müller et al., 2017; Crouch et al., 2001).

Brito & Campos, 2019 conducted a study in the area of Physical Education, in which a gain in income was observed after the application of the collaborative methodology – Peer Instruction. In the

authors' perception, this satisfactory performance confirms the understanding of the concepts necessary for learning for the knowledge of a future professional, and it was also noted that this income is associated with collaborative participation in pairs.

As evidenced in the research dissertation of Meirelles, 2020, in the medical course, in the classes of Clinical and Therapeutic Skills at the Faculty of São Caetano do Sul, after the application of the collaborative methodology – Peer Instruction, there was a satisfactory performance and an improvement in the understanding of the concept after collaborative participation among peers.

This circumstance highlights the importance of health education actions as an integrative strategy of a collective knowledge that translates in the individual its autonomy and emancipation. (Machado et al., 2007).

Valente (2014), setting out examples of the introduction of Project-Based Learning (ABPP) and Problem-Based Learning (BPA) indicates difficulties in applying these methods, with numerous classes. These problems can be repaired with the introduction of Information and Communication Technologies (ITCs) in classrooms, configuring Hybrid Teaching (*Blended Learning*), that is, merging the online resource with face-to-face activities for the implementation of the active methodology (Brito & Campos, 2019).

In this perspective, it is believed that the *collaborative strategy, called Peer Struction*, may be a necessary intervention to develop skills and abilities during morphology classes. In this way, we will conduct this study, with the objective of analyzing how the IP technique can increase the performance and understanding of students during morphology classes.

2 METHODOLOGICAL PROCEDURE

Field research allows the understanding of how students in the sixth period of the morphology class will have a greater understanding of knowledge. application of the adapted Peer Instruction technique. On this type of research, Gonsalves (2001 *apud* Piana, 2009, p. 169) pronounces:

> Field research is the type of research that aims to search for information directly with the population surveyed. It requires a more direct encounter from the researcher. In this case, the researcher needs to go to the space where the phenomenon occurs, or occurred and gather a set of information to be documented [...]

The information will be collected using *Google Forms*, and the research subjects will be students of the sixth period of the morphology course, of the Medical Course of the Integrated University Center of the city of Campo Mourão - Paraná. With this in mind, the approach used will be qualitative:

> Qualitative research answers very particular questions. She worries [...] about a level of reality that cannot be quantified. That is, it works with the universe of meanings, motives, aspirations, beliefs, values and attitudes, which corresponds to a deeper space of relationships, processes and phenomena that cannot be reduced to the operationalization of variables (Minayo, 1994 *apud* Chiapetti, 2010, p. 144).

This approach will be carried out from an exploratory perspective, with a view to closer approximation with the reality of the subject under study. According to Gil (2008, p. 27), "exploratory research is developed with the objective of providing an overview, of an approximate type, about a given fact".

When the researcher goes to the field, he has a personal perspective of the problem, as well as references from a theoretical survey conducted before his going. This brings it closer to the problem studied, giving it a foundation and sometimes completing existing gaps. However, when talking to the research subjects, the researcher's perspective is usually altered, forming a new vision or complementing the existing one.

> In this sense, exploratory research often leads the researcher to the discovery of new approaches, perceptions and terminologies for him, contributing to his gradually his own way of thinking being modified. This means that it progressively adjusts its perceptions to the perception of the interviewees. In other words, he is able to control, almost imperceptibly, his personal bias (Piovesan et al., n.d 1995, p. 321).

The instrument used for data collection will be a questionnaire. According to Gil (2008, p.121), "one can define a questionnaire with the research technique composed of a set of questions that are submitted to people with the purpose of obtaining information about knowledge, beliefs, feelings, values [...]".

2.1 FIELD

This study will preferably be carried out in person, being transferred online through the Google Meet platform if a new government decree that does not authorize face-to-face meetings occurs. The research field will be in the morphology classroom once a week at the Faculty of Medicine - Integrated University Center, located in the city of Campo Mourão, Paraná.

2.2 SUBJECTS

The population will be students of the sixth period of the medical course enrolled regularly at the Integrated University Center, in the city of Campo Mourão, Paraná. The estimated sample number will be 80 students, however it will depend on the number of adherence to students who will fill out the Free and Informed Consent Form (TCLE), which will be delivered at the first meeting and will be filled out in person. Initially, an exhibition class with the aid of the power point will be administered, and subsequently applied questions based on clinical cases related to the subject already taught, by the Socrative Student platform. Students will answer multiple choice questions at first individually, and will be given time to discuss among them why they chose such an alternative without knowing the correct answer. They will be reapplied to assess the income gain.

2.3 PREPARATION OF THE INSTRUMENT

Data collection will be performed through a questionnaire elaborated by the researcher. The construction of this instrument followed some procedures, with a view to giving it greater reliability.

For the elaboration of the questions, the researcher based on the bibliographic reference. From it, the following themes were established, chosen to meet the research objectives: Thyroid Hormones, Hyperthyroidism and its Pathophysiology, Peer Instructions (Chart 1). Questions will be opened so that participants can express themselves freely, allowing a better exploration of the answers.

Table 1: Script of questions (Questions) organized from its themes and its objectives.

Temas	**Objetivos**	**Questões** (Elas devem ser inseridas no *Socrative* ou em outro software para realização do Quiz)
Hormônios Tireoidianos	Compreender a fisiologia da formação dos hormônios tireoidianos	Você saberia explicar a fisiologia da formação dos hormônios tireoidianos e aplicar este conhecimento em situação real, ou seja, em contextos na área da saúde? Tente explicar a partir de um exemplo prático A partir da estratégia utilizada em sala de aula pela professora, nos dois momentos (individual e em pares), você poderia dizer que ela auxiliou na compreensão do tema (Hormônios Tireoidianos)? Tente explicar a partir de um exemplo, que aconteceu com você, assim como os seus colegas na tentativa de responder as questões
Hipertireoidismo e sua Fisiopatologia	Compreender a Fisiopatologia do Hipertireoidismo Identificar um quadro clínico de Hipertireoidismo Verificar como se faz uma condução básica no caso do Hipertireoidismo	Você saberia explicar a fisiopatologia do Hipertireoidismo e aplicar este conhecimento em situação real, ou seja, em contextos na área da saúde? Tente explicar a partir de um exemplo prático Como você poderia identificar um caso clínico de Hipertireoidismo? Tente descrever a partir de uma situação prática Você seria capaz de realizar uma condução básica no caso de Hipertireoidismo após a aula de Doenças da Tireoide? Descreva a partir de um exemplo
Instruções por Pares	Identificar como a técnica PI pode favorecer o processo de ensino e da aprendizagem Identificar como a participação entre os pares pode definir o processo de aprendizagem de um determinado conteúdo	Você saberia dizer se a estratégia utilizada em sala de aula (Peer Instruction) foi interessante para aprender o conteúdo da matéria? Explique a partir de um exemplo prático Você saberia identificar quais são as vantagens da técnica Peer Instruction no momento da aprendizagem de um determinado conteúdo? Dê um exemplo, caso possa facilitar na sua explicação Você acredita que a participação entre os pares, utilizado na técnica Peer Instruction, poderia melhorar o seu desempenho em situações reais da sua prática profissional? Tente explicar a partir de um exemplo

Source: Prepared by the author.

The exploratory study allows, therefore, to combine the advantages of obtaining the qualitative aspects of information with the possibility of quantifying it later. This association is carried out at

> the level of complementarity, making it possible to broaden the understanding of the phenomenon under study (Piovesan et al., n.d; 1995, p. 322).

The questionnaires will be extracted *from Google Forms* and saved in *Word*, ensuring the registration of the information, to analyze the collected data.

2.4 ANALYSIS PROCEDURE

Once the *Google Forms questionnaires have been extracted and* converted into *Word files*, you will perform an analysis in which the data obtained and the theoretical framework collected were related. It is based on the methodology of content analysis, in which categories are created for data interpretation:

> Content analysis is a technique of analysis of communications, which will analyze what was said in the interviews or observed by the researcher. In the analysis of the material, we seek to classify them into themes or categories that help in understanding what is behind the discourses. (Silva & Fossá, 2015, p. 2).

Thus, after the questionnaires will be saved, it will perform the exploration of the collected material. The text of the answers will be encoded, considering clippings of the text as units of record. According to Franco (2008), the units of record can be considered through words, themes, characters and/or items. After the design of the registration units, the "establishment of categories that differ thematically in the units of record (passage of raw data to organized data)" (Silva & Fossá, 2015, p. 4).

> Thus, the text of the interviews is cut into units of record (words, sentences, paragraphs), grouped thematically into initial, intermediate and final categories, which allow inferences. Through this inductive or inferential process, we seek not only to understand the meaning of the interviewees' speech, but also to seek another meaning or another message through or with the first message. (Silva & Fossá 2015, p. 4).

The categories will be created after the interviews, because, in this way, they emerged based on the contents of the answers, discourses and analysis of the collected material (Franco, 2008).

> The formulation of these categories follows the principles of mutual exclusion (between categories), homogeneity (within categories), pertinence in the transmitted message (non-distortion), fertility (for inferences) and objectivity (understanding and clarity). (Silva & Fossá 2015, p. 4).

In order to assist in the creation of registration units and, consequently, of categories, it will *use* the Iramuteq software, in which the obtained data were processed.

> This computer program enables different types of textual data analysis, from very simple ones, such as basic lexicography (word frequency calculation), to multivariate analyses (descending hierarchical classification, similitude analyses). It organizes vocabulary distribution in an easily understandable and visually clear way (similarity analysis and word cloud). (Camargo & Justo, 2013a, p. 515).

The *software* offers five possibilities of analysis. In this research we intend to use the Descending Hierarchical Classification Method (CHD), which

> [...] represents in a Cartesian plane the different words and variables associated with each of the CHD classes. The interface allows the retrievy, in *the original corpus* , of the text segments associated with each class, when the context of statistically significant words is obtained, enabling a more qualitative analysis of the data. ((Camargo & Justo, 2013a, p. 516).

3 RESULTS AND DISCUSSION

Active methodologies have received considerable attention in recent years. They have attracted strong advocates, among them teachers looking for alternatives to traditional teaching methods. This expression "active learning" is recognized as an approach to the classroom, where the teaching method is planned to teach students during the learning process, making it the main element in the search for knowledge, in contrast to traditional teaching, characterized by eminently exhibition classes. (Prince, 2004)

The learning process is complex and involves internal factors of physiological and psychological interactions and interaction with the external environment. It covers the habits that the subject forms with the assimilation of social and cultural values, to which he has access during the socialization process. It is, therefore, to face external demands of a social nature, mobilizing the subjects to develop answers that satisfactorily meet such demands. (Piovesan, et al 2018)

By relating to people and objects, the human being forms bonds and develops different ways of knowing and learning, based on both individual and collective experience. Such experiences are capable of constructing learning models that are elaborated and modified based on interactions with objects of knowledge, with others and with themselves. (Piovesan, et al 2018)

All of us, in our daily relations of development and action, work considering the three main theories about the learning process: (I) inattista, (II) environmentalist and (III) interactionist. (Peres et al, 2014)

For the inatist theory of knowledge, the focus of learning is the subject himself. The concept is based on the idea that genetic and maturational factors define what constitutes a human being, that is, learning happens from the inside out. Thus, the role of the school and the teacher is to favor the expression of innate characteristics, however educational success depends on the characteristics brought by people (Peres et al, 2014).

In the opposite way to environmental theory, it attributes to the environment the constitution of human characteristics. It values the role of the teacher and considers that learning occurs through the transmission of information. Teachers are at the heart of this process, and should be great connoisseurs of the issues to be addressed and responsible for the transmission of information to students. (Peres et al, 2014).

For interactionist or constructivist theory, the focus is on the processes of knowledge, that is, on the interaction between the subject who learns and the object, both hereditary factors and contents, culture and society interact in learning. People are the subjects who actively seek information. Teachers guide the learning process, acting as a facilitator and mediator of knowledge between subject and object. *(*José Alencar Gomes da Silva Minister of State for Education Fernando Haddad Secretary of Special Education Claudia Pereira Dutra Rector of the Paulista State University - et al., n.d)

Thus, the teacher acts as a facilitator of knowledge, a mediator between subject and object, guiding the teaching-learning process. The internal motivations, previous knowledge, the active and collaborative posture of the students along with the direction of teachers in the search for new knowledge collaborate with the process of learning construction.

In line with the National Curriculum Guidelines, 2014, which states that the medical course should have its pedagogical project built collectively, centered on the student as a subject of learning and the teacher only a facilitator and mediator of the teaching-learning process. And describes in article 29, as structuring the course, the following: *Use methodologies that privilege the active participation of the student in the construction of knowledge and integration between the contents, ensuring the indissociability of teaching, research and extension (Brasil, 2014, pag 4)*. And again to emphasize in Article 32: *The Undergraduate Course in Medicine should use active methodologies and criteria for monitoring and evaluation of the teaching-learning process. (ibid)*

A qualitative study conducted by Ribeiro et al (2016) evaluated how the active methodology has reflected in the teaching - learning process, analyzing the potentialities and limitations of this new teaching method within the context of academic activities developed during medical graduation. Exploring the students' perspective, it was observed that most of the participating students see the active methodology as an excellent teaching strategy, being superior when compared to the traditional teaching methodology.

Thus, the student must be the protagonist of his learning, in this sense he must be removed from his passivity and encourage him to seek information for the construction of his own knowledge. This fact would not occur so easily if the student was passive in this process, only as a receiver of information passed on by the professors. (Oliveira et al., n.d.)

The students, when searching in the bibliography for the subjects for the construction of their knowledge throughout the undergraduate course, promote them as a researcher, facilitating the construction of skills such as creating, investigating, criticizing and reflecting (Andrade & Vieira, 2012).

Carvalho and Santos, 2022, conducted a qualitative study on the Perception of Academics with traditional and active methodologies in the Teaching of Chemistry for Agrarian Sciences at the State University of Mato Grosso - Campus Sinop. Scientific evidence shows a gain in the construction of learning with the use of active methodologies, and even a preference of 66.7% of students for the active method, in which they presented a greater success in learning with the application of the Active Methodology.

As evidenced by Garcia et al (2019), in a qualitative work, with 50 students from the second and final year of the nursing course, about the perception of students in the construction of knowledge in the context of active methodology, which positively assists in the development and construction of knowledge.

Active methodologies have the potential to arouse curiosity, as students engage with the search for knowledge and bring new elements, not yet considered in classes or in the teacher's own perspective, bringing engagement, perception of competence and belonging, in addition to persistence in studies. (BERBEL, 2011).

In the midst of the diversity of existing active methodologies, it is necessary to choose the most appropriate to the course stage. Demonstrations, classroom discussions, presentations, conceptual and mental schemes are relevant in the initial semesters, while in the other semesters the use of problematization processes, case analysis and project-based learning provide better implications for training (Oliveira et al., n.d.).

There are several discussions about active methodologies that can encompass different practices, with the aim of increasing the student's attention and curiosity to grant essential learning. One of the alternatives used to try to change medical education has been the inclusion of Peer Instruction (PI) or Peer Instruction (Garcia et al., 2019).

Peer Instruction is an active teaching-learning methodology that helps teachers quantify, in real time, students' understanding and understanding of the topics presented in the classroom. Thus, both the student and the teacher will be *able to obtain immediate feedback* about learning about a particular topic taught in class (Crouch et al. 2001).

This methodology, also known as Peer Instruction (IpP), which provides greater interactivity in the classroom, was developed by Professor of Physics Eric Mazur, harvard university (Müller et al., 2017). Since its creation in the 1990s, IpP has been presenting relevance in the international teaching method due to its ability to facilitate development, cognitive skills and means of interaction, with a positive impact on the teaching-learning process (Müller et al., 2017; Crouch et al., 2001).

Peer Instruction has been adopted as an alternative of collaborative learning, which can be defined as instruction or learning by peers, being considered a teaching method that aims at greater interaction between students during classroom discussions, providing a space for arguments and relationships between students (Crouch et al., 2001).

IP has been used in various research themes, in the areas of medical sciences, humanities and exact. Rao and Di Carlo apud Muller (2017) evaluated the impact of interaction between colleagues on student performance in conceptual issues in a Physiology course for medical students. The questions answered by the students were categorized as: comprehension, application and analytical skills; in the three categories there was a statistically significant increase in the score of students after discussion with colleagues: 94% to 99%, 82% to 99% and 73% to 99% respectively. (Müller et al., 2017).

We can verify in Garcia et al. (2019) that, when conducting a research with 30 volunteer students of the Medical course, evaluating their perception in biochemistry classes and observed results that showed correct 67% (before the group discussion) at the initial moment of the activities and, after applying the technique, observed about 100% (after the group discussion) in the performance.

Müller et al. (2017) in a systematic review of the literature, according to the implementation of the active peer instruction (PI) teaching methodology from 1991 to 2015 evaluated the impacts that ip has produced on student learning. The diversity of results found shows that IP is a highly recommended

proposal, especially when seeking to engage the student in the learning process, as well as improve their learning outcomes.

In view, considering that the formulation of hypotheses and problem solving is one of the competencies necessary for the graduate of the medical course, it is of paramount importance to evaluate the perception of the student in relation to the methodology applied in the teaching process - learning.

Pereira and Afonso (2020) conducted a quantitative research, in which 24 students of the Physiotherapy course in the discipline of morphological and physiological sciences about their general perceptions about peer instruction, and obtained positive results, it was found that, in their perceptions the methodology helped them to study individually the contents and practice skills such as teamwork and argumentation, reinforcing the importance of active methodologies in the teaching-learning process and in the training of students with a critical and reflective profile.

Data obtained from the researches carried out by Mazur (2012) indicate that, with the use of the Peer Instruction methodology, the level of information retention by students during classes has a variation in the percentage initially calculated from 20% - only using traditional exhibition classes - to a percentage of 60% from the application of this methodology.

Godoi and Ferreira (2016) in a quantitative and qualitative study conducted by the Salesian University Center of São Paulo - UNISAL, on the application of Peer Instruction in Higher Education, evidence positive points and difficulties encountered in the application of the method.

On the positive aspects, an evolution of students' performance is shown after the impact of the application of the Peer Instruction methodology. In relation to the difficulties encountered, they point to the following aspects: (I) a greater volume of work in the preparation, application and evaluation of activities by teachers; (II) challenges involving the question of how to deal with the low interest of some students, as well as the lack of conceptual "basis"; and (III) issues related to logistical and technological difficulties involving the tools that support the methodology.

Although the active teaching methods are related to a greater effectiveness of the learning process in health courses, students face difficulty adapting to the method due to a culture of exhibition classes implemented in the country since basic education. Where a teacher exposes the content and the student only passively receives and reproduces the information (FERREIRA; MOROSINI, 2019)

Authors such as Berbel (1998), Bordenave and Pereira (1985) argue that the teaching-learning process should not be restricted exclusively to a single methodology. It should be sought to extract the best that each method is able to offer and enjoy the potential of both, prioritizing the effective construction of knowledge.

4 FINAL CONSIDERATIONS

It is known that it is necessary to innovate in the teaching process – learning, so that it becomes interactive, attractive and practical during learning, facilitating the acquisition of knowledge, involving the student in order to develop skills and reasoning. Thus, the diversity of results found shows that IP is a highly recommended proposal, especially when seeking to engage the student in the learning process, since the engagement provided by the IP makes students more responsible for their learning throughout the disciplines, facilitating understanding and interaction, as well as the exchange of ideas among students, improving your learning outcomes.

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