



## ACTIVE METHODOLOGIES IN TEACHING SCIENCE: CONCEPTS ABOUT HUMAN REPRODUCTION IN THE 8TH GRADE

### *ACTIVE METHODOLOGIES IN SCIENCE TEACHING: CONCEPTIONS ABOUT HUMAN REPRODUCTION IN THE 8TH GRADE*

Manoel Messias dos Santos (1) – State University of Alagoas (UNEAL) Campus II,

Student of the Biological Sciences Course (Bachelor's Degree), Brazil.

Email: manoel.santos3@vamos.uneal.edu.br

Delma Holanda de Almeida (2) – PhD in Health Sciences- 2023- University

Federal University of Alagoas- UFAL. Master's Degree in Health Sciences 2012- Federal University of

Alagoas- UFAL. Degree in Biological Sciences, Bachelor's and Licentiate's Degree- 2007-

Federal University of Alagoas. Education Counselor of the State of Alagoas.

Professor at CESMAC University Center and the State University of Alagoas

**SUMMARY:** This study investigated the impact of active methodologies in Science teaching, specifically on conceptions about human reproduction, in an 8th grade class. The research is of a qualitative exploratory nature and was conducted at the Oton Gaspar de Farias Municipal Elementary School, located in Carneiros-AL, involving an 8th grade class with 30 students. Initially, pre-tests revealed significant gaps in students' knowledge about human reproduction, contraceptive methods, STIs, and teenage pregnancy. To address these gaps, two active methodologies were implemented: Problem-Based Learning (PBL) and Gamification. PBL involved solving real and fictitious problems in groups, while Gamification used an interactive quiz about the human reproductive system. Both methodologies were developed in two 50-minute classes, promoting active and engaging learning. The results of the post-test showed significant improvements in students' conceptions, with notable increases in the understanding of human reproduction, contraceptive methods, and STIs. Furthermore, students demonstrated greater confidence and comfort when discussing sensitive topics. The comparative analysis highlighted the effectiveness of active methodologies in promoting more meaningful and integrated learning, developing critical skills such as problem-solving, communication, empathy and collaboration.

**Keywords** Science Teaching; Human Reproduction; Active Learning Methodologies; Traditional Teaching.

**ABSTRACT:** This study investigated the impact of active methodologies in the teaching of Science, specifically on the conceptions of human reproduction, in an 8th grade class. The research is of a qualitative, exploratory nature and was conducted at the Municipal School of Basic Education Oton Gaspar de Farias, located in Carneiros-AL, involving a class of 30 students. Initially, pre-tests revealed significant gaps in students' knowledge about human reproduction, contraceptive methods, STIs, and teenage pregnancy. To address these gaps, two active methodologies were implemented: Problem-Based Learning (PBL) and Gamification. PBL involved solving real and fictional problems in groups, while Gamification used an interactive quiz about the human reproductive system. Both methodologies were developed in two 50-minute classes, promoting active and engaging learning. The post-test results showed significant improvements in students'

conceptions, with notable increases in understanding of human reproduction, contraceptive methods, and STIs. Additionally, students demonstrated greater confidence and comfort in discussing sensitive topics. The comparative analysis highlighted the effectiveness of active methodologies in promoting more meaningful and integrated learning, developing critical skills such as problem-solving, communication, empathy, and collaboration.

**Keywords:** Science Teaching; Human Reproduction; Active Learning Methodologies; Traditional Teaching.

## 1. INTRODUCTION

Science teaching in the 8th grade of Elementary School faces significant challenges in making the content attractive and understandable for students. Traditionally, Science teaching has been characterized by a more expository and less interactive approach, which often results in a lack of interest on the part of students.

In this scenario, active methodologies emerge as innovative alternatives capable of reversing this situation, promoting student engagement and meaningful learning. These methodologies contrast with traditional practices by placing students at the center of the learning process and encouraging them to - them to participate in a more active and collaborative way.

With this in mind, this study is relevant to identify how active methodologies influence students' understanding of human reproduction, a topic of great curiosity for adolescents and, at the same time, considered sensitive and challenging to be addressed by teachers. With the help of new practices, the aim was to make teaching more dynamic and interactive, facilitating the assimilation of complex concepts and promoting greater awareness of the importance of sexual education.

Therefore, the central problem of this research is: How do active methodologies influence 8th grade students' conceptions about human reproduction? Thus, the objective of this study is to investigate the effectiveness of active methodologies in Science teaching to improve students' conceptions about human reproduction.

Thus, to achieve this objective, students' prior conceptions about human reproduction were identified. Then, two active learning methodologies, problem-based learning and gamification, were applied to teach this topic. Finally, a post-test was applied, followed by analysis and evaluation of possible changes in students' conceptions after the application of these teaching methodologies.

## 2.1 ACTIVE LEARNING METHODOLOGIES IN SCIENCE TEACHING

Active Learning Methodologies (ALM) are pedagogical approaches that place the student at the center of the educational process, promoting active participation and engagement of students in the construction of knowledge. Unlike traditional methodologies, where the teacher is the main transmitter of information, active methodologies encourage students to be protagonists of their own learning, developing critical and reflective skills.

Nascimento and Coutinho (2016) understand MAA as innovative forms of teaching that encourage active student participation, involving sensory, affective and cognitive aspects. In addition, they point out that students have more freedom in activities and are challenged to solve real problems, which promotes more engaged and effective learning.

This conception highlights the importance of AAM in the educational environment, proposing a model that goes beyond the traditional passive transmission of knowledge. Scientifically, AAM is supported by several learning theories, including Jean Piaget's constructivist learning theory and Lev Vygotsky's social-constructivist theory. These theories state that learning is an active process, where students construct knowledge from their experiences and interactions.

Pereira (2012) corroborates this perspective by pointing out that they place the student at the center of the educational process, promoting active participation and the use of various dimensions, such as sensory/motor, affective/emotional and mental/cognitive.

Furthermore, these methodologies break with the exclusivity of the role of the teacher and the textbook, encouraging students to engage more deeply and meaningfully with knowledge, using innovative and challenging teaching strategies. "Active methodologies are starting points to advance to more advanced processes of reflection, cognitive integration, generalization, and reworking of new practices" (MORÁN, 2015, p. 18).

In the search for greater engagement and meaningful learning, there are numerous active learning methodologies that can be used by teachers in the classroom or outside of it. Paiva et al (2016) highlight the variety of methods for implementing active teaching-learning methodologies, including strategies such as problematization, Arco de Marguerez, PBL, TBL, and culture circles, as well as other practices such as seminars, group work, debates, and workshops.

In view of this, it is up to the teacher to act as a facilitator of learning, promoting an environment where students are encouraged to be protagonists of their own learning process. It is essential that the teacher plans diverse and interactive activities, creating an environment conducive to the intellectual development of students.

3

Active methodologies have their roots in the progressive education movement of the early 20th century. XX, influenced by educators such as Jean Piaget and Lev Vygotsky, great names in the interactionist movement. Diesel et al (2017) explain that these great authors were pioneers and made an enormous contribution to the development of active learning methodologies, developing a perspective on the stages

of cognitive development (Jean Piaget) and the other (Lev Vygotsky) creating a more social perspective for the learning process, that is, interactionism.

Based on this understanding, it is possible to see that over the decades, these ideas have been developing and adapting, with new authors, new studies, culminating in the various approaches to active methodologies that we know today. Morán (2015) understands that: "Active methodologies are starting points to advance to more advanced processes of reflection, cognitive integration, generalization, and reworking of new practices" (MORÁN, 2005, p.18).

Therefore, it is clear that there are multiple applications and benefits of active learning methodologies. However, Diesel et al (2017) warn that teachers are often unsure of the objective or the influences that AAM have on student learning. This is related to teaching practices, which often due to lack of time, limited resources, poor training, etc., generate a lack of clarity in applying this active method, and thus, end up resorting to the traditional teaching method.

## 2.2 TRADITIONAL EDUCATION

Traditional teaching is characterized by a teacher-centered approach, where the teacher is the main transmitter of knowledge and the students are passive receivers. Classes are generally expository, focusing on memorizing content and repeating exercises. Leão (1999) explains that the traditional methodology is based on the idea that human intelligence was made to store information, whether simple or complex, without the need for greater social interaction between the individual and the environment.

Given this, it is possible to imagine that this type of methodology values the transmission of information in a linear and sequential way, only throwing information that the student must hear, store and repeat, with little interaction and active participation from those involved. In this same line of thought, Pereira and Silva (2022) point out that the traditional teaching methodology suffers from the lack of interaction between teacher and student, which results in a distance between the content taught and the reality of the student, impairing learning.

In this context of traditional teaching, we can identify some types of approaches, such as expository classes, where the teacher presents the content verbally, using resources such as the board, slides and textbooks; Teaching by repetition, where students are encouraged to memorize information and repeat exercises to fix the content; Summative assessments, in which students' performance is assessed mainly through tests and exams that measure the ability to memorize and reproduce the content.

Traditional education has its roots in the formal education of the 18th and 19th centuries, when schools became established as institutions responsible for transmitting knowledge. In Brazil, this approach was widely adopted during the colonization period and remained predominant throughout the 20th century. Morán (2019) explains that many renowned scholars, such as Dewey (1950), Freire (2009), Rogers (1973), Novack (1999) had been developing ideas for a long time to overcome this teaching model, which continues to this day.

Pereira and Silva (2022) highlight that in Brazil the traditional method is widely used, the authors see these methodologies as archaic and outdated, they argue that there are several factors that lead to per-

lasting permanence of this teaching, being one of the great problems of national education.

Given this perspective, it is clear that Brazilian education is rooted in the traditional teaching method, which has long been identified and problematized. However, it cannot break away from this more convenient way of dealing with the teaching-learning process. Morán (2015) argues that progressive or disruptive changes are necessary to focus on personalization, collaboration, and student autonomy. He emphasizes that profound adjustments are essential, as the traditional model will not work with small changes. The focus should be on the active and involved student, and on the teacher as a guide, not just a transmitter.

From this line of thought, it is clear that there is a need to break with the traditional teaching model, to place the student at the center of learning, to seek, learn, and use new methodologies. When it comes to Natural Sciences, when approaching a subject (human reproduction) that generates a lot of curiosity in 8th grade students, active methodologies can enable greater interaction and meaningful learning beyond the traditional method mentioned.

### 2.3 TEACHING HUMAN REPRODUCTION IN THE 8TH GRADE

Teaching human reproduction in the 8th grade of elementary school includes an understanding of the biological and physiological processes related to reproduction, including the anatomy of the male and female reproductive systems, fertilization, embryonic and fetal development, as well as aspects related to reproductive health and sexuality. According to the National Common Curricular Base (BNCC) (Brazil, 2018), these topics are fundamental and of great importance to students, generating interest and curiosity at this stage of adolescence.

The National Curricular Parameters (PCN) (Brazil, 1997) also consider the topic linked to sexuality and human reproduction to be of great importance at each educational stage, as it sees the subject as having a significant social impact and which is connected to the topic of sexual orientation, involving not only biological factors, but also social, cultural and pleasure factors.

However, Barbosa et. al (2019) warn that the teacher training of Science teachers, although following the guidelines of the BNCC and the PNC, is insufficient because it does not take into account the cultural context, prior knowledge and daily life of students, focusing only on the biological part, often using the traditional teaching method.

In view of this, teaching Science in the 8th grade deals with an enormous responsibility to make the teaching-learning process meaningful. At this stage of life, teenagers are discovering themselves, with countless doubts and their own conceptions about the most diverse topics, which need correct guidance to improve, demystify, correct, deepen, etc.

Based on this understanding, Lucas et.al (2021) corroborate the perspective, highlighting that 8th grade students go through bodily changes and have many doubts, making this content essential. They also mention that students at this stage prefer dynamic activities rather than lectures or textbook-centered classes.

Given the above, it is clear that teaching Science on the topic of human reproduction needs to go beyond the conventional method, it needs to make this process more dynamic, more interactive, more social, etc.

From the last stage of Elementary School onwards, it is essential that students have a better understanding of



conception of how the fertilization process occurs, hormonal changes, contraceptive methods, sexually transmitted infections (STIs), pregnancy, gestation and different types of childbirth. Information about reproduction and sexuality must be objective and clear, breaking all types of prejudices, favoring the appreciation of the health of one's own body, respecting the doubts and feelings of this public (Brazil, 1998).

To make this feasible, different approaches can be used in teaching human reproduction, including: Theoretical Classes: focusing on the presentation of concepts and information through expository classes, using resources other than textbooks, such as slides and videos. Followed by practical activities: carrying out experiments, anatomical models and simulations to illustrate the reproductive processes; Discussions and Debates: Promoting reflection and dialogue on teenage pregnancy, contraceptive methods and Sexually Transmitted Infections.; Lectures and Workshops: inviting healthcare professionals to address specific issues and provide up-to-date information.

### 3. MATERIAL AND METHOD

This study adopted a qualitative approach with an exploratory character to investigate the effectiveness of active methodologies in teaching Science on human reproduction in the 8th grade of elementary school. The research was carried out during the month of August 2024, conducted at the Oton Gaspar de Farias Municipal Elementary School, located in the city of Carneiros-AL, involving an 8th grade class with 30 students.

The Oton Gaspar de Farias school has 5 8th grade classes (A, B, C, D and E), in addition to 6th grade classes, 7th and 9th grades, to carry out the study, some procedures were adopted to choose the class, the first involved selecting the class that best met the criteria determined by the researcher, such as: Being an 8th grade class; Class with the lowest number of absent students and class that has two consecutive Science classes. These points were fundamental for data collection and for better application of the proposed methodologies. The class that best met the criteria was 8th grade B, which was used for this research.

To collect data, pre-tests and post-tests were applied regarding the participants' prior and subsequent conceptions about human reproduction.

#### Initial Data Collection:

**Pre-test:** It was applied to the 8th grade B class, aiming to identify the students' prior conceptions about human reproduction. The pre-test had 4 objective multiple-choice questions and 5 subjective questions, totaling 9 questions.

6

Pre-test: students' conceptions about human reproduction:

1. What do you understand by human reproduction?

- a) Process by which plants reproduce.
- b) Process by which human beings have children.
- c) Scientific method for cloning human beings.



d) None of the above.

2. What is the main function of the male reproductive system?

- a) Produce milk.
- b) Produce sperm.
- c) Protect the body against infections.
- d) Produce female hormones.

3. What is the main function of the female reproductive system?

- a) Produce sperm.
- b) Feeding the baby after birth.
- c) Produce eggs and provide an environment for embryo development.
- d) Produce male hormones.

4. Name 3 differences between the female reproductive system and the male reproductive system.

5. What is fertilization?

- a) The process of growth of the baby in the womb.
- b) The union of the sperm with the egg.
- c) Menstruation.
- d) The production of sperm and eggs.

6. What contraceptive methods do you know?

7. What are the main consequences of teenage pregnancy?

8. What do you know about STIs?

9. Do you feel comfortable and confident talking about this topic in Science classes?

### Implementation of Active Methodologies in 8th grade Class A:

In this study, two active learning methodologies were used, the first applied was Problem-Based Learning (PBL), followed by Gamification. Each methodology was developed in two 50-minute classes, the first class for contextualization and the second class for carrying out the planned dynamics.

### Moment 1: Problem-Based Learning (PBL):

Class 1: Real and fictitious problems related to human reproduction were presented for group investigation. Duration: two 50-minute classes

7

1. **Infertility:** A couple has been trying to have children for over a year without success. What can be the causes of infertility and what treatment options are available?
2. **Sexually Transmitted Infections (STIs):** A teenager discovers that he has contracted an STI. What are the possible consequences for reproductive health and how can the transmission of these diseases be prevented?
3. **Teenage Pregnancy:** A 15-year-old girl discovers she is pregnant. What are the challenges and implications of teenage pregnancy for the mother and baby?
4. **Contraceptive Methods:** A group of friends are discussing contraceptive methods. Which

What are the different methods available and how do they work to prevent pregnancy?

**5. Assisted Reproductive Technologies:** A same-sex couple wants to have children. What assisted reproductive technologies are available and how can they help this couple achieve their dream of having children?

Class 2: After the presentation of the cases, the students were divided, the cases were drawn for each group, then each group was asked to discuss, research, analyze, and present the appropriate responses for the case that remained.

### **Moment 2:** Gamification:

A Quiz was held, a question and answer game about the human reproductive system.

Duration: two 50-minute classes.

Class 1: general presentation of the activity dynamics, division of groups, explanation of the QUIZ format, etc.

Lesson 2: Students competed to see who could answer the most questions about human reproduction correctly. Each group was given signs A to E, and had the time to read the question plus 30 seconds to decide which alternative was correct and to hold up their sign at the end of that time.

For this, the projector was used to visualize the questions and correction in sequence.

### **Participants' Observations:**

During the implementation of active methodologies in the class, observation and evaluation of participants was carried out to record the engagement, participation and knowledge acquired by the students.

### **Post-test:**

Once the active methodologies were applied in 8th B, a post-test was applied to assess possible changes in the conceptions of the students participating in the research. The post-test consisted of 3 objective questions (2, 3 and 5) and 5 subjective questions (1, 4, 6, 7, 8 and 3, 9), seeking to have the student describe the possible learnings after the application of the active methodologies.

### **Post-test**

1. What did you learn about human reproduction?
2. What is the main function of the male reproductive system?
  - a) Produce milk.
  - b) Produce sperm.
  - c) Protect the body against infections.
  - d) Produce female hormones.
3. What is the main function of the female reproductive system?
  - a) Produce sperm.

b) Feeding the baby after birth.

c) Produce eggs and provide an environment for the development of the embryo.

d) Produce male hormones.

4. Name 3 differences between the female reproductive system and the male reproductive system.

5. What is fertilization?

a) The process of growth of the baby in the womb.

b) The union of the sperm with the egg.

c) Menstruation.

d) The production of sperm and eggs.

6. What contraceptive methods do you know and how do they work?

7. What are the main consequences of teenage pregnancy that you have learned?

8. What do you know about STIs?

9. Do you feel more comfortable and confident talking about this topic in science classes?

#### 4. RESULTS AND DISCUSSION

Science education faces the ongoing challenge of making complex topics accessible and meaningful to students. Among these topics, human reproduction stands out for its biological and social importance. The use of active methodologies in science teaching has the potential to promote more participatory and student-centered learning, with promising results in improving the understanding and retention of scientific concepts, in addition to establishing more interactive, meaningful and interesting learning.

This study investigated the conceptions of 8th grade students about human reproduction, comparing the application of active methodologies in the 8th grade B class with the previous conceptions of this group. For this, pre-test, Problem-Based Learning and Gamification were used in the teaching of human reproduction, and post-test.

The data obtained allowed an in-depth analysis of the students' perceptions, highlighting both both prior knowledge and areas that require greater clarification and an innovative pedagogical approach.

##### Data Analysis:

9

- Content Analysis: Student responses on pre- and post-tests were categorized and interpreted to identify recurring patterns and themes.
- Comparison: Pre- and post-intervention conceptions were compared to assess the impact of active methodologies.

Graph 1 below presents the results obtained from the pre-test according to the satisfactory answers for each question.

### Graph 1- Result of pre-test with 30 students

Source: Survey data, 2024.

The data collected reveal that, in general, the class has a good understanding of the basic concepts of human reproduction and reproductive systems. However, some specific areas, such as the differences between reproductive systems and fertilization, show low understanding, suggesting the need for differentiated pedagogical approaches. In addition, the analysis reveals that there is a considerable knowledge gap regarding STIs and contraceptive methods that needs to be addressed to ensure comprehensive and effective education.

Continuing with the data analysis, it is worth noting that the objective questions (2, 3 and 5), because they are easy to solve, had a high accuracy result, which was already expected. On the other hand, the objective questions (1, 4, 6, 7, 8 and 3, 9) showed a warning sign regarding the level of learning about human reproduction. Next, a comparative analysis of the class's prior conceptions in each question of the pre-test. To be objective and allow for better understanding, Table 1 presents the main points observed from the students' responses.

**Table 1-Overview of pre-test results**

Matters	Main points observed
Understanding Human Reproduction	Overall, the class presented low knowledge.
Function of the Male Reproductive System	the question was well understood by the class.
Function of the Female Reproductive System	The class demonstrated reasonable knowledge on this topic.
Differences between Reproductive Systems	The class had great difficulty mentioning the different organs between the male and female sex.
Understanding Fertilization	The class has reasonable knowledge
Knowledge of Contraceptive Methods	The class has average knowledge
Consequences of Teenage Pregnancy	The class has a moderate understanding of the impact of teenage pregnancy.
Knowledge about STIs	The topic showed great need for reinforcement.
Comfort in Discussing the Topic	showed a very low number of students who feel confident talking about human reproduction.

Source: Survey data, 2024.

The pre-test also highlights the lack of creating a safe and comfortable environment so that students can discuss sensitive topics without embarrassment. In this sense, active methodologies can be used as a powerful tool to overcome these problems. Damo and Stange (2009) corroborate this view when they infer, based on the results of a study they conducted on a similar topic, that classes that use active, student-centered methodologies can contribute to meaningful learning and strengthen autonomy and fill gaps such as those observed in this study.

10

However, Diesel et. al (2017) argue that this type of approach alone is not the only solution to solve these problems mentioned, requiring reflection on the part of the teacher so that the methods used are diversified, consistent with the reality of the class and with the initial objective. This fact is a reality and this study presents some possibilities among countless others that can have a positive effect.

Having presented the results of the pre-tests, the following is a breakdown of the application and results of the active methodologies in the 8th grade B class:

**Problem-Based Learning (PBL):** The implementation of Problem-Based Learning (PBL) in the 8th grade B class proved to be highly effective, promoting active and engaging learning. Students developed critical skills, such as problem-solving, communication, teamwork, and empathy, in addition to deepening their knowledge about reproductive health and sexual education. These successful results reinforce the importance of using active methodologies in science teaching to promote relevant education.

In this sense, Segura and Kalhil (2015) carried out research in which they detailed the characteristics of Problem-Based Learning, and in the end, they concluded that the use of this method in Science classes can contribute to scientific knowledge and to the strengthening of scientific culture in Education.

For Nascimento and Coutinho (2016), this method encourages students to research, leading them to acquire new knowledge through their own learning. These understandings are shared and were observed during the application of this teaching methodology.

**Gamification:** The implementation of gamification in the 8th grade B class was highly successful, fostering a fun and interactive learning environment. Healthy competition, coupled with immediate feedback, not only reinforced students' knowledge about the human reproductive system, but also developed important skills such as teamwork, communication, and decision-making. These positive results underscore the value of incorporating gamification elements into science education.

Oliveira et. al (2023) through their research on Gamification focused on teaching Science They noted the importance of working on the topic in a playful and interactive way, corroborating the results of this study, the researchers concluded that the educational system needs changes, the use of technology, and that the traditional methodology is not sufficient to meet the demands of the educational context.

Therefore, it is possible to infer that these approaches promoted a dynamic, engaging and practical learning environment, allowing students to develop critical skills, such as problem solving, communication, empathy and teamwork.

As a result, a significant increase in student engagement and understanding of reproductive health issues was observed in the class studied, reflected in the positive post-test results that will be discussed below.

For a more detailed analysis, the objective questions, because they are easy to solve, represented practically 100% of the correct answers, which was expected due to the low level of difficulty. For this reason, the analysis was centered on the subjective questions, seeking to understand and compare the possible transformations in the conceptions of the students in the class before and after the application of the MAA. Table 2 below shows the expected and satisfactory answers regarding the knowledge worked on during the application of the active methodologies.

**Table 2-Expected responses after applying MAA**

(Continued)

	<b>Expected responses</b>
<b>1</b>	Mention the functions of the male and female reproductive systems, the fertilization process and how pregnancy occurs, or contraceptive methods and the importance of sexual education.
<b>4</b>	The female system produces eggs; the male system, sperm; The female system houses the development of the embryo; the male system does not; The female system has the uterus and ovaries; the male system has the testicles and the penis.

Source:Survey data, 2024.

**Table 2-Expected responses after applying MAA**

(Conclusion)

<b>6</b>	Condom: prevents the passage of sperm and protects against STIs and pregnancy; Birth control pill: contains hormones that prevent ovulation; IUD: device inserted into the uterus that prevents fertilization.
<b>7</b>	Mention the interruption of studies, financial difficulties in caring for the baby, or the physical, psychological and emotional impacts on the teenager.
<b>8</b>	Remember the meaning of the acronym STIs (Sexually Transmitted Infections), examples such as syphilis and HIV, and that they can be prevented with the use of condoms. Mention that most of them can be cured and others cannot, etc.
<b>9</b>	Yes, I feel more confident to discuss the topic and clear up my doubts; The classes helped me to better understand the subject and to understand the importance of talking about human reproduction.

Source:Survey data, 2024.

In view of this, graph 2 below presents the results of the post-test according to the answers that satisfactorily addressed the proposed questions:

### Graph 2-Post-test results

Source:Survey data, 2024.

The post-test highlights the positive impact of using active methodologies in teaching Science, especially in topics such as human reproduction and sexuality. This view is present in the work of Nascimento and Coutinho (2016) who concluded in their research

about active learning methodologies, which significantly influence the construction of students' knowledge, contributing to the training of researchers and potentially raising the level of learning in schools.

12

Damo and Stange (2009) concluded in their work on the Human Reproductive System and Sexuality, with 7th grade students, that active methodologies generate relevant participation and satisfactory learning results after their application.

Continuing, the comparative analysis of the class's pre- and post-conceptions follows, based on subjective questions (1, 4, 6, 7, 8, 9). To be objective and enable better understanding, Table 3 below presents the main points observed:

**Table 3-** Summary of post-test results

(Continued)

Matters	Main points observed
Understanding Human Reproduction	Previously, the class showed a low level of understanding, but now there has been a significant improvement, with 97% of the answers considered satisfactory.
Differences between Reproductive Systems	Large improvement in the class (from 40% to 93%), this suggests that active methodologies are more effective for teaching comparative and detailed concepts.
Knowledge of Contraceptive Methods	Considerable improvement from 63% to 97%, this indicates the effectiveness of active methodologies in promoting practical and applied understanding.
Knowledge of Contraceptive Methods	Very positive balance, from 63% to 97%, this indicates the effectiveness of active methodologies in promoting practical and applied understanding.
Consequences of Teenage Pregnancy	Satisfactory result in the class from 60% to 97%, suggesting that active methodologies can engage students more in discussions about social and personal impacts.
Knowledge about STIs	Significant improvement from 40% to 77%, highlighting the need for more interactive approaches to health topics.

Source: Survey data, 2024.

**Table 3-** Summary of post-test results

(Conclusion)

Comfort in Discussing the Topic	Considerable improvement in the class, from 20% to 50%, indicating that active methodologies helped students feel more confident and comfortable discussing sensitive topics.
---------------------------------	---

Source: Survey data, 2024.

The post-test results indicate that the active methodologies applied in the 8th grade B class were effective in improving the understanding and retention of concepts about human reproduction. The class showed significant improvements in almost all topics, proving the urgent need to implement new practices that place the student at the center of learning.

Lucas et. al (2021) agree with this view, as in their research on the perception of teachers and students about the different teaching resources in the study of human reproduction, they infer that the use of active teaching methods, similar to those in this research, encouraged students to be more participatory, to improve their conception of the subjects, to give their opinion and favor the teaching-learning process.

Next, in the analysis of the results, two topics stood out: understanding of human reproduction and comfort in discussing this topic in science classes. These topics showed considerable improvement in relation to what was obtained in the pre-test. Thus, Table 4 below presents some of the students' conceptions about these two topics. The choice of answers was made by observing those that best and most clearly responded to the proposed topic. The aim was to preserve the identity of the participants by naming the subjects with the letter A for student, followed by the number of the analysis of the answers, from 1 to 30 students.

**Table 4-Understanding human reproduction**

(Continued)

Students	Understanding Human Reproduction
A 1	<i>"It is a process in which human beings reproduce and if there is no protection, it can result in disease or unwanted pregnancy"</i>
The 7	<i>"Which is sexual reproduction, and occurs when the sperm and the egg meet. And it has a very large genetic variability."</i>
A 10	<i>"I learned about STIs and how contraceptive methods work and how to prevent sexually transmitted infections."</i>
The 13th	<i>"protecting yourself against diseases, body care, condoms, etc."</i>

Source: Survey Data, 2024.

**Table 4-Understanding human reproduction**

(Conclusion)

At 15	<i>"I learned what fertilization is, how to prevent sexual infections and prevent pregnancy"</i>
The 19th	<i>"I learned that human reproduction is when two gametes join together and fertilization occurs, generating an embryo"</i>
The 23rd	<i>"I learned the functions of the reproductive organs, diseases and preventions"</i>
The 25th	<i>"I learned how to protect myself the right way. That teenage pregnancy can cause the death of both the embryo and the mother"</i>
The 28th	<i>"In the last classes I learned that human reproduction happens when sperm meet the female egg, thus generating a new being."</i>
At 30	<i>"I learned that we must be very careful with age protection and especially with responsibility, because in addition to sexual intercourse bringing several risks, an unwanted pregnancy can also occur and this can ruin a teenager's future and limit a dream."</i>

The students' responses demonstrate that there was considerable understanding of the topics covered by quite **Source: Data from** of the MAA. They also suggest that this type of approach can directly contribute to **research, 2024.** improving students' conceptions about human reproduction, generating consistent more learning.

Nicola and Paniz (2016) understand that the use of teaching resources such as MAA in Science classes greatly favors the teaching/learning relationship. saying, creating a more dynamic, participatory environment, making teaching of quality by stimulating critical thinking. This perspective is evidenced by the responses obtained in table 4.

Still from this perspective, Morán (2016) explains in his research on how active methodologies change education, that they work with problems and situations in reality, and with this, they lead the student to build knowledge at school and take it integrally into their lives.

14

In view of this, it is clear that working on human reproduction in the 8th grade in a way that makes the student the center of learning can promote meaningful learning, contributing to a better understanding of what it is and the importance of studying human reproduction. Furthermore, this knowledge will accompany them inside and outside of school, integrating their worldview and enabling a better way of dealing with themselves and others.

Another important point that stood out when analyzing the data obtained was the potential that the methodologies

Active strategies were used to unlock students' inhibitions when working on more complex topics, such as human reproduction and sexuality. Table 5 shows students' perceptions about how comfortable or uncomfortable they felt after applying the MAA.

**Table 5-Comfort in discussing the topic**

Students	Comfort in Discussing the Topic
<b>A 1</b>	<i>"Yes, I feel comfortable talking about pregnancy, about how sexual relations occur among others now after learning and talking about it is normal."</i>
The 7	<i>"Yes, I think we should understand our bodies and learn how to prevent it."</i>
<b>A 10</b>	<i>"More or less, I still have a certain shyness about it, but overall, it's much more normal now than before."</i>
The 13th	<i>"Yes, because it is part of life. It is necessary that everyone understands that it is not something shameful or funny, but rather something serious and that we must study all of this."</i>
<b>At 15</b>	<i>"Yes, because in fact there was no reason to be ashamed because these classes are a preventive measure for everyone to also get to know their body."</i>
The 19th	<i>"Yes, especially when the class is conducted in a more "relaxed" manner, as this way I feel more comfortable talking about it."</i>
The 23rd	<i>"More or less, it's good to know more about it because most of the time it's kind of embarrassing to talk about it at home."</i>
The 25th	<i>"Yes, I feel more free to talk about this subject now because I have learned more about it."</i>
The 28th	<i>"Yes, before I didn't feel very comfortable talking about it, but now I see that it's super cool"</i>
<b>At 30</b>	<i>"Yes, because I think it's normal, and it's also good for us to learn about ourselves."</i>

**Source: survey data, 2024.**

In this context, students' responses confirm that active methodologies have great potential to promote more meaningful learning, generating greater student engagement, resulting in better understanding and comfort in discussing complex topics.

In Vicente's research (2023) on Sexual Education in the different versions of the National Common Curricular Base: From openness to silencing around the topic, among his conclusions, he highlights that understanding sexual issues can enable the understanding of sexuality, deconstruct taboos, prejudices and give an active voice to subjects through knowledge.

In view of this, the responses obtained in Table 5 are in line with this understanding, since they demonstrate that the students, to a greater or lesser extent, were able to develop their perception and knowledge about human reproduction. In this way, enabling greater confidence in approaching the topic.

In the work of Damo and Stange (2009) on the human reproductive system – school knowledge, sexuality and students' daily lives, they developed the proposed methodologies in a significant way and noted that the students had great participation and acceptance, being able (most of them) to talk about human reproduction and sexuality without prejudice or limitations, and with confidence. They infer that this was only possible thanks to the establishment of a relationship of trust during the application of the MAA.

Thus, it is clear how important it is to use active methodologies in teaching Science, especially on complex topics such as human reproduction. Students' conceptions about this topic are shaped by their daily lives, and it is essential that they receive adequate and meaningful information, which can be achieved through more dynamic, active, objective teaching that respects the student's reality and places them at the center of their learning.

## 5. FINAL CONSIDERATIONS

The application of active learning methodologies in the 8th grade B class demonstrated a significant impact on students' conceptions about human reproduction, as evidenced by the analysis of the results of the pre-test, activities and post-test. Initially, the pre-tests revealed important gaps in students' knowledge about human reproduction, contraceptive methods, STIs and teenage pregnancy. However, the implementation of activities such as Problem-Based Learning (PBL) and Gamification not only increased student engagement but also promoted a deeper and more practical understanding of the topics covered.

The post-test results showed significant improvements in correct answers and in students' confidence in discussing sensitive topics, highlighting the effectiveness of active methodologies in promoting more meaningful and integrated learning, developing critical skills such as problem-solving, communication, empathy and collaboration.

The importance of approaching reproductive health issues in an active and engaging way cannot be underestimated. These topics are essential not only for scientific knowledge, but also for the comprehensive education of students, enabling them to make informed and responsible decisions about their health and well-being. However, teaching these topics also presents challenges, such as creating a safe environment for discussions and dealing with prejudices and cultural taboos.

Finally, adopting participatory and student-centered approaches can significantly improve 8th graders' understanding of human reproduction, as well as transform the educational experience by promoting more lasting learning and empowering students to become informed and responsible citizens.

## REFERENCES

BARBOSA, Luciana Uchôa; Viçosa, Cátia Silene Carrazoni Lopes; FOLMER, Vanderlei. Sexual education in education policy documents and its resignifications. **Electronic Journal Health Collection**, v. 11, no. 10, p. e772-e772, 2019.

BRAZIL. Ministry of Education. National Common Curricular Base. Brasília, 2018.

16

BRAZIL, Secretariat of Elementary Education. National curriculum parameters: introduction to national curriculum parameters / Secretariat of Elementary Education. – Brasília: MEC/SEF, 1997. 126p.

DAMO, Nadia Cristina Holtz; STANGE, Carlos Eduardo Bittencourt. **The human reproductive system – school knowledge, sexuality and students' daily lives**. Educational Development Program – PDE - of the State Secretariat of Education – SEED, Superintendence of Education



DIESEL, A.; Santos Baldez, AL; Neumann Martins, S. The principles of active teaching methodologies: a theoretical approach. **Thema Magazine**, Pelotas, v. 14, n. 1, p. 268-288, 2017. DOI: 10.15536/thema.14.2017.268-288.404. Available at: <https://periodicos.ifsul.edu.br/index.php/thema/article/view/404>. Accessed on: December 28, 2024.

LEÃO, Denise Maria Maciel. Contemporary paradigms of education: traditional school and constructivist school. **Research notebooks**, n. 107, p. 187-206, 1999.

LUCAS, Larissa Fracalossi et al. The content of human reproduction in elementary education: perception of teachers and students and the use of different teaching resources. **Encitec Magazine**, v. 11, no. 3, p. 301-315, 2021.

MORÁN, José et al. Changing education with active methodologies. **Contemporary media collection. Media convergences, education and citizenship: young approaches**, v. 2, n. 1, p. 15-33, 2015.

NASCIMENTO, Tulliana Euzébio do; COUTINHO, Cadidja. Active learning methodologies and the teaching of Sciences. **Multiscience online**, v. 2, no. 3, p. 134-153, 2016.

NICOLA, Jéssica Anese; PANIZ, Catiane Mazocco. The importance of using different teaching resources in Science and Biology Teaching. **InFor**, v. 2, no. 1, p. 355-381, 2016.

OLIVEIRA, Neyla Cristiane Rodrigues de; Ribeiro, Karen Veloso; COMPAFNON, João Batista Rodrigues Cruz. LITERATURE REVIEW ON GAMIFICATION WITH A FOCUS ON TEACHING SCIENCE AND BIOLOGY. **Science and Biology Teaching in Focus**. 2023.

PAIVA, Marlla Rúbya Ferreira et al. Active teaching-learning methodologies: integrative review. **SANARE-Public Policy Journal**, v. 15, n. 2, 2016.

PEREIRA, Renata de Lima; SILVA, AG Criticism of the traditional expository methodology. **Proceedings I**, 2022.

PEREIRA, Rodrigo. Active method: techniques for problematizing reality applied to Basic Education and Higher Education. **VI International Colloquium. Education and Contemporaneity. São Cristóvão, SE**, v. 20, 2012.

VICENTE, Luciane da Silva. Sexual Education in the different versions of the National Common Curricular Base: From openness to silence around the topic. **Education in Review**, v. 40, 2024.