Teaching sensory perceptions: An investigative class

https://doi.org/10.56238/sevened2023.006-031

Eptácio Neco da Silva
Master in Biology Teaching
Piauí Federal Institute of Technology - São Raimundo Nonato Campus

Amanda Fernandes Leal
Master in Constitutional Law
FAESF - São Francisco College of Education

Antônio Celso da Silva Alves
Master in Biology Teaching
C. E. Maria da Conceição Teófilo Silva - SEDUC – MA

Wilton Linhares Teodoro
Master in Biology Teaching
EETI Monsenhor Aguiar - SEDUC – CE

Francisco Pereira de Brito
Master in Biology Teaching
Federal Institute of Technology of Piauí-Campus Campo Maior

Alvenisa Fernandes Costa Soares
Specialist in Higher Education Teaching and Hospital Administration
Municipal Health Foundation - Teresina – PI

Millena Raimunda Martins de Almeida Carvalho
Specialization in Professional Education
CEEPS Monsenhor José Luís Barbosa Cortez - SEDUC – PI

Antonia Nádia Viana Soares
Undergraduate student in Zoology
Federal University of Piauí - UFPI

Gualberto de Abreu Soares
Master in Biology Teaching
CEEPS Monsenhor José Luís Barbosa Cortez - SEDUC – PI

ABSTRACT
All sensory processes begin with stimuli, which represent a form of energy, and a sensory cell converts this energy into a change in the membrane potential, regulating the production of action potentials in the central nervous system, whose encoding results in sensation. The general objective of this work is to report an experience in the development of an investigative teaching sequence (CES) on sensory perception of sight and taste with students of the 3rd grade of high school. The SEI was developed in 4 classes, where each one lasted 50 minutes and the materials used were: notebook and cell phone, to enable remote activities; fruits, sugar, drinking water and a spoon for practical activities; pen and tape for identification of materials. And virtual resources were used, such as: google classroom, google meet, google forms. CES raised the following problem question: Can the taste of food be altered by the sense of sight? During the application of the Investigative Didactic Sequence, it was observed that in the beginning the students were not motivated and were even anxious, since they wanted the answers ready. However, the characteristics of teaching by investigation with the participation of students were observed, a participation that grew during the activities.

Keywords: Biology, Senses, Experimentation.

1 INTRODUCTION

The Nervous System directs the activity of the muscular system, thus providing locomotion and also controls the functions of various internal organs through the autonomic nervous system, allowing us to sense the internal and external environment and be intelligent people to obtain the most advantageous conditions for survival (HALL, 2012).

The Sensory System is often worked in a traditional way, and The teacher plays an essential role in introducing students to the particularities of the scientific community, helping them in the process of constructing meanings.(BARCELLOS; COELHO, 2019), which makes the investigative approach essential for the knowledge construction.

All sensory processes begin with stimuli, which represent a form of energy, and a sensory cell converts this energy into a change in the membrane potential, regulating the production of action potentials in the central nervous system, whose encoding results in sensation (REECE et al., 2015).

The brain's ability to process sensory information is more limited than the ability of its receptors to measure the environment, with attention being a kind of filter that works by selecting objects for further processing. Thus, in vision, for example, the process by which we select, organize and interpret stimuli, translating them into a meaningful and coherent image, is called perception – which can be influenced by a series of factors such as contrast, intensity, volume, movement, smell, among others (SILVA et al., 2019).

Knowledge of the functioning of the sense organs is of paramount importance for people's quality of life. For example: second Vilar et al., 2016, there is an increase in cases of myopia in children and young people, since they are exchanging the desktop computer for smartphones or tablets, making a visual effort to see so close, causing the ocular system to lose focus far more easily.

The olfactory epithelium is located in the roof of the nasal cavities, communicating posteriorly with the nasopharynx, which implies that odors can reach the olfactory bulb by inspiration through the nostril and also by the retronasal route during food ingestion (FRANCO, 2018), where we can observe that the perception of the taste of food can be altered by the sense of smell. In a recent study, Menni o.fl., 2020, demonstrated that in people with Covid 19, they had loss of smell and taste, fever and cough, which evidences the joint action of these two organs.

Second Borges; Damatta, 2016, in contemporary society, the rapid transformations that affect the world make us realize the technological advance in the means of information and communication and has been challenging the school to become more democratic and effective, which envisions the possibility of an education through teaching by inquiry.

Article 35 Inc. III of the Law of Guidelines and Bases of Education – LDB (BRAZIL, 1996), establishes as a purpose, the improvement of the high school student as a human person, including the ethical form and the development of intellectual autonomy and critical thinking. Faced with this requirement in the form of the Law, there is a need to change from traditional teaching methodologies to methodologies that provide students with the construction of knowledge and make it a leading role in the entire learning process.

The general objective of this paper is to report an experience in the development of an investigative teaching sequence (SEI) on sensory perception of sight and taste with students of the 3rd grade of high school.

2 METHODOLOGY

The present work follows a qualitative methodological approach of the experience report type. It was developed according to the principles exposed by Chizzotti (2003), where the qualitative approach involves a deep experience in the people, events and places that constitute the objects of study, seeking to extract from the experiences the real underlying meanings. In this context, the experience report corresponds to a one-on-one SEI on sensory perception of the senses: sight and taste developed with students of the 3rd grade of High School in a class of the Integrated Technical Course in Administration.

The SEI was developed in 4 classes, where each one lasted 50 minutes and the materials used were: notebook and cell phone, to enable remote activities; fruits, sugar, drinking water and a spoon to carry out practical activities; pen and tape to identify materials. And virtual resources were also used, such as: google *classroom, google* meet, google forms.

3 RESULTS

CES raised the following problem question: Can the taste of food be altered by the sense of sight? To answer this question, we proposed the following sequence, as described in chart 1.

Table 1 – Summary of the stages of the CES

Stage	Class	Theme/Concept	Description of the Activity
1	1	Problematization, motivation and hypothesis raising	Presentation of the problem situation: Can the taste of food be altered by the sense of sight?
			Optical Illusion Image Observation (Appendix A) Observation of Food/Fruit Images (Appendix B)
			Hypothesis raising of the answers to the problem question.
			Guidance for students to conduct research on the topic in question
2	2	Hands-on activity	Orientation for the practice "Between taste and sight"
3	3	Data analysis	Compare the observations made with the hypotheses raised.
4	4	Socialization of results/evaluation	Presentation of the results of the group discussions and evaluation on the topic and methodology.

Source: Author Himself

3.1 DESCRIPTION OF THE STEPS

3.1.1 Step 1 – Problematization, motivation and hypothesis raising

This step will be developed in a 40-minute class, using the google meet tool. In this lesson, the following problem question will be raised: Can the taste of food be altered by the sense of sight?

The following guiding questions will also be raised:

- What happens to the sense of taste when we get a cold? How can it be explained?
- A young man and his girlfriend were having problems with their eyesight and were unable to read a recently published article about covid 19. The young man, when reading the article, had to move his vision closer to the pages to see more clearly, while his girlfriend needed to move the pages away from the article. Possibly what vision problems the couple was experiencing? How To Fix Couple's Vision Problem?
- Is the camera the same as the eye, or is the eye the same as the camera?

The optical illusion picture frame and the food picture frame, Appendices A and B, respectively, will be shown. The images will be made available to students via whatsapp.

Students will be divided into groups of up to 05 components, which will discuss with the teacher's intermediation, via whatsapp, to raise hypotheses to try to answer the question presented. The groups will be identified by the letters A, B, C, and so on. A general whatsapp group will be created, containing sub-groups A,B,C, etc.

Also at this stage, students will be guided to carry out research on the subject.

3.1.2 Step 2 – Practical Activity

Groups of students will be guided to carry out the practical activity "Between taste and sight". Each group of students will do this activity in their residence and will have their family members as volunteers. The idea is that the students can ask questions with the volunteers, after tasting the juices and observing images referring to the juices produced. In this way, the students will induce the volunteers to think about drinking a juice from a fruit, where they will actually taste the juice of another fruit. In this activity, the sense of sight and taste should be stimulated.

3.1.2.1 This activity will be as follows:

At home, the student will make two fruit juices, having two options for this:

Option 1 – Acerola juice A and guava juice B;

Option 2 – Mango juice A and cajá juice B.

The members of the house will volunteer to taste the juices, which should be made available randomly. For example, if the student has opted for option 1, then he can offer juice A to his father and brother and juice B to his mother and sister.

The methodology for distributing the juices will be at the discretion of the groups.

The juices should be offered in glasses that will be pre-identified with an adhesive tape as follows:

Option 1: Acerola juice A pre-identified with an adhesive tape containing the name guava juice.

Option 1: Guava juice B pre-identified with an adhesive tape containing the name acerola juice

Option 2: Mango juice A pre-identified with an adhesive tape containing the name cajá juice.

Option 2: Pre-identified cajá juice B with an adhesive tape containing the name mango juice.

First, the student shows a picture of Appendix B, and then they offer a glass of juice of one of the flavors. The glass should contain the name of the juice corresponding to the image observed, however, containing a juice of another flavor.

After completing the practice, students must answer the following questions:

a) Was there a difference in the perception of flavors?

b) How did the volunteers feel when they did the tasting?

c) Was there a prevalence of any of the sense organs?

All stages of the practical activity must be recorded through photos and/or videos, so participants must sign the term of use of image (Appendix C).

The material produced will be made available on the Google classroom platform.

3.1.3 Step 3 – Data analysis

The groups of students will analyze the data collected in the practical activity and in the research to resume the discussion with the teacher's mediation, on the problem issue, comparing the information carried out with the hypotheses raised.

3.1.4 Step 4 – Socialization of results/evaluation

The groups will socialize the results obtained and then answer the QAM evaluative questionnaire (Appendix D), consisting of 05 (five) questions related to the theme of Vision and Taste and 05 (five) questions about the applied methodology. The questionnaire will be made available through google forms.

4 DISCUSSION

The SEI was planned for a total of 04 classes of 50 minutes, carried out remotely and organized in 04 stages that demonstrate the actions carried out with an investigative bias and the participation of 22 students.

4.1 PROBLEMATIZATION, MOTIVATION AND HYPOTHESIS RAISING

In this first stage, we talked about teaching by inquiry, and the following problem situation was raised: **Can the taste of food be altered by the sense of sight?** The students were instructed to try to respond to this situation, only with empirical knowledge, emphasizing that this moment would be the moment of raising hypotheses. The online platform used was Google Meet and the descriptions of the students' and teachers' speeches, made in the chat or orally, are typified in table 1, demonstrating that empirical knowledge would be insufficient to respond to the problem situation. In all discursive interactions, fictitious character names were used to preserve the identity of the students.

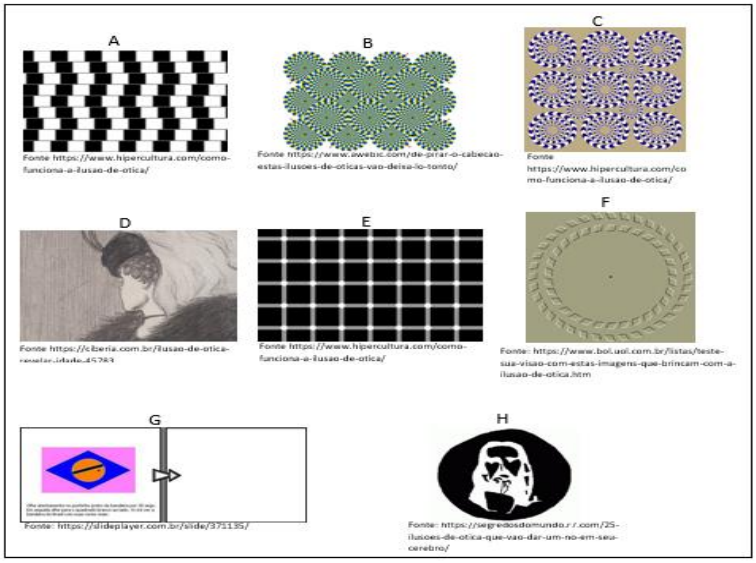
Table 1 – Discursive interactions: hypothesis raising

ACTORS	TALK
Professor	Can the taste of food be altered by the sense of sight?
A1	I never paid attention to it
A2	Not sight, but smell helps a lot
Professor	Why Batman?
A2	I think by feeling if it smells good or not
A3	It's the influence of smell
Professor	Folks, but the problem situation is: Can the taste of food be altered by the sense of sight?
A4	Yes, my father always says that you eat first with your eyes, when the food is pleasing to the eye it becomes easier to enjoy.
A5	Olfactory memory?
A1	I think smell and appearance send different commands to the brain
Professor	What command would these Wonder Woman be?
Class	Total silence
Professor	Guys, any more opinions?

Source: Author Himself

At first, the students were afraid to speak up, so there was a need to motivate them. Second Paim and Saints (2018), above the teaching practice itself, the student's motivation is of paramount importance for learning, which is the teacher's responsibility. In this context, the figures in chart 1 – Optical illusions were presented to the students, whose main objective, in addition to motivation, was to demonstrate that the perceptions of what we see can be modified. The figures were presented, one by one, through Power Point.

Table 1 – Optical illusions



The images in Chart 1 were interpreted as follows:

Figure A represents an optical illusion in which we see non-parallel lines, where in fact, all the lines are parallel.

Figures B and C are static, but when you look at them, you can see movements.

Figure D either shows the image of an old woman, or the image of a beautiful girl.

In figure E you can see little black dots flashing, but in fact these little black dots are part of the optical illusion.

In figure F there are two motionless wheels, but when the vision is concentrated on the central point, the wheels begin to rotate in opposite directions.

Figure G shows the Brazilian flag in different colors. When you focus your gaze on the black dot in the center of the flag for a period of 30 seconds, and then look away from the whiteboard located on the right side of the picture, you can see the Brazilian flag in its real colors.

In figure H, when you stare at the 4 dots right in the center for a period of 30 seconds, and then close your eyes, turn your head to the wall and open them again, you will see the supposed image of Christ.

The results of the discursive interactions presented in chart 1 are shown in table 1 below, showing that motivation provoked greater student participation.

Table 2 – Discursive interactions of optical illusions

ACTORS	TALK
Professor	In figure A, are the lines parallel or not?
A5	They're crooked.
Professor	Has anyone else seen a crooked image?
A6	I also saw a crooked image
A2	And so do I
Professor	Guys, this is optical illusion, all the lines are parallel. For you to realize how images can be formed with the information that the brain receives.
Professor	Look at figure B, is there anything moving?
A3	It's all moving
A7	Optical illusion, right, professor?
Professor	Look at figure C, is it moving?
A5	No, it's not moving.
Professor	Storm, bring your view closer to the image and then move away
A5	Now it's stirred!
A7	When you stare at just one, the others rotate and when you look from afar they all rotate.
Class	Kkkkkkkk
Professor	What image are you seeing in figure D?
A2	From one perspective, you're an old lady and from another a woman with her back turned?
Students	Kkkkkkk
Professor	In picture E is there a black ball in the middle? Can you see it?
A4	I can see it moving, it feels like it's on one side
Professor	Now he looks at the little ball in the center and moves his head back and forth
A8	Shook it all up
Professor	Fix your gaze for 30 seconds on the dot in the center and then look at the frame on the side and you should see the Brazilian flag in real colors.
A7	Wow!
A4	I was able to see the actual colors of the flag! What a dough!
Professor	Fix your gaze for 30 seconds on the four dots in the center of the image, then close your eyes, turn your head to the side and open your eyes again.
A5	I saw the image of Christ**!**

Source: Author Himself

Motivation allowed for a more effective participation in the discussions on the raising of hypotheses of the guiding questions (P1, P2, P3), highlighted in table 3 below.

The statements of the guiding questions P1 and P3 do not clearly portray a scientific language, such as, respectively, A1, A2, A3, A5, A7 and A1, A2 and A11.

Second Porto and Cunha (2016), the use of investigative activities enables the discussion of social problems experienced by students, in which the answers obtained in this process will serve as a subsidy for a transformation of reality. Thus, in the survey of hypotheses of the guiding question P2, there is a greater proximity between empirical knowledge and scientific knowledge, because it is precisely this problem well experienced by the students, as can be seen in the statements A1, A5, A8, A9, A10, A11.

Table 3 – Discursive interactions

ACTORS	TALK
P1	**What happens to the sense of taste when we have a cold? How can this be explained?**
A1	Food loses its taste.
A7	The person's sense of taste can no longer identify the taste of the food.
A5	The sense of smell makes it more difficult when we lose the sense of smell
Professor	How could you explain this?
A2	Taste palettes are left without function.
A3	The cold interferes with the senses.
Professor	In what way does it interfere?
A1	It kind of proves that these senses are connected in some way.
Professor	Anyone else to talk about?
Class	Silencio total
P2	**I'm going to ask one more question: - A young man and his girlfriend had problems with their eyesight and couldn't read a recently published article about covid 19. The young man, when reading the article, had to move his vision closer to the pages to see more clearly, while his girlfriend needed to move the pages away from the article. Possibly what vision problems the couple was experiencing? How To Fix Couple's Vision Problem?**
A1	Myopia and Hyperopia
A2	Myopia and Astigmatism
A9	Myopia and Astigmatism
A5	Myopia
A10	Astigmatism and myopia
A2	Astigmatism is a close up problem (I suffer from it)
A1	Astigmatism isn't exactly that
Professor	And what is Astigmatism?
A11	Those of you who have vision problems are already aware of the subject.
Professor	Would anyone know how to fix the couple's vision problem?
A11	In the case of their lenses, one would be for near and the other for far away, wouldn't it?
A8	In my opinion the lens is divergent, I think so.
P3	**Is camera the same as eye? Or is the eye the same as the camera?**
A1	I think the eye is the same as the camera.
Professor	Why?
A11	The camera is the same as the eye, isn't it, teacher?
Professor	Why do you think that?
A11	Because the eye was made by God, then the scientists made the camera and had to study the eye to create the camera
Professor	But what's in the camera for you to say is equal to the eye or what's in the eye to say it's equal to the camera?
A2	I don't think we have the ability to capture, to take pictures from the eye
A11	But the agent keeps in our memory what we see, not everything, but the camera doesn't take everything away either, it takes away what we want.

Source: Author Himself

4.2 STEP 2 – PRACTICAL ACTIVITY

At this stage, the discussion on the raising of hypotheses was resumed, and in the previous class it was instructed that the students meet in groups to debate among themselves, and raise the hypotheses about the questions presented.

The new discursive interactions were shown in Table 1, presenting the speeches of the representatives of the groups formed. At first, there was little interaction from the students, as shown in table 1 below:

Table 1 – New discursive interactions – hypothesis raising

ACTORS	TALK
Professor	Can the taste of food be altered by the sense of sight?
A9	I think it influences a lot, because the way we see the food helps a lot, for example: just seeing something sour, like a lemon, we kind of taste it.
Professor	Anyone else want to make any placements?
A11	Our senses are intertwined
A2	Yes, as another sense is an important factor for tasting, our brain already uses other senses for this, so vision would not be something dispensable.
Professor	A9, why do you think that when you see the lemon we already taste it?
A2	Because of taste memory. Like, you taste a food once and then you'll remember how it tastes.

Source: Author Himself

As a form of motivation, chart 1 below was shown:

Table 1 - Fruits

It was found that the intervention of the teacher as a mediator was very important for the active participation of the students, which can be seen in the continuation of table 1 below. Second Ferraz and Sasseron (2017), the active posture of the teacher in the context of investigations and argumentation in order to mediate knowledge to their students, can promote the development of skills typical of scientific culture.

Table 1. Continuation

ACTORS	TALK
Professor	Imagine looking at the shiny apple, giving the impression that it is very sweet. Could it be that if I eat this apple and it's not so sweet, but because I look at the image of it and think it's sweet, will I feel it less sour?
A1	I don't think so, when my mother buys some very beautiful grapes, we think it's very sweet, but sometimes it tastes sour, it's horrible.
A11	With fruit not so much, but it happened, for example, with coxinha, I looked at it and thought that the coxinha is good, then I eat it and it's not all that, but because I looked at it and it's so beautiful, then I eat it and I think it changes the taste for the better.
Professor	Would the emotional state play a role?
A11	Yes, teacher, these days my mother made a very beautiful pasta, and before finishing it I tried it and it was very tasty. So I asked my dad to let me go for a walk and he wouldn't let me. I was so sad that the pasta lost its taste for me.
Professor	What happens to the sense of taste when we get a cold? How can it be explained?
A2	Agent reached a consensus in the group, when a cold the sense of smell is obstructed and we cannot taste with the taste buds. Our body is, quote-unquote, disoriented, not knowing the true taste.
Professor	Disoriented how?
A2	When we don't smell it, it tastes different
A1	It's as if when you have a stuffy nose, the part of you that tastes it kind of goes off.

Professor	I'll ask the other question: - A young man and his girlfriend had problems with their eyesight and couldn't read a recently published article about covid 19. The young man, when reading the article, had to move his vision closer to the pages to see more clearly, while his girlfriend needed to move the pages away from the article. Possibly what vision problems the couple was experiencing? How To Fix Couple's Vision Problem?
A8	My father has myopia and then he has to get very close to be able to see.
A1	Me too, I have a very high degree of myopia. If I take off my glasses, I can't see a foot in front of me.
Professor	A1, Do you know what is your vision problem?
A1	I have myopia and astigmatism and astigmatism, but I don't know what astigmatism is.
A12	My vision problem runs in the family, I started with a small degree and it's increasing.
Professor	Would you be able to explain why the degree increased over time?
A1	Cell phone use impairs eyesight
A13	My mom says it's because I face the screen of the cell phone, so it damages my vision lol

Source: Author Himself

Also at this stage, the students were instructed to carry out the practical activity "between taste and vision". The practical activity was carried out in a group, where representatives of the group did practical activities with the participation of family members.

4.3 STEP 3 – DATA ANALYSIS OF THE PRACTICAL ACTIVITY

In this class, the practical activity developed by the groups was discussed. In short, the practical activity consisted of observing the image of a fruit and drinking a juice of another fruit of a similar color and answering the questions:

Question A: Was there a difference in the perception of flavors?

Question B: What is the feeling of the volunteers when doing the tasting?

Question C: Was there a prevalence of any of the sense organs?

The groups forwarded the reports, whose questions were tabulated in chart 1, below:

Chart 1 – results of the practical activity carried out by students

GROUP	**Was there a difference in the perception of flavors? The**	**How did the volunteers feel when they did the tasting?** B	**Was there a prevalence of any of the sense organs?** C	Age of volunteers (in years)	Degree of kinship
1	YES	Apparently, the volunteers did not let themselves be carried away by the name of the juice in each glass, since the texture and color of the juices were visible	Sight and Smell	38	Mother
2	NO	They were curious	Vision	32	Not informed
3	NO	She was confused	Taste	Not informed	Mother and brother
4	YES	Confusion, he found it a strange taste. He was startled.	Vision	Not informed	Father and sister
5	No	Amazement	Taste	Not informed	Mother and brother

Source: Author Himself

The results show that vision influenced the perception of taste in groups 1 and 4, and did not influence groups 1, 3 and 5, which served as support for the conclusion of the initial problem question. In addition, the participation of family members during the practical activity contributed significantly to the conclusion of the hypotheses raised, thus demonstrating the investigative character of the CES. Figures 1 and 2 below reveal the moment of participation of family members in the practical activity. The dissemination of the images was previously authorized by the authors.

Figure 1. – Father and sister of student A4. The father observes the image of the guava figure and drinks acerola juice. She observes the image of acerola and drinks guava juice.

Source: A4 Student

Figure 2 – Mother and brother of student A8. The same procedure was performed with regard to the limbs in figure 1.

Source: Student A9

4.4 STAGE 4 – SOCIALIZATION OF RESULTS/EVALUATION

The discussions were resumed, where new discursive interactions are reported in table 1.

Table 1 - Resumption of discussions

ACTORS	TALK
Professor	Can the taste of food be altered by the sense of sight?
A4	Taste is not only perceived by the taste buds, but also by the other senses, including sight. Vision is responsible for forming the image of the food, which will go to the brain, which activates the memory about a certain flavor, helping in its perception.
Professor	What happens to the sense of taste when we have a cold? How can it be explained?
A4	We don't feel the flavors because smell is our body's most sensitive sense
A1	Smell and taste are intertwined. They are the two that make the agent feel the taste of food.
A9	Agent researched and saw that it influences a lot, because approximately 80% of the perception of the taste of food is caused by smell
A1	Taste and smell are intertwined because their innervation is so close and sensitive.
Professor	On the question of vision, why do we need to move our vision closer or farther away to see better?
A4	The boy probably has myopia and astigmatism, because he can't see things that are far away (myopia) and has blurry vision (astigmatism). His girlfriend, on the other hand, is farsighted due to difficulty seeing up close.
Professor	Is the camera the same as the eye or is the eye the same as the camera?

A9	The chamber is an enhancement of the eye. The camera has the focus. But the eye has parts that the camera doesn't. Iris, Crystalline Vitreous Humor, etc.

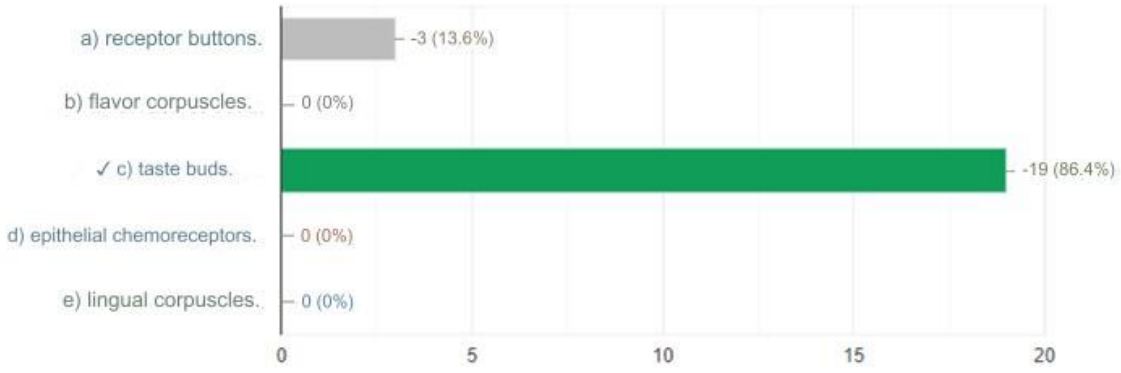
Source: Author Himself

Table 1 – resumption of discussions shows that the students increased the repertoire of technical words, characterizing the development of scientific literacy and demonstrating that there was construction, in addition to the socialization of knowledge.

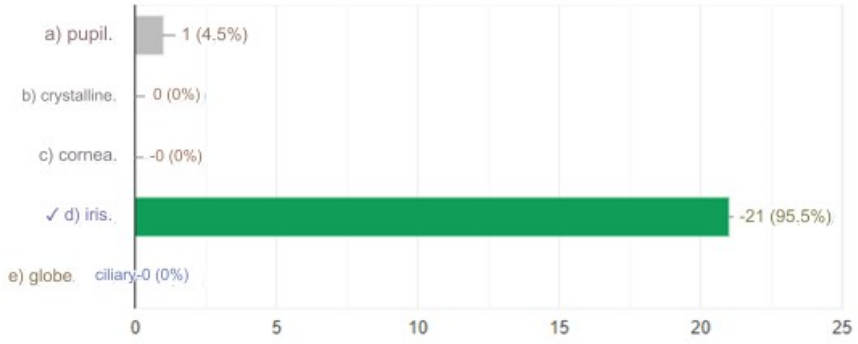
An evaluative questionnaire was applied containing the first 5 objective questions about sight and taste, followed by another 5 objective questions about the applied methodology. The questionnaire was applied through Google Forms, with the participation of 22 students.

The percentage values of the first 5 questions of the evaluative questionnaire with the lowest correct answers and with the highest correct answers ranged from 72.7% (Graph 4) and 100% (Graph 3), respectively.

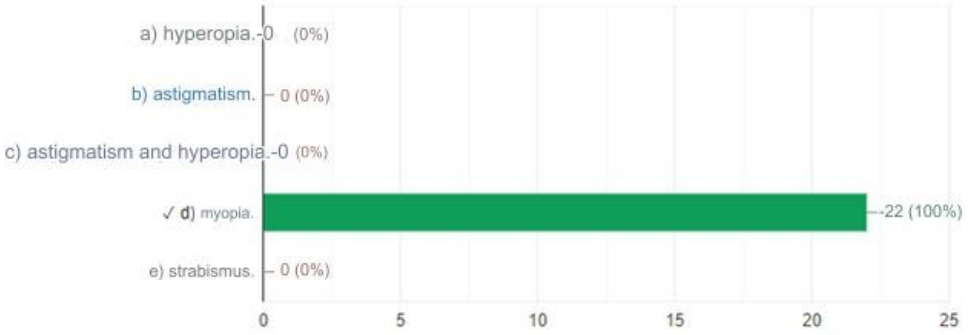
Graph 1 – 1) During food, we are always concerned with the taste of a certain food. If we don't like the taste, we probably don't ingest it. To taste food, we rely on sensory cells located in the mouth that are grouped in small elevations called: Number of answers: 19 / 22 correct answers.



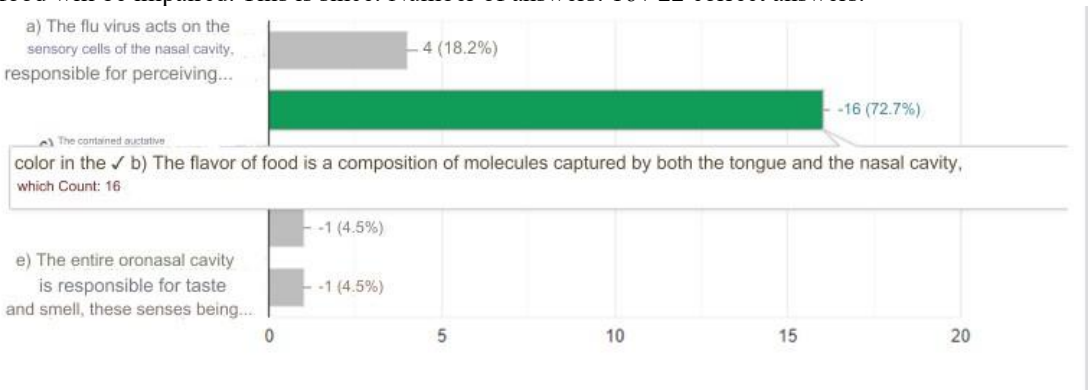
Graph 2 - 2nd) (UFF-RJ) When the "color of the eyes" of a person is mentioned, it refers to the color of the structure of the eyeball called:. Number of answers: 21 / 22 correct answers.



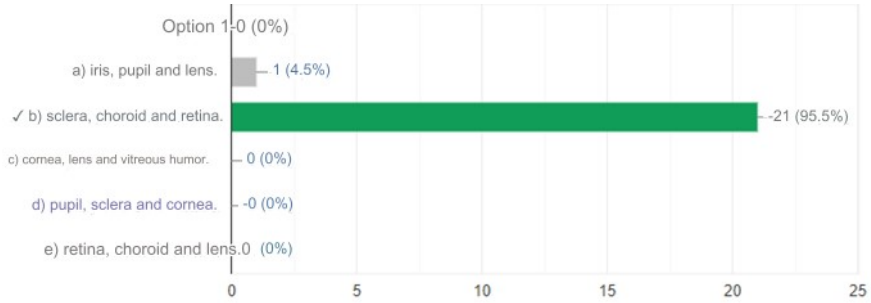
Graph 3 - 3) The human eye may present an alteration that consists of an elongation of the eyeball. In this case, there is a separation of the retina from the lens, causing the image to be formed before the retina, making it unclear. The individual with this disorder has great difficulty seeing distant objects. This change is represented in the figure: Number of answers: 22 / 22 correct answers.



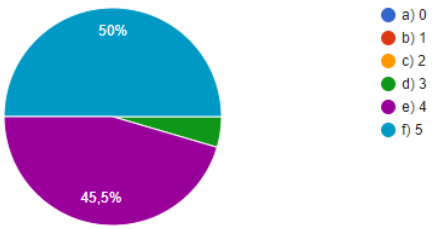
Graph 4 - A taster should not perform his work when he has the flu, because his perception to classify the aromas and flavors of food will be impaired. This is since: Number of answers: 16 / 22 correct answers.



Graph 5 - 5) The bulb of the eye, embedded in a bony cavity called the orbit, is made up of transparent membranes and media. The membranes are: Number of answers: 21 / 22 correct answers.

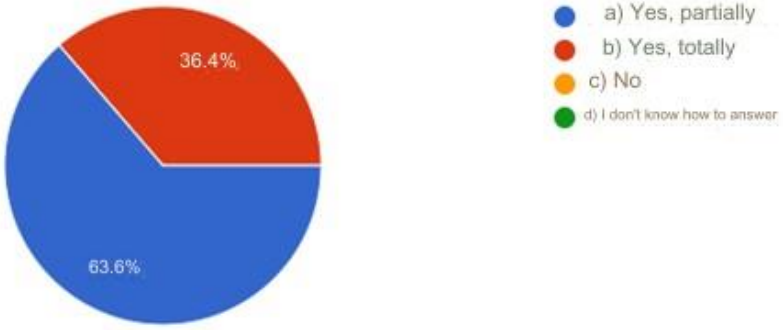


Graph 6 - 6th) On a scale of 0 to 5 where zero is terrible and 5 is great, what grade would you give to the methodology of Teaching by Inquiry? Number of responses: 22 responses.



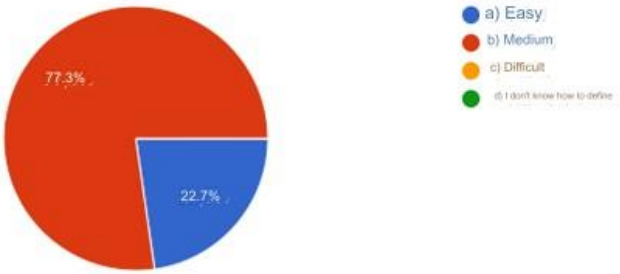
Graph 6 revealed that there was a high rate of acceptance of Teaching by Research, with higher percentages of positive grades from 4 to 5, with 5 being the maximum grade.

Graph 7 - 7) Did Inquiry-based Teaching provide learning? Number of responses: 22 responses.



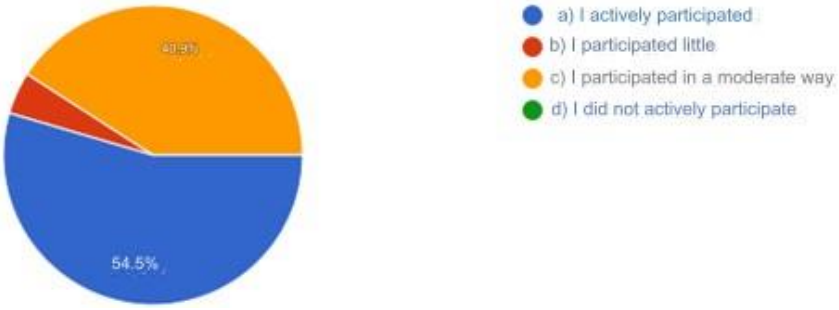
Graph 7 revealed that for 36.4% of the interviewees there was total learning, and for 63.6% there was partial learning, which presupposes significant learning.

Graph 8 - 8th) Did you find the methodology of Teaching by Inquiry: Number of responses: 22 responses.



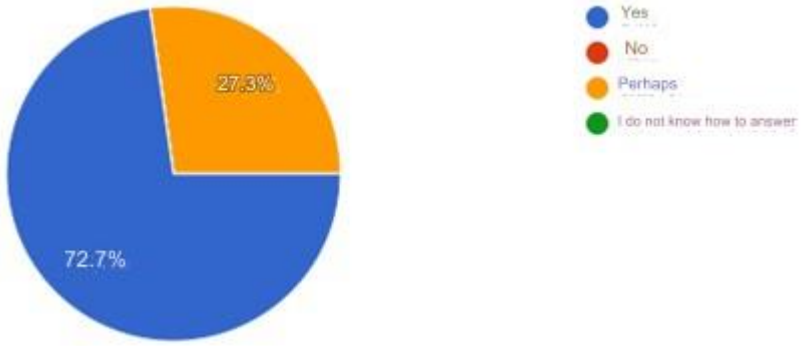
For the interviewees, the methodology applied was between medium and easy, which instigates us to provide, even more, teaching by inquiry.

Graph 9 - 9º) How would you classify your participation in the activities developed in Teaching by Inquiry? Number of responses: 22 responses.



Graph 9 revealed that there was active participation on the part of many of the students, which is attributed to the methodology applied and the moments of motivation and intermediation of the teacher.

Graph 10 - 10º) Would you be interested in participating in other classes using the methodology of teaching by inquiry? Number of responses: 22 responses.



Graph 10 revealed that there is student interest in teaching by inquiry, which drives us to provide more of this type of methodology.

5 FINAL THOUGHTS

During the application of the Investigative Didactic Sequence, it was observed that in the beginning the students were not motivated and were even anxious, since they wanted the answers ready. However, the characteristics of teaching by investigation with the participation of students were observed, a participation that grew during the activities.

The evaluative research, carried out through the *google forms* questionnaire, revealed that there was learning, in addition to the students' interest in this type of investigative methodology, which is assumed that this didactic sequence can be applied by other teachers, and disseminated as a form of teaching in which the construction of knowledge by the student occurs.

REFERENCES

BARCELLOS, L. DA S.; COELHO, G. R. Uma análise das interações discursivas em uma aula ivestigativa de Ciências nos anos iniciais do Ensino Fundamental sobre Medidas Protetivas Contra a Exposição ao Sol. Investigacoes em Ensino de Ciencias, v. 24, n. 1, p. 179–199, 2019.

BORGES, D. S. L. B.; DAMATTA, R. A. Entre Letras e Sons: Paródia Musicalizada, A música como um Gênero Textual Promotor de Aprendizagem de Ciências. Revista Philollogus. Anais...Rio de Janeiro: Anais da XI JNLFLP, 2016.

BRASIL, M. DA E. LDB : Lei de diretrizes e bases da educação nacional. [s.l: s.n.].

CARDOSO, M. J. C.; SCARPA, D. L. Diagnóstico de Elementos do Ensino de Ciências por Investigação (DEEnCI): Uma Ferramenta de Análise de Propostas de Ensino Investigativas. Revista Brasileira de Pesquisa em Educação em Ciências, v. 18, n. 3, p. 1025–1059, 2018.

CHIZZOTTI, A. A pesquisa qualitativa em Ciências Humanas e Sociais: Evolução e desafios.Revista Portuguesa de Educação, 16(2), 221-236, (2003).

FRANCO, A. L. DE A. L. F. Correlação dos sentidos do olfato e paladar entre si e com comportamentos sociais. [s.l.] Faculdade de Medicina Lisboa, 2018.

HALL, J. E. Guyton & Hall Fundamentos de Fisiologia. 12. ed. Rio de Janeiro: [s.n.].

MENNI, C. et al. Loss of smell and taste in combination with other symptoms is a strong predictor of COVID-19 infection. medRxiv, p. 2020.04.05.20048421, 2020.

PAIM, M. R.; SANTI, N. R. O USO DE PARÓDIAS COMO FERRAMENTA DIDÁTICA PARA O ENSINO DE CIÊNCIAS / BIOLOGIA. Revista Eletrônica Sala de Aula em Foco, v. 7, n. 2, p. 107–115, 2018.

PORTO, M. D.; CUNHA, H. O ensino de ciências por investigação. [s.l: s.n.].

REECE, J. B. et al. Biologia de Campbell. 10o ed. Porto Alegre: Artmed, 2015.

SILVA, K. B. DA et al. Neurobiologia da Visão e da Ilusão de Ótica. n. 24, p. 1–17, 2019.

VILAR, M. M. C. et al. Aumento da prevalência de miopia em um serviço oftalmológico de referência em Goiânia - Goiás. Revista Brasileira de Oftalmologia, v. 75, n. 5, p. 356–359, 2016.