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The Interactive Classroom Methods for science classes

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Abstract

Interactive methods are good resources to make students reason and think because they improve open analysis and hypotheses and develop divergent thinking in Science, Technology, Engineering, Mathematics, Computer Science subjects. The aim: for students to build knowledge from intersubjective relationships by studying and working autonomously; develop the ability for self-learning and publicize trends of perspective development with new methodologies so teachers and students can enrich themselves with these experiences.

The appropriate use of interactive methodologies contributes to a higher level of work from the teacher, through them it discovers attitudes and capacities of his students, their willingness to work and curiosity for research. And at the same time, students can work in a more practical way the contents and acquire training and information for later use in the mentioned subjects. This improves the approval rate by 10%.

Keywords: *Teaching-learning experiences; methodologies; interaction; learning.*

1. Why use Interactive Methods?

The incorporation of computer science and computers into classes as in homes forces Education teachers to reconsider how to teach today and which methodologies use in classrooms to teach not only computer science but to generate disciplines known as STEMC (science, technology, engineering, mathematics and computer science) to promote the development of constructive thinking. Information and computer technologies facilitate a new possibility for teachers to offer students a more personalized, balanced, varied and flexible attention to work and teach by favoring the teaching-learning process.

Interactive methods are a good resource for making students reason and think because they favor open analysis and hypotheses and develop divergent thinking in subjects mentioned for both educational computing and computer science teaching.

What we aim to do is to make known both methodological tools and their use to process information and carry out research projects, solve problems, work cooperatively... to promote the development of students' skills. Integrated classes (computer media tenure and their use in union of interactive teaching methodologies) achieve a greater number of educational and teaching objectives.

The interactivity of these methods is based on actions and functions that are exercised on a reciprocal basis in the teaching-learning process between teachers and students, and in these proposed methods the student will be in charge of searching for the contents that will make up the topic or unit raised by the teacher, using and analyzing techniques and new technologies. Students become the center element of the activity and must organize and work collaboratively and make decisions. Teachers oversee errors, help and facilitate in the learning process and in the construction of knowledge. It is the unity of instruction and education, the union of the school with the life and systematization of teaching. The teacher designs the teaching situation (case, problem, simulation, etc.) Its functions focus on the following aspects:

1. Present the task and give clear instructions on how to perform it; facilitates conditions, provokes and organizes situations, space and materials. The teaching process is an intercom process.

2. Negotiate the work process, the objective and the composition of the group, provide information and resources to achieve them, respond to queries, correct errors.

3. Deploys actions and stimulates the exchange of explanations and justifications in the realization of a task, so that the student understands the logic of the contents in the work sequence and in the evaluation of results.

4. Seeks to ensure the success of the weakest components and basic learning objectives and to develop knowledge and learn to think and act in their own style.

2. What are Interactive Methods for?

To deal with real problems or practical situations involving control of skills like those to be handled by a science professional, computer science... Critical thinking skills are worked: generating ideas, solving problems, developing hypotheses, verifying them, making decisions, etc. And interpersonal and teamwork skills are developed, alongside with the communication to search for information, select it, argue, use specialized languages, etc. The general objectives to be achieved with these methodologies are:

- Make students learn among themselves by studying and working autonomously.
- Develop self-learning capacity
- To publicize trends of perspective development with new methodologies which help teachers and students enrich themselves with these experiences.

3. How students learn when using Interactive Methods

+ Students analyze demand, think, organize, search for information, work as a team and make decisions, and teachers help and facilitate their learning building process.
+ With these methods the interaction occurs between peers when they cooperate to do a common task by helping and receiving help, i.e. with reciprocity.
+ When working in a work group, different points of view are expressed, ideas are contrasted, and possible solutions or alternatives are developed together creating enriching situations to advance and learn.
+ When a group helps a partner not miss time, it is learning because it improves one's understanding and mastery of the subject and communication skills

4. Guidance for using Interactive Methods

- Few students in the group: interdependence and collaboration to learn and help how to learn. Randomly formed, by list order, depending on the proposed task, etc.
- Group heterogeneity: to achieve learning by interaction. They should be aware of the cooperation that this task requires and the advantages of carrying out group work.
- Good organization of work: help groups adopt a management style to build the learnings and decide how to work by seeking the exchanges of ideas, etc.

- Responsible for functions as spokesperson, secretary, responsible for the material, etc. on a rotating basis.

At the same time, techniques such as:

- Use new technologies: propose interaction activities and ask for clarification when students intervene.
- Deepening for reasons. And answer the questions with other questions.
- Interpret data, give examples, make clarifications, summarize, ...
- Make brief exhibitions to present concepts or techniques.
- Use concept simulation techniques in science.

The various interactive methods have many elements in common and it is not always easy to narrow the difference. Its implementation usually requires students to:

- Use strategies to process information from oral exposures, written texts, graphic material, iconic or statistical material.
- Develop participatory, descriptive, explanatory and argumentative materials.
- Interact in class from assumptions, exercises and verification and acting activities.

The following is a series of Interactive Methods to be used in Science, Technology, Engineering, Mathematics, Computer Science.

5. The Case Method

Proposes conjectures and seeks solutions, example of environmental issues.

5.1. What is it?

It is the description of a specific situation that brings a specific reality closer to a group of people in training. An initial analysis of the case is performed in a group, with a teacher-oriented work script to interpret and clarify. And then define the problems, reach conclusions about the actions to take, search and analyze information, contrast ideas, defend them with arguments and make decisions.

5.2. Features

- The situation presented must be real or appear to be, because it is logical and admissible.
- It must be relevant to students, so that they can be involved in their resolution.
- It must be unresolved, as students must generate hypotheses, contrast, make guesses, complete knowledge and seek solutions and alternatives.
- It should not have a single solution as the discrepancy must have a space.

- The decision to be made must be argued.

5.3. What is favored?

- The ability to analyze and train in real case resolution with functional learning.
- Intrinsic motivation for learning and developing communicative skills.
- The possibility to experience an authentic assessment linked to real events.

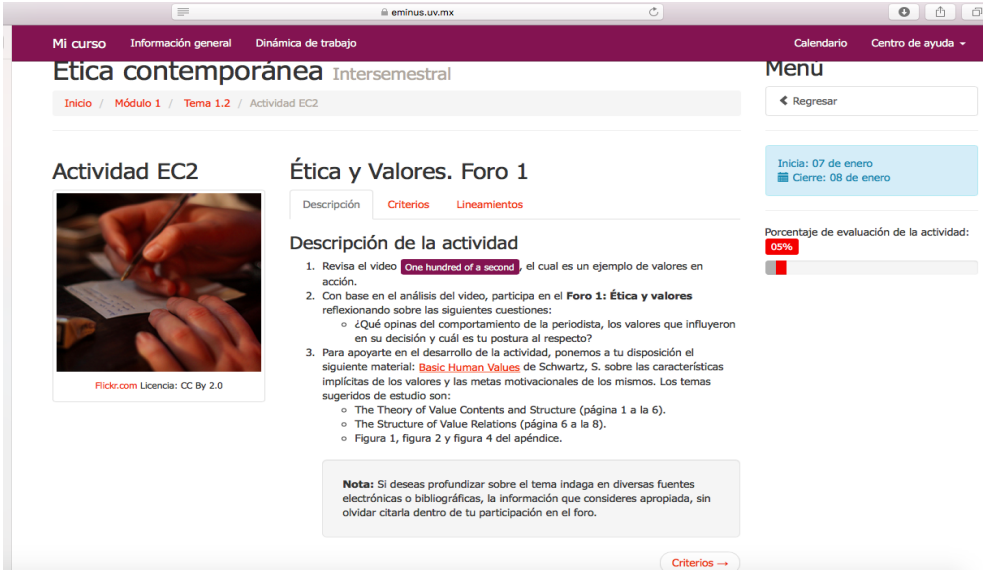

Figure 1. Example of this method in a virtual course at the University of Veracruzana

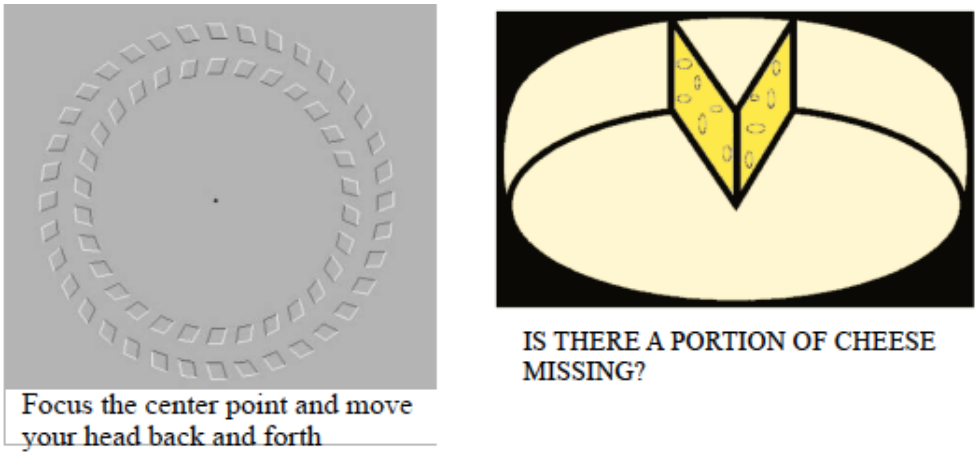

Figure 2. Interaction activity to advising vision concepts to the case method.

6. The chain of questions

Emphasizes analysis of a hypothesis promoting memory capacity. For example, in the use of computer applications, human biology...

6.1. What is it?

It is a structure suitable for reviewing any subject worked and preparing the exam. For about three minutes each team thinks of a question about the topic that will be raised to the team next to them, following an order.

6.2. Features

Questions are asked about fundamental issues (which might be on an exam) worked in the class to help the other teams. Four-component teams are organized. It starts by giving to all teams 3 minutes to search for a question.

After three minutes, one team's speaker asks the next team, who answers it, and then the team's speaker asks the next one, and so on until the last team asks the question to the first team that has started. There are two speakers per team: to ask the question they have thought between everyone and to give the answer. You can make the rounds you want.

7. The Puzzle

It favors the proposal of hypotheses and the interrelationship of different solutions individually to find and verify the right thesis and solution.

7.1. What is it?

This technique is especially useful for areas of knowledge where content is likely to be "fragmented" in different parts (e.g. experimental, technological, sciences). All students need each other and are "forced" to cooperate, because each of them has only one piece of work to be done and their teammates have the others, essential to successfully complete the proposed task: the global mastery of a subject under consideration.

7.2. Features?

The material under study is split into as many parts as members the team has, so each of its members receives a piece of the information on the subject that all the teams are studying, and does not receive the information of the others teammates. The student should prepare his own dossier with the information given to him by the teacher or that he has been able to search for.

Then, with the members of the other teams that have studied the same sub-item, they form a "group of experts", where they exchange information, delve into key concepts, build schemas and conceptual maps, clarify the doubts raised, etc.; we could say that they become experts in their section. Each of them then returns to their home team and is responsible for explaining to the group the part he has prepared.

8. The Projects

They promote global and multidisciplinary studies by applying them to detailed research plans to develop apps or green apps.

8.1. What are they?

His idea is that learning involves direct contact with the object of study through a planned task, carrying out activities, resources and skills that culminate in results performing work, with proposals or an exhibition, of an object, etc.

8.2. Features

It works on real problems and engages in various disciplines. It requires understanding the task, planning, searching for various sources of information, teamwork and the realization of the project.

They allow to globalize contents. Students carry the incitement, work autonomously with the help of the teacher who provides them with resources and collaborates with them. The activities to be carried out, the documentation to be delivered, deadlines and evaluation criteria must be defined.

8.3. What do they favor?

- Learn to make your own decisions and act independently.
- Improves the motivation to learn because it relies on experience and allows you to apply what you have previously learned to specific situations.
- Strengthens students' self-confidence and encourages research learning.

Example of collaborative research project on primates, involved: team formation, dossier concreteness, use of tics; involved the organization and planning of tasks of two groups at the international level for the production of the project and its exhibition.

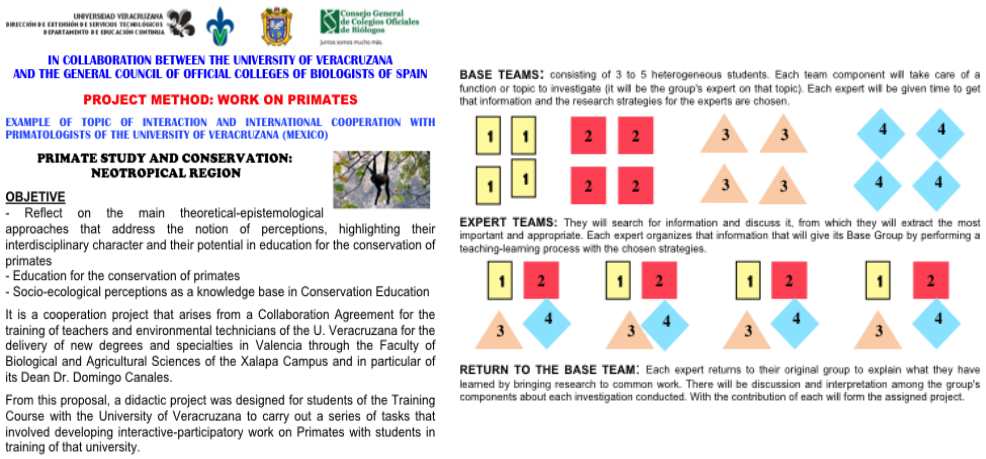

Figure 3. Example of work using project methodology. And example of the puzzle method that pleases hypotheses and solutions

9. Simulations

Emulate realities using computing and information technologies for environmental problems by viewing their evolutions and making decisions to correct them.

9.1. What are they?

They are wide range activities that allow to reproduce or represent in a simplified way a real or hypothetical situation. They are the most effective means of testing different hypotheses about environmental and computer processes using models. It proposes different hypotheses and solutions that make it easier to understand the consequences.

9.2. Features

Its objective is to make decisions or come to understand the interactions of people with the environment around them such as: localization of industries, roads, railways, urban issues, etc. are very useful in Science, Technology, Engineering, Mathematics, Computer Science.

Used: presentation, realization and visualization of the organization of living things in Biology, Artificial Intelligence in Computer Science... helps students understand the intentions and motivations of social agents.

9.3. Simulator apps

Carbon Footprint Simulation Programs: ceroc02.org/calculadoras/. Models of interactions between pairs of species. The GLOBE program. The global reports of the Intergovernmental Panel on Climate Change...

10. Results

These methodologies are being used in the university and middle schools for two courses, we would need some more course to see the most reliable evolution. In the last two courses with 70 students (35 in each course) 50 students approved in first instance, an average of 25, in previous courses the average was 21 students. We believe that students learn the contents more quickly, that is, they use less time to understand the concepts and there are a greater number of approved in first calls of the subjects.

11. Conclusions

The conclusions of these methodologies concern both teachers and students.

1. These methodologies serve as another means for teachers to improve their level of work with their students, participating in the tasks presented with the educational materials developed. At the same time it serves to discover the attitudes of the students, their willingness to work and curiosity for research.

2. Students carry out a set of activities that encourage learning based on theoretical training, developing hypotheses, working content and solutions to the topics raised by acquiring training and information for later use in the Science, Technology, Engineering, Mathematics and Computer Science.

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