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TEACHING SCIENCE IN CONTEXT FOR HEALTH CAREER STUDENTS THROUGH ENTERTAINING EXPERIMENTS

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Abstract: This article reports the results of the educational innovation project "Science Learning in an Everyday Context", which addresses the problem of the perception of science in Health Sciences students, through innovative experiments that They put science in an everyday context for the student. The initial data indicate that the incorporation of activities with everyday products increases interest and improves the students' perception of science, who recognize the integration of various disciplines in this type of practices. Additionally, the transfer of these results to a formal subject in the curriculum of the nutrition and dietetics career of a Chilean university is reported.
Keywords: Science teaching, science in context, everyday chemistry, health sciences students.

INTRODUCCTION

Various studies show that science teachers in both basic and secondary education in Chile tend to have classes that are not very interactive and focused on the teacher, giving greater importance to rote learning, and to a lesser extent to the understanding of concepts (1). In the same way, they do not give much importance to practical laboratory activities, putting them in the background compared to expository classes, referring to lack of time, equipment and problems with students.

In relation to the contents, teachers consider the conceptual domain to be important according to the logic of the subject's discipline, consistent with what was stated above, little value is given to experimental contents. Despite this, teachers consider it important to motivate students with examples from everyday life to explain the content.

The way of teaching that teachers have stated they use includes a methodology that tends to unite explanation and learning, classifying practical activities as a tool to achieve content and test theories. The most used materials in science classes are the blackboard, the textbook, exercise guides and laboratory practices.

Teachers state that the main objective they have when evaluating is to verify the learning of concepts, with written tests and exams being the most used instruments.

On the other hand, it is important to have an overview of scientific education in Chile, in basic education and mainly in secondary education, since the students who receive universities bring with them this type of training and are faced with science courses. basics mainly during the first year in the curricula of health sciences careers.

In the same way, some proposals have been consolidated for the development of science curricula in many countries, among them, the Science-Technology-Society (STS) approach to promote scientific culture among students. Additionally, the word Environment has been included in this approach, leaving Science-Technology-Society-Environment (STSE), which aims to give a more complete and contextualized image of science, considering the understanding of environmental and quality of life issues. The aforementioned pursues the promotion of scientific culture by aiming at the development of skills that allow students to use the knowledge acquired in an everyday context. It not only involves disciplinary issues, but also attitudinal ones.

Regarding what must be taught in science, science and technology are encouraged to behave as two systems that interact intellectually and socially, selecting examples and problems from everyday life, and not only emphasizing teaching in science. pure and decontextualized science.

University professors encounter the problem of the lack of interest that students have in the study of science, especially in the cases of careers that are not disciplinary. Some

studies have shown that this is due to the lack of prior training in the subject and the way in which it is taught. Furthermore, it may be related to a non-favorable attitude of students towards science, with the affective aspects acquiring greater relevance to achieve the necessary motivation to achieve learning. (4)

The literature indicates that in general the factors that influence the motivation of students towards a certain subject are:

- Perceive the connection of what has been learned with everyday life.
- Appreciate the usefulness for your future profession.
- The motivation they may receive from their parental models.
- The self-concept of the students, about whether they are good or not in science.
- The methodology used by teachers.

Considering the above, the use of recreational resources has been introduced in teaching-learning activities, especially in experimental sciences such as physics and chemistry (5). Game-based learning turns the student into an active subject who gets involved in the process.

Along the same lines, the incorporation of innovative practices that allow science to be contextualized can generate research topics focused on everyday life to motivate students. Likewise, the use of project-based learning (PBL) has been shown to provide students with a greater understanding of the nature of science, when compared to traditional experiments (6).

The way to contextualize practical activities may include actions such as:

- Include materials for everyday use in laboratories.
- Use of everyday life situations to construct concepts.
- Meetings with scientists and visits to facilities of institutions with industrial and research activity.
- Preparation of research projects to solve practical problems focused on everyday life, generating a dialogue between disciplines.

In order for these actions to impact the science teaching-learning process, they must be carried out continuously. Another type of teaching-learning strategy involves the "Reproduction of an Innovation Environment in the Classroom" (RIEC), with the student participating in their own learning through the development of their creativity, innovation and collaborative work capabilities, involving the student in the preparation of a product that responds to a real need of the society to which he belongs. For example, through the formation of fictitious companies made up of teams of students with a teacher in the role of consultant, using the scientific method as a basis for the development of products (7).

The experiments that can be carried out are varied and will depend on what you want the students to learn (8,9). For example, the manufacture of soap (from a fat or an oil) allows them to be introduced into the lipid saponification reaction, content of biochemistry courses. However, making soap from an avocado will allow us to recognize the presence of lipids in food and that these must be extracted from the plant material, and for this to occur the wall of the plant cells must be broken with a nonpolar organic solvent, resulting in a more integrative experience between biology and chemistry. In both cases, they will value the possibility of preparing a useful product with their own hands that they can use themselves, encouraging them to study science subjects (10).

	Considering your Project at the science fair, you consider that:	I strongly disagree (%)	I strongly agree (%)	I don`t agree and I don`t disagree (%)	I agree (%)	I totally agree (%)
A	It puts science in the context of life, through a commonly used product	0		6.3	93.7	
B	It integrates topics from more than one subject (chemistry, biology, microbiology, etc.).	0		0	100	
C	I have learned more than in a traditional science laboratory	0		12.5	87.5	
D	I would like to have more laboratories of this type in other basic science subjects in my curriculum.	0		0	100	
E	It gave me ideas to have my own business using the scientific knowledge I learned.	0		18.8	81.2	

Table 1. Evaluation of students regarding their scientific project.

METHODOLOGY

The first part of the project involved the participation of 30 nursing students, between second and fourth year, from a Chilean university enrolled in the general training elective "Entertaining Science", carrying out different product preparations during a semester: alcohol gel, moisturizing creams, soaps, etc. In addition to experiments, such as separation of natural products, studies of antioxidant power in foods, molecular gastronomy, synthesis of nanoparticles, among others. At the end of the semester, the students presented their own projects at a science fair, being evaluated by experts. Likewise, students' interest in science was measured through perception surveys.

Finally, the experiments that were designed by the students were collected to be applied in the subjects of the Health Sciences career curricula in the areas of microbiology, organic chemistry, biochemistry, etc.

The perception surveys were developed and validated, taking as a model the "Executive Summary NATIONAL SURVEY OF SOCIAL PERCEPTION OF SCIENCE AND TECHNOLOGY IN CHILE 2016" published on the website of the National Scientific and Technological Commission (CONICYT) published on July 25 2016. In addition, open questions were incorporated that could provide information about the students.

RESULTS

Once the practical activities were completed, the students had three weeks to present their own scientific projects that were presented at a science fair that took place in a highly vulnerable high school in the Metropolitan Region in a science fair.

The titles of the projects were the following:

- Healing cream.

- Sunscreen.
- Dermacoffee.
- Bath Bombs.
- Lipstick.
- Gelatin soap.
- Alcohol in antioxidant gel.
- Therapeutic touch kit.
- Molecular lemon pie.
- Refreshing sun lotion.

In the titles, it can be seen that most of the students' projects involve the production of cosmetic products, proposing formulations, materials and experimental development. Then, they executed their projects, achieving the preparation of their respective products.

In addition, they presented brochures and brochures with a brief description of their products and their relationship with health sciences. The stands of the science fair were visited by primary and secondary school students, as well as their respective teachers, who asked questions to the university students. Cognitive, procedural, and cognitive competencies were evaluated using a rubric during the entire process, including the final presentation at the science fair.

After the course, a survey was applied to obtain our students' new perception of science in academic and everyday contexts. In general, there is a good evaluation of aspects such as the integration of different disciplines such as biology, microbiology and chemistry.

Likewise, when they were asked if they had learned more than in a traditional laboratory, 88.9% showed a significant degree of agreement. It is important to note that 73% believe that what they learned during this course could give them ideas to start their own business by selling their own products.

On the other hand, the students left their opinions regarding this experience, which are transcribed below:

- "Excellent Elective, you learn a lot without being under pressure, thanks to the teachers for their dedication.
- "Very good subject, you learn in an entertaining way through practice with the help of the teachers who were always willing to answer the concerns that arose during each laboratory. The final project was quite entertaining, since it covered everything we had learned in the field in addition to having done our exhibition outside the university."
- "Excellent course, it focuses on what science and technology is, making each of these aspects completely clear, it also shows you that with simple products you can do much more than you think, I think that materials like this are needed in the network of nursing to be able to enchant their students even more, thus being able to reduce the academic dropout rate in the first years."
- "It is a very entertaining field, as its name suggests, knowledge can be applied but in a very didactic way and that makes everything more understandable. Nice experience."

Didactic experiences like these can be extrapolated to disciplinary subjects in science, through active methodologies, such as project-based learning (PBL) to achieve deep and significant learning in students, in addition to the strong motivational component that it implies. Teamwork provides positive aspects to students such as reflective thinking and the enhancement of their oral and written communication skills.

TRANSFER OF RESULTS TO OTHER SUBJECTS

The first practice that was formally implemented in the curriculum of a health sciences degree at this university was the laboratory called "Bate that beats the gel" in the nutrition and dietetics degree, being the sample of a total of 24 students of the

integrated immunomicrobiological subject.

An experimental activity was carried out in the nutrition and dietetics major that consisted of the preparation of alcohol gel, explaining the microbiological implications in the use of this product and the chemical part behind its preparation. Once the alcohol gel was prepared Microbial resistance tests were carried out, using the flora present on the hands.

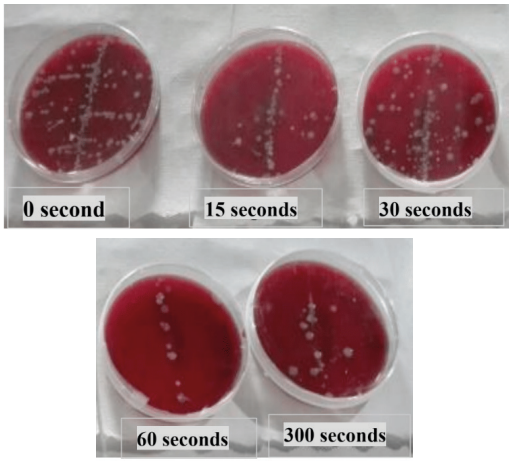

Figure 1. Antimicrobial resistance results of alcohol gel prepared by nutrition and dietetics students.

The week following the experience, a perception survey was administered to them in different areas of their life, studies and the practical experience carried out.

Regarding the general perception, the results show that 83% of students agree and strongly agree that science and technology contribute positively to improving the environment. 88.9% of students consider that science and technology make their lives easier.

With a lower perception is the contribution of science and technology when facing natural disasters with 55.6%, the improvement in nutrition with 61.1% and 66.7% consider that science and technology provides knowledge most trusted in the world.

Regarding perception in daily life, students respond that science and technology are important in their perception of the world, in the care and prevention of diseases, in caring for the environment and in their profession or work. with percentages above 80% agreement. It is important to highlight that a percentage of 72.2% considers that science and technology affects their decisions as a consumer.

There is no significant contribution of science in students' decisions regarding their political and social opinions.

In relation to the contribution of science and technology in their career, 88.9% of students indicate that they agree that they are fundamental for understanding professional subjects.

Finally, 100% of nutrition and dietetics students agree and strongly agree that the preparation of alcohol gel puts science in an everyday context, and all respondents would like to have more experiences of this type in their other basic science subjects.

88.9% of the participants agree and strongly agree that there is an integration of various disciplines, such as chemistry, biology and microbiology. The same percentage agrees that they have managed to learn more than in a traditional laboratory.

Regarding the question about whether the practical experience gave them the idea of having their own business using the scientific knowledge learned, the agreement reached 72.2%.

CONCLUSION

The incorporation of projects and experiments that enhance the participation of students in their own learning, in an everyday context, that is, considering their particularities in social, cultural and regional aspects, allow the development of critical and collaborative thinking, which It is reflected by the improvement in the perception of science by this group of university students, which can clearly be transferred from one subject to another.

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