IOSR Journal of Research & Method in Education (IOSR-JRME)
e-ISSN: 2320–7388, p- ISSN: 2320-737x Volume 12, Issue 6 Ser. II (Nov. – Dec. 2022), 69-81
www.iosrjournals.org

Energy umbrella to enhance interest in STEM Education

AUTHOR

Abstract
As technology evolves and advances, STEAM (science, technology, engineering, art and maths) education becomes increasingly essential. By including it comprehensively in the classroom, it provides opportunities to prepare the new generations to face important challenges. It requires the use of innovative and alternative methods of teaching and learning, such as projects, laboratory practices and technological tools. And it allows the development of skills such as analysis, documentation and problem solving, supporting them to deal with situations in their daily lives.
This chapter will present a STEAM project developed in the 4th ESO physics class that consists of the construction of an energy umbrella that would help increase the percentage of electricity generated in a sustainable way and provide electricity savings, since it would allow energy self-sufficiency; getting closer to achieving the Sustainable Development Goals (SDGs).
It has been developed in English, which has allowed students to develop the linguistic competence of a second language, professional skills, greater concentration and memory.

Keywords
Education; STEAM; TIC; Bilingual competence

Date of Submission: 15-11-2022 Date of Acceptance: 01-12-2022

I. Introducción

The STEAM method is a teaching-learning method that is based on the idea of educating students in five specific disciplines; Science, Technology, Engineering and Mathematics (in English Science, Technology, Engineering, Arts and Maths; STEAM).
A methodology focused on problem solving, through which questions are asked, objects are examined, background information is tracked and needs are investigated.

On the one hand, (Morrison, 2006), cited by (Lantz, 2009), executive director of the Teaching Institute for Excellence in STEM (TIES), points out that STEM is the creation of a discipline based on the integration of others in a new "everything", thus building an interdisciplinary bridge with its own identity.
Also, (Tsupros, 2009), cited by (Lantz, 2009), specialist in the STEM curriculum for Inter-mediate Unit 1(IU1), defines STEM education as an interdisciplinary strategy for learning where academically rigorous concepts are they fit the real, that is, science, technology, engineering and mathematics are put into practice in contexts related to school, society, work and a global initiative of the development of the gift in STEM and with the ability to compete in the new economy.

In addition, several functions of STEM education are highlighted. (Morrison, 2006), cited by (Lantz, 2009), suggests that STEM students should be:

- Problem solvers. Being able to determine questions and problems, plan investigations to collect, collect and organize data, draw conclusions and then put it into practice in new and innovative situations.

- Innovators. Creatively use the concepts and principles of Science, Mathematics and Technology, putting them into practice in the processes of engineering design.

- Inventors. Recognize the needs of the world and creatively design, test and implement the solutions obtained (engineering process).

With this methodology, students get used to working as a team, making joint decisions in the face of research, carrying out collaborations and making hypotheses. Likewise, this educational system is capable of increasing creativity when it comes to solving problems, improves individual critical thinking, improves self-esteem and boosts communication skills.
Likewise, it helps them learn through first-person experimentation, which improves long-term retention of con-

cepts.

Learning science, engineering, technology, art and mathematics in school implies not only passively "receiving" the concepts constructed by science, engineering and mathematics, but also "doing" science, engineering, art and mathematics, that is, actively engaging in the cognitive, social and discursive activities of the field.

This framework proposes the classroom as a space in which to reproduce in STEM education practices analogous to those that occur in the professional STEM world, as has been proposed for some time by the framework of school scientific activity in our country (Izquierdo, Espinet, García, Pujol ,& Sanmartí, 1999). This framework is not only consistent with the framework of sociocultural learning (Rogoff, 1994), but also promotes a more accurate vision of what the STEM professional world itself is like (Duschl & Grandy, 2012), as well as consistent with the framework of competencies scientific measures proposed in PISA (Crujei-ras & Jiménez-Aleixandre, 2012).

The dimensions of STEAM practice, common in all its disciplines:
- experimentation with natural and technological phenomena through the observation, manipulation, collection and analysis of data.
- scientific and mathematical modelling, and interaction with virtual representations of abstract entities.
- the argumentation and communication of scientific, mathematical and technological solutions, as well as the evaluation of evidence and arguments provided by others.

This project has been developed in bilingual mode (English) allowing students to:

– Achieve communicative competence in the second language, in many cases at the level of a monolingual native speaker.

–The introduction of a second language from the first formative stages favors the comprehension of the speech acts and the culture of another language.

– Students grow up knowing cultures other than their own, they understand that they are part of a diverse society.

– Beyond linguistic competence, handling another language is perceived as a professional skill.

– Greater selective attention and multitasking ability by being able to alternate between two languages.

– Enhances attention, memory and concentration.

– Easier to learn other languages.

The method that has been used for teaching English in the project is the Cambridge Method. This method develops the skills of listening and speaking comprehension, written comprehension, development of academic writing, as well as informal and formal professional writing.
This project aims to provide students with knowledge and involvement in achieving the SDGs (Sustainable Development Goals), connecting the world of cooperation and education.
Students develop critical thinking, empathy, effective argumentation, cooperation or conflict resolution, among others.

II. Objetives

The main objective achieved with the development of this project is:

Develop a sustainable device that generates electricity through an active and participatory methodology (STEAM) in English.

Other important objectives are:

- Linguistic competence of a second language, English.
- Work creatively to solve problems of daily life, performing individual and group tasks (cooperative work).

- Develop academic and personal skills.
- Know how to build tools that allow them to act as citizens in mobilization actions within today's society.

III. Metodology

This project, which was developed in the 4th ESO physics class, consists of the construction of a solar energy umbrella with the aim of increasing the percentage of electricity generated in a sustainable manner and providing savings in electrical energy, since it would allow energy self-sufficiency.

This methodology (STEAM in English) places students at the center, making them protagonists in the construction of their own learning. In addition, it tries to generate an active and participatory student body, with the teacher's role being that of a motivating, dynamic and guiding leader in the classroom, capable of relating transversal content and specific subjects to generate global citizenship.

Cooperative work can be incorporated at two levels: as a methodology and project resources, and as a skill to be developed. Each member assumes responsibility for meeting common goals. Each person promotes the performance of others. They lend support, encourage each other, share on the basis of mutual commitment and interest.

It is important to properly structure tasks, assign roles and functions well. It is a great challenge to put interpersonal skills to work: leadership, decision-making, communication, conflict management and negotiation.

The project has been developed in three different spaces:

- Classroom: where the concepts necessary to develop the project are explained and reviewed.

- Technology workshop: center workshop with the layout, tools and utensils necessary to make and manufacture the umbrella.

- Outdoors (terrace of a cafeteria and patio of the school): start-up of production of the umbrella in spaces where sunlight spends the longest time on the solar panels. (See phase 7 of the project)

Being a multidisciplinary project, the previous concepts that the students needed to know and the basic skills required have been taken into account. For this reason, it was developed in the 4th year of secondary school. Its duration has been one school year.

To review the previous concepts, learning pills have been used, a short, concise and autonomous educational resource, which summarizes the main characteristics of the concept (content offered in small doses). These pills are training videos that charge
importance as audiovisual educational material, since they are characterized by being of short duration and focus on the presentation of a particular concept or procedure.
They allow students to concentrate on those concepts/procedures in which they have the greatest difficulty, and on the other hand, it facilitates the teaching task in the transmission of knowledge by selecting to work with educational pills that contemplate their learning needs.

IV. Project Phases

1. Detection of the problem or need: the objective of our project is clearly described and we specify the initial conditions that the object that will solve our problem must meet.
Students are asked the following question: "Develop a sustainable device that generates electricity".
Weeks: 2

2. Search for information: consists of collecting and analyzing all possible information on the problem raised in the previous step.
Some problems can be solved with our knowledge and imagination. Other times we need to gather information to help us find the right solution, through asking people questions, observing objects or consulting books and magazines.
Weeks: 2

3. Search for solutions and idea selection: in this stage, ideas are suggested to solve the problem, including improvements to existing solutions.

Among all the proposed ideas, the one that best suits the needs and objective of our problem is chosen. To select the idea we can follow several methods, one of them may be to mix all the positive aspects of each of the ideas. The one that we will follow in class will be to elaborate a score table for each one of the proposed ideas where the items that we consider necessary will be valued, such as: cost, simplicity of execution, aesthetic quality, adaptation to the objectives,... The idea that has the best score will be the one that is made.

Of all the proposed ideas, it was determined that the solar umbrella would be, overall, the most viable idea.
Weeks: 3

4. Design of the solution: it is the most creative phase of the technological process in which the characteristics of the object to be built are determined. To do this, first possible solutions to the problem are thought, then the most appropriate idea is selected and finally all the necessary details for its construction are defined, all this with the help of the graphic expression of ideas (sketches, sketches, plans, etc.).

In this phase we will make different types of drawing:
Overview views: drawing the idea in its entirety
Plan, elevation and profile: main views to enter the technical data of the design.
Details of parts and joints
Quartering

The prototype (Figure 1, 2 and 3) of what is going to be produced is made through drawings, sketches and diagrams that try to be as precise as possible.

Weeks: 2

5. Work planning:

In this phase, the tasks and the necessary means for the construction of the product are specified. The operations to be carried out are defined in an orderly manner and the necessary materials and tools are selected.
In this phase, the process sheet will be made, where the tasks assigned to each member of the group will be taken into account, which pieces need to be done before, ... the objective is to maximize the work time of each member of the group. group, with which we will ensure that the execution time of the project is minimal.

A document must be prepared where the following aspects will be taken into account:
What are you going to do
Who is going to do it?
How will it be done?
When will it be done and how long will it take?

Weeks: 2

6. Production: stage in which the umbrella is manufactured, built following the planned action plan and respecting the rules of use and safety in the use of materials, tools and machines. Includes manufacturing, assembly, finishing...
Weeks: 6

7. Verification and evaluation: it is evaluated if the built object responds to its purpose and meets the initially established conditions. Otherwise, the causes are sought and the object is redesigned and built. Here we will take into account the appearance, operation, material used, maintenance, etc. Thus we will have two possible options, that the product is adequate, with which we will reach the end of the process or that it is not, so we will have to return to the selection of the idea to see where we can change it.
It is about verifying its usefulness and validity.
Weeks: 2

For this phase, the students have contacted the person in charge of a restaurant, on whose terrace the umbrella has been installed and the corresponding tests have been carried out. In addition to the owner of the establish-

ment, several clients offered to test the umbrella, being able to see its usefulness while respecting the environment.
Previously, the umbrella was installed in an area of the center where it received the greatest amount of sunlight in the morning to monitor its activity and test its operation.

In total there were 19 weeks, from the month of January to the month of May.
Approximately 5 hours were spent each week.

8. Commercialization: market launch of the good or service produced. It should be noted that the marketing of the product is not necessary if it is not dedicated to market purposes.
Attending to the mathematical competence of the STEM project, the components of the group carried out a market study determining its viability, according to the cost.

"The cost can be high, so for the prototype we will use lower quality materials, in smaller quantities and recycled. However, we believe that it is an affordable investment for many businesses that would provide a new service and save in a sustainable way". Comment made by one of the students.

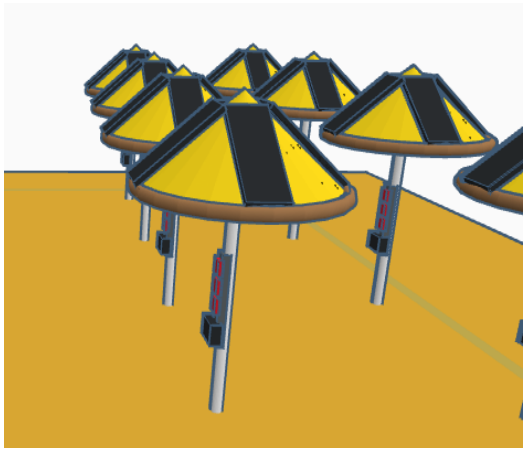

Figure 1. Prototype solar energy sunshade

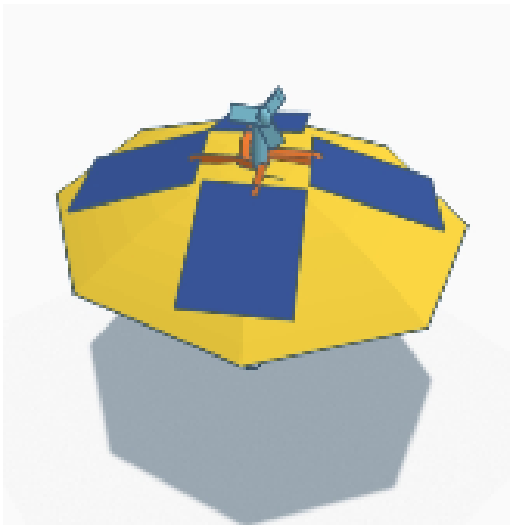

Figure 2. Phase 4 of the project

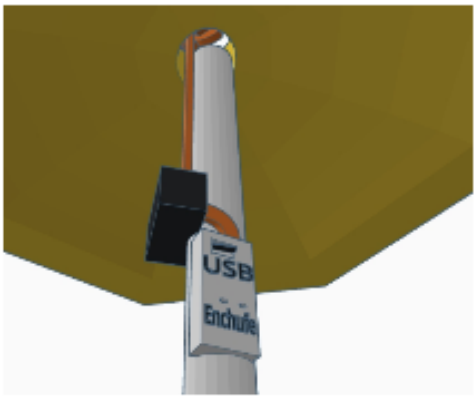

Figura 3. Phase 4 of the project

CONCEPTS
Below are the concepts and contents that have been developed in each of the disciplines, prior to the start of the described project:

SCIENCES:
Renewable energy
Electricity. Ohm's law
Environment

MATH:
Cost calculation
Formulas
Solving equations

TECHNOLOGY AND ENGINEERING:
Electrical and electronic components
Solar panel
technological memory
Electrical circuits
Materials and properties
Gears
Mechanisms
Structures
Plans, sketches.

ART:
Desing assisted by computer
Flat, two-dimensional figure
To size
Scale
Dimensions
Views and perspectives
Shade
Square and bevel
Geometric figures

MATERIALS
Parasol
12V rechargeable battery
Power cord (1m)
Battery clips
Solar panel
12V to 4.5V converter

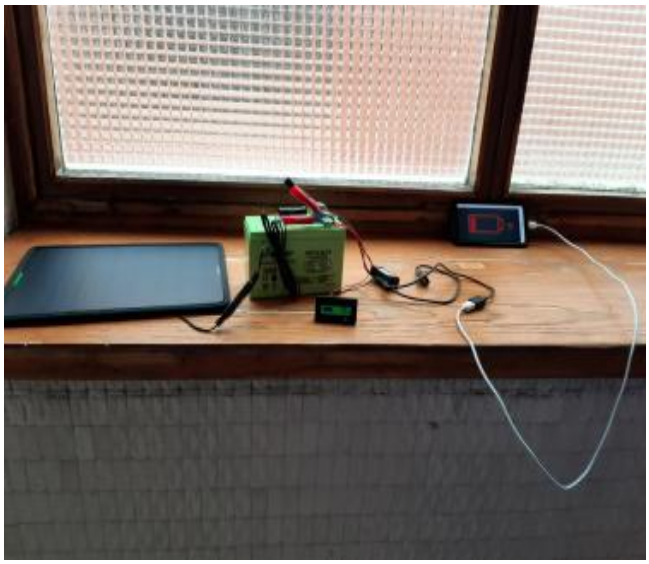

Figure 4. Materials

1. SPECIFIC VOCABULARY

This section defines specific activities and nomenclatures of the various disciplines involved.

Rechargeable battery: device that stores electrical energy. Its charge can be restored.

Electric current: flow of electric charge (electrons) that runs through a material.

Battery Clips - Heavy metal clip used for quick connection.

Solar panel: glass plate that is placed in a clear place and collects solar energy to conduct it to an electrical energy transformer.

12V to 4.5V converter: voltage converter converter.

Electrical and electronic components: instruments that have application in the activities of distribution, storage, transformation and distribution of electrical energy. They are of vital importance in different areas of current life, since through them all the operations that we carry out on a daily basis are facilitated.

Electric wire: element to conduct electricity. Made of copper for its greater conductivity.

Resistance: electrical element necessary to regulate the electrical resistance of a circuit. It is measured in ohms (Ω).

Multimeter: portable electrical device that allows to measure different electrical magnitudes, mainly resistance (ohms), current (Amps) and voltage (Volts).

Fuse: electrical component made of a conductive material, usually tin, which is placed at a point in the electrical circuit to interrupt the current when it is excessive.

Diode: electronic device through which current flows in one direction. It acts as a unidirectional switch for the current.

Technological memory: document that describes and references the work carried out.

Electrical circuits: set of electrical elements connected to each other that allow generating, transporting and using electrical energy to transform it into another type, such as heat energy or light energy.

Gears: set of gear wheels and parts that fit together and form part of a mechanism or machine.

Mechanisms: device intended to transmit and/or transform forces and/or movements from a motor to a receiver.

Structure: distribution of the set of important elements of an object. Each of its components has a function and form that complements the rest.

Plane: graphical representation of an object or area on a two-dimensional surface.

Sketch: outline, scheme of a visual project that allows characterizing the essential features and elements, without measurements.

Wind generator: device that harnesses the mechanical energy of the wind (energy of movement) to convert it into electricity.

2. COST

Students have developed a budget on a spreadsheet with all the materials and tools needed to build the umbrella; from screws to solar panels. They have investigated the price and benefits of these elements on different websites of companies in the sector to place the order.

It consists of the sum of the costs of each material that we use to build the project, adding VAT and labor. In our case, we will not include any labor costs.

For the calculation, we start from a table, with the following sections:

• Number: It is simply a numerical order for each material.

• Quantity of each material (expressed in cm2, m, Kg., unit)

• Description: each kind of material that is bought at a given price (we group together all the pieces that are built with this material)

• Unit price (euros per meter, per unit, per kilogram)

• Total cost: quantity of material x unit price.

COURSE		GROUP		DATE
PROJECT				**SHEET Nº**
Nº	**AMOUNT**	**MATERIAL**	**PRICE**	**TOTAL PRICE**

Table 1. Budget

Umbrella €37.99 + Battery €14.50 + Wiring €1 + Solar Panel €32.99 ×4 (€131.96) + Wind Generator €7.25 + Multimeter €6.95 = €199.65
This is the price of the materials in the catalogs available on the internet, for mass production you would buy in bulk, which makes them 10% to 20% cheaper.
In that case, it would cost: €159.72.

3. EVALUATION

To evaluate this STEAM project, we have based ourselves on the following items:
✓What have they learned?
✓ How is the product generated?
✓ How have they worked?

✓ How can they improve?

To which the following evaluation criteria correspond:
• Knows the steps of the scientific method and applies them to specific situations
• Formulate hypotheses and propose experiments to test them
• Work as a team respecting opinions contrary to yours
• Assumes responsibilities
• Initial report of objectives and presentation of the project.
It includes an explanation of the project, its objectives, links with the different disciplines involved in the chosen topic, times, distribution of tasks among group members, estimation of the time needed for each task, adjusting to the credits of the assignment. ture.
• Final presentation of the project and technological report, both in Spanish and English.

Tools to track and give feedback:

Team diary: instrument to monitor the work of a team from self, co and hetero evaluation.

WORK PLANNING

ACTIVITIES	FINALIZATION	PERSON IN CHARGE

Table 2. Work planning

MONITORING AND EVALUATION OF WORK SESSIONS

DATE	TASK PERFORMED	PERSON IN CHARGE	EVALUATION

Table 3. Monitoring and evaluation of the work sessions.

Project portfolio: learning and self-assessment instrument that allows the student to be aware of their own learning (Selection of evidence of their learning process, reflection on what they have learned and their identity as future reflection on goals and strategies).

English dictionary: the students have a blog with all the technical vocabulary used in the development of the project in English, from each of the five disciplines. They have defined in English each of these words and concepts along with an image.

Evaluation Rubric

	ACHIEVED	**ALMOST ACHIEVED**	**IN PROCESS**	**NOT ACHIEVED**
COLLABORATION AND PARTICIPATION	Ha colabrado con el equipo, participando activamente a lo largo del proyecto	Excepto en algunas ocasiones, ha colaborado con su equipo y ha participado en las actividades	Ha mostrado poca participación en las actividades realizadas en equipo	Apenas ha colaborado en la realización de las actividades
RESPONSIBILITY AND FUNCTIONS	Ha sido consciente en todo momento de sus funciones y tareas	Ha tenido claro cuáles han sido sus responsabilidades en la mayoría de las actividades	En muchas ocasiones no ha comprendido cuáles eran sus funciones y tareas	Se ha mostrado pasivo y no ha identificado sus funciones y responsabilidades
SEARCH AND INDAGATION	Ha participado activamente en la investigaciñon	En varias ocasiones ha participado en la investigación	En ocasiones ha mostrado interés por participar	No ha participado activamente en la investigación
EXHIBITION AND COMMUNICATION	Ha defendido sus ideas de forma aservia, respetando las de los demás	Normalmente ha dado razones para justificar sus ideas y ha escuchado a los demás, aunque a veces no ha tenido en cuenta sus oponiones	Le ha costado defender sus ideas de forma razonada y habitualmente no ha tenido en cuenta las opiniones de los demás	No ha dado razones para defender sus opiniones, ni ha tenido en cuentala de los demás
PRODUCT DESIGN	Utiliza técnicas artísticas adecuadas para representar	Suele hacer uso de técnicas artísticas adecuadas	Ha tenido dificultad para el uso de técnicas adecuadas	Apenas ha trabajado en un correcto uso de técnicas artísticas

	modelado y estética			
BLOG in english	Uso seguro, crítico y responsable de las tecnologías e inglés	En varias ocasiones ha ha hecho un uso responsable de las TIC e inglés	Ha tenido dificultad para el uso de las TIC y el inglés	Apenas ha trabajado en un correcto uso de las TIC y no ha utilizado inglés

Table4. Evaluation rubric

4. SURVEY

In order to know the opinion of the students about the experience during the project, we ask them to answer the following questions and select the answer that is closest to their opinion.

ASKS	Totally agree	Agree	Desagree	Strongly desagree
1.The project allowed me to realize that the advancement of technology implies a responsible use of it.				
2.The activities carried out were planned to respond to a daily problem.				
3.The guiding question of the project allowed me to direct my work towards the fulfillment of a goal.				
4.The development of the project motivated me to pose new questions related to the subject.				
5.The development of the project allowed me to think about a problem of today's society.				
6.During the development of the project, make decisions based on the analyzed information.				
7.The project allowed me to contribute ideas related to the search for solutions to a daily problem.				
8.The development of the project allowed me to put my skills at the service of the group through teamwork.				
9. My teachers guided my process during the project.				
10. The presentation of the final work allowed sharing reflections regarding the personal use of technological devices, risks and repercussions on health, due to their excessive use				

Table 5. Survey of the students who developed the project

RESULTS OBTAINED IN THE SURVEY

The following graph shows the results of the survey carried out on the 12 students who participated and carried out the proposed project:

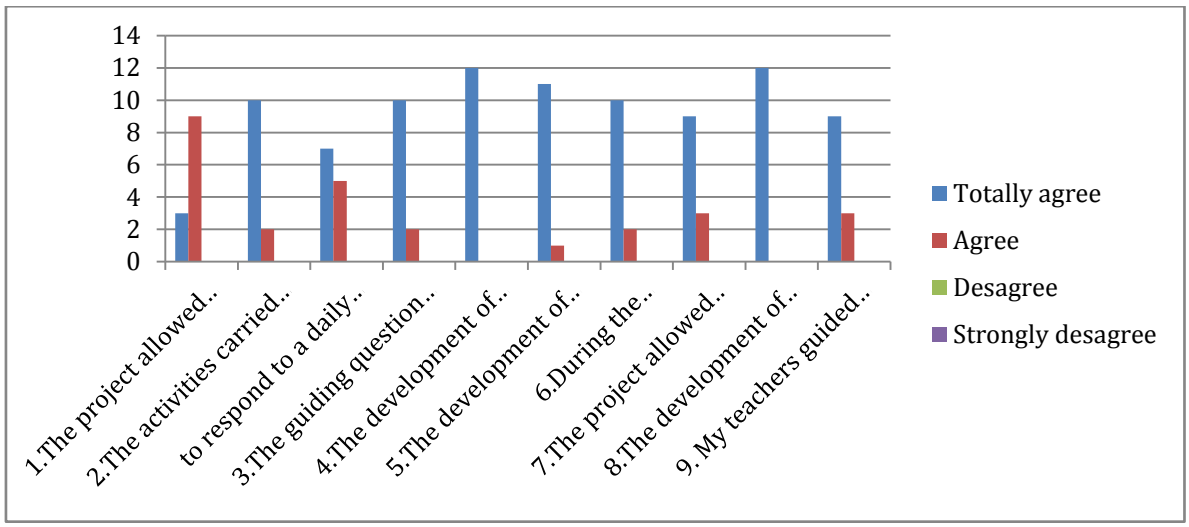

Figure 5. Bar chart with the results of the survey carried out to the students who developed the project.

PREGUNTAS	Totally agree	Agree	Desagree	Strongly desagree
1.The project allowed me to realize that the advancement of technology implies a responsible use of it.	25,00%	75,00%	0%	0%
2.The activities carried out were planned to respond to a daily problem.	83,33%	16,67%	0%	0%
3.The guiding question of the project allowed me to direct my work towards the fulfillment of a goal.	58,33%	41,67%	0%	0%
4.The development of the project motivated me to pose new questions	83,33%	16,67%	0%	0%

related to the subject.				
5.The development of the project allowed me to think about a problem of today's society.	100,00%	0,00%	0%	0%
6.During the development of the project, make decisions based on the analyzed information.	91,67%	8,33%	0%	0%
7.The project allowed me to contribute ideas related to the search for solutions to a daily problem.	83,33%	16,67%	0%	0%
8.The development of the project allowed me to put my skills at the service of the group through teamwork.	75,00%	25,00%	0%	0%
9. My teachers guided my process during the project.	100,00%	0,00%	0%	0%
10. The presentation of the final work allowed sharing reflections regarding the personal use of technological devices, risks and repercussions on health, due to their excessive use	75,00%	25,00%	0%	0%

Table 6. Results of the survey carried out in percentage

It should be noted that, in all the questions asked, the students Strongly Agree or Agree. During the development of the project they felt the support of their teachers and that they took into account the contributions and recommendations that their classmates made to improve their final work. Therefore, it can be said that most of the students perceived that the evaluation, feedback and revision was constant during the development of the project. The project allowed them to make decisions based on the information analyzed and reach an agreement with their peers. Therefore, it can be said that the students considered having had a voice and a vote during the different activities proposed in the project. A large percentage of the students perceived that the project favored the development of 21st century skills.

V. Results

The biggest benefit of prototype development is to demonstrate the ease with which this device can be built; which would allow, with the appropriate investment, to put the product on sale.
The umbrella would help increase the percentage of electricity generated in a sustainable way, and provide electricity savings, since the people who buy it would be, in part, energy self-sufficient.

COMPETENCES
The key competences developed in the project are:

• Mathematical competence and competence in science, technology and engineering: equation resolution, formulation of formulas, electrical circuits and characteristics of electronic elements. Scientific method, advances and limitations of technology and engineering. Compression of the natural environment. Skills to take care of the environment.

• Competence in linguistic communication: development of the technological memory (document that includes the entire process and phases of the project).
This competence constitutes the basis for one's own thinking and for the construction of knowledge in all areas of knowledge. It makes it possible to appreciate the aesthetic dimension of language and enjoy literary culture.

• Multilingual competence: the project has been carried out in English, which has allowed the students to improve their level, using technical words related to mathematics, science, art, technology and engineering.

This competence supposes recognizing and respecting individual linguistic profiles and taking advantage of their own experiences to develop strategies that allow them to mediate and make transfers between languages. It integrates historical and intercultural dimensions aimed at knowing, valuing and respecting the linguistic and cultural diversity of society.

• Digital competence: use of apps to design the umbrella, spreadsheets to prepare the budget, word processor to prepare the technological report, presentation programs to present their work. Its safe, critical and responsible use.

• Personal, social and learning-to-learn competence: they have investigated the situation of society in terms of access to energy, they have developed personal skills and cooperative work.

• Citizen competence: they have developed the ability to act as responsible citizens and participate in social and civic life, based on the understanding of social and economic concepts and structures, as well as sustainability and world events.

• Entrepreneurial competence: they have thought and researched about starting their own business to produce solar umbrellas.
They have developed the ability to act on opportunities and ideas, critical thinking and project management of financial, social and cultural value.

VI. Conclusions

After having concluded both the investigation and the assembly of the prototype, we can state that the energy umbrella would be very beneficial for society.
On the one hand, the proposed price is much lower than the price it would have on the market, which would be around €300 just for the parasol and for 4 solar panels; without taking into account the battery or the wind generator. On the other hand, it is a very easy project to carry out.

Therefore, *"due to the good reception and the easy manufacturing of our energy umbrella, we believe that it is a project that has a future, and that it will help increase energy efficiency, since with the implementation of the umbrella it will be possible to generate electricity in places where it was not done".* Conclusion of one of the students.

From the academic and educational point of view, with the development of this STEAM practice, the following is achieved:

- Experimentation with natural and technological phenomena through observation, manipulation, data collection and analysis.

- The elaboration of scientific and mathematical models, and the interaction with virtual representations of abstract entities.

- Scientific, mathematical and technological argumentation and communication, as well as the evaluation of the evidence and arguments provided by the rest.

- Work as a team and that the students themselves explore and achieve the solution of a problem through critical thinking, effective communication and efficient time management.

Through multidisciplinary and interdisciplinary work and the use of the STEAM methodology, it seeks to give a creative and artistic perspective to education; in this way, improve the learning of both scientific and technological content, with the advancement in divergent thinking and the development of creativity within the students.

The experience favored collaborative work because the students during the development of the activities discussed healthily and presented their ideas, made contributions from their skills and learning, took responsibility for what they did, for the results they obtained and reached agreements. for the success of their activities.

Education based on STEAM skills considerably promotes the skills of the 21st century, since its models, teaching strategies and suggested learning environments to apply them are encouraged to develop them to the fullest.

It should be noted that this kind of active methodologies used, such as problem-based learning and project-based learning, are essential to foster teamwork by those who make up the teaching process, as well as learning to face difficulties in order to be part of the teaching process. - given its possible solutions based on the integration of the disciplines that make up said methodology: Science, Technology, Engineering, Art and Mathematics.

Implementing this kind of methodology allows the conditions to be generated so that the desire for significant learning in students is manifested, where new competencies are produced, the strengthening of creativity, the change within the curricular of the entities education, as well as the incorporation of new educational trends.

Educating students in STEM subjects prepares them for life as they are critical for future jobs and the development of modern society. The integration of STEAM activities in the curricula of Secondary schools has great potential to provide a richer educational experience. Students can acquire a different way of thinking.

Education can be playful and natural, showing students the relationships between subjects and real life, thus increasing a sense of motivation, self-efficacy and problem-solving skills. These skills can be used throughout life to help them get through tough times and take advantage of opportunities when they arise.

Bibliography

[1]. Crujeiras, B., & Jiménez-Aleixandre, M. P. (2012). Participar en las prácticas científicas. Aprender sobre la ciencia diseñando un experimento sobre pasta de dien-tes. Alambique: Didáctica de Las Ciencias Experimentales, 72, 12–19.
[2]. Duschl, R. A., & Grandy, R. E. (2012). Two Views About Explicitly Teaching Nature of Science. Science & Education, 22, 2109–2139.
[3]. Izquierdo, M., Sanmartí, N., Espinet, M. y García, M.P. (1999). Caracterización y fundamentación de la ciencia escolar. Enseñanza de las Ciencias, núm. extra, pp. 79-92.
[4]. Rogoff, B. (1994). Developing understanding of the idea of communities of learners. Mind, culture, and activity, 1(4), 209-229.
[5]. Morrison, Janice, 2006. TIES STEM education monograph series, attributes of STEM education.
[6]. Lantz Jr, H. B. (2009). Science, technology, engi-neering, and mathematics (stem) education what form? what function. Report, CurrTech Integrations, Baltimo-re.
[7]. Tsupros, N., R. Kohler, and J. Hallinen, 2009. STEM education: A project to identify the missing components, Intermediate Unit 1 and Carnegie Mellon, Pennsylvania.

XXXXXX, et. al. "Energy umbrella to enhance interest in STEM Education." *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 12(06), (2022): pp. 69-81.