Erasmus+ KA2 Project
"The Future You Choose"
Joint Staff Training Event on
Experiential Learning

Teodósio, J.; Fidalgo, J.P. & Ramos, M.T.

Fundão, Portugal, 8th-13th May 2022

Cofinanciado pelo
Programa Erasmus+
da União Europeia

Motivation

UNESCO's/European educational organizations' global vision for Education:

- the importance of preparing students for this century skills and specific know-how.

- **the absolute need to change the paradigm of Education is emphasized: classes guided by traditional models do not fit this new vision and it is necessary to prepare students for key skills as creativity, communication, critical thinking, innovation and the ability to solve problems through cooperation, besides knowledge.**

- This proposal necessarily implies "changes in pedagogical and didactic practices in order to adapt the overall educational action to the purposes of the students' skills profile."

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Motivation

Publication of the document, by the ME, *Profile of Students Leaving Compulsory Schooling* , approved by Order No. 6478/2017 of 26 July 2017.

- The **principles** , **vision** , **values** and **key competences** in Education for the 21st century are stated.
- This document implies "**changes in pedagogical and didactic practices in order to adapt the entirety of the educational action to the purposes of the students' competence profile**."

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do we have today?

- **Some subjects in the school curriculum:**

- **Network supported by ICT;**
- **Network supported by governmental organizations, or not, companies, universities…**
- **Specific materials** for a practical approach to experimental sciences work in the schools (e.g. applications, *software* , *kits* , communication networks…)
- The **use of pedagogical practices based on valuing experimentation, experiences, know-how, cooperation and sharing** .

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do we have today?

Some other subjects in the school curriculum:

- some more difficulties in identifying supports that promote the educational vision recommended for the 21st century:
- there is much less time and space in which professors and students are invited to get involved in projects supported by governmental or non-governmental, national or international organizations, companies, universities…
- less valued appreciation of them when compared to other subjects (in terms of support outside the school, e.g. in relation to scientific experimental subjects).

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do we have today?

This doesn't mean all schools and subjects are preparing those essential competences indicated by UNESCO for the 21st century education model:

- the promotion of creativity;
- the ability to communicate;
- critical thinking;
- innovation;
- the ability to solve problems through cooperation.

Need to reflect on the pedagogical practice being developed.

How to achieve a successful integration of the school subjects in the new educational paradigm?

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do we have today?

Description of a teacher's practice who spares no effort and prepares his pedagogical practice with care and dedication (Neves Vicente:1998):

He believes that the students will listen to him because what he says is interesting; they will understand it because it simplifies and orders knowledge; they will be attentive because he speaks with confidence on what he says, transmits vivacity and communicates efficiently. At the end of the class, he has the conviction that the students will reproduce what he did and said.

However, on the contrary, he listens: *I heard, but I didn't understand*, *he says it's clear, but it's still confused*, *he says it's wrong, but I don't know what he wants* , (…)

This is the case of the teacher who ***makes the effectiveness of learning depend on the effectiveness of teaching*** .

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do we have today?

- **Prevalence of teaching against the prevalence of learning. (Neves Vicente: 1998).**
- **Very positive results in learning (and in exam results) by excellent students in all subjects).**
- **Greater difficulties in obtaining positive results from the weaker students.**
- **Small investment about leading students to be able to think about real-world problems.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Needing to change practices

It is necessary:

- **To believe that students have interests and that a large ammount of contents are some of them;**
- **To think and find out learning activities that meet the learning interests of students.**
- **To place students at the center of the process;**
- **To prepare classes aimed to develop students' abilities by improving knowledge and skills that, in some way, they already have;**
- **Never abdicate the scientific rigor.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Needing to change practices

It is necessary:

- **To bring students closer to reality, to the world in which we live in, emphasizing theoretical problems as real problems;**
- **To enable students in order to get involved in personal work projects that combine discovery (answers to their questions), learning (course contents) and action (civic intervention) .**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is Experiential Learning?

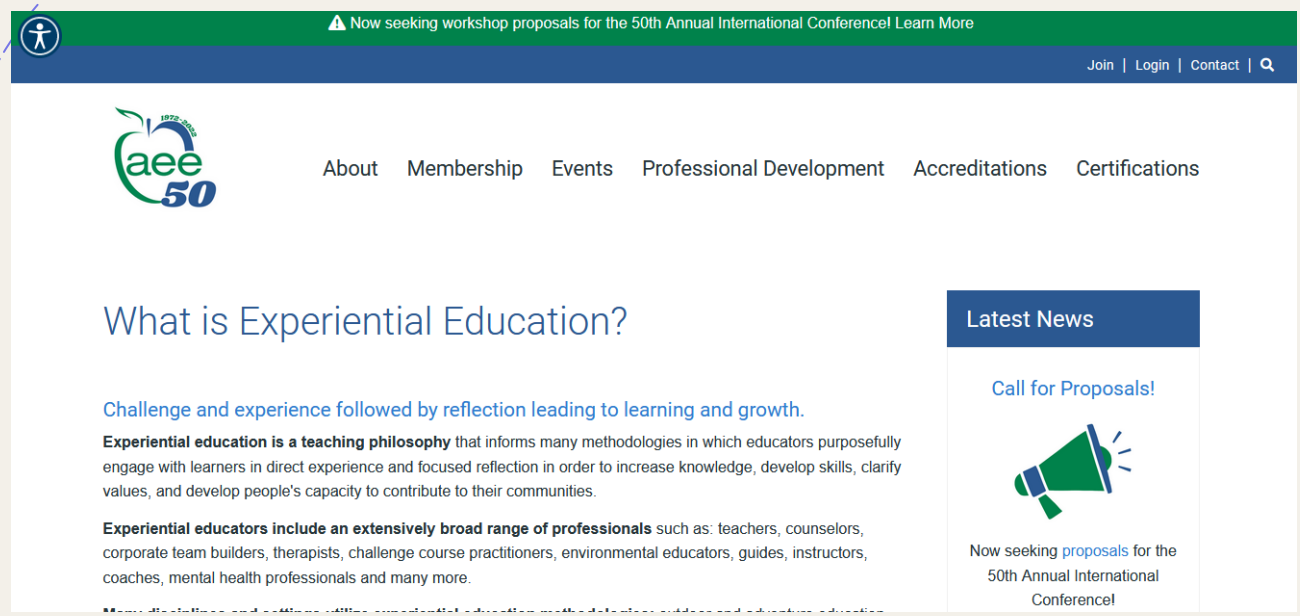
***Association for Experiential education* (2004)**

- It's a philosophy that is at the origin of several methodologies, from which educators create situations that le*a*d to the **involvement of learners in direct experiences,** followed by **reflection .**

It's commonly accepted that, throughout the process of experiential learning: **knowledge is built**, **skills are developed**, values are **clarified and** capacities **to contribute to the (well-being) are enhance in the communities** where learners live.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is Experiential Learning?



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is Experiential Learning?

An experiential learning of the school curriculum:

- **allows the teacher to value the students' life experiences to improve learning in the subjects they have;**
- **allows applying the students' learning and reflections to real life problems or situations.**
- **estimulates and engages students in projects (of value) so that they can intervene in society by exercising a responsible citizenship.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Contemporary contributions to Experiential Learning

John Dewey :

“Experience is what connects us to the future”

- **Learning always takes place in a context of experience. (although not all experiences are of equal educational value)**
- **The “principle of continuity” and the “principle of interaction” underlie a new way of learning that is opposed to the traditional way.**
- **According to the “principle of continuity”, the experiences we have gone through, will condition the experiences we will have in the future .**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Requirements to approach Experiential Education

- Be prepared to accept having a less teacher-centered and more student-centered role.
- The experiences or learning situations chosen or proposed should be always followed by moments **of reflection, analysis and synthesis**.
- Throughout the learning process, students should be encouraged to **ask questions and doubts**, to **investigate**, to **experiment**, to **solve problems**, to assume **responsibilities**, to **be creative** and to **make sense from the outcomes they produce**.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Erasmus+ KA2 Project
"The Future You Choose"
Joint Staff Training Event on **Experiential Learning**

An example of schoolwork in Philosophy using experiential learning by

Mr. Teodósio, J. (Philosophy teacher)

Fundão, Portugal, 8th-13th May 2022

Cofinanciado pelo
Programa Erasmus+
da União Europeia

Agrupamento de Escolas do Fundão
Medalha de Ouro da Cidade do Fundão

Examples: an experiential learning (of Philosophy)

Valuing students' experiences for the consolidation of learning

- **Starting from life experiences and the experiences that students have**, in relation to some of the subject contents
- **Value students' contributions, which will be subjected to further reflection** .

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning of (Philosophy)

Operational example:

- Working groups formed.
- Maximum 3 of 4 students a group.
- Curricular contents of the 10th grade: **Logical Argumentation and Speech.**

TASK:

*- Identify, in some **speeches** that you have recalled (in sports, politics, advirtesements) the fallacies that may be present on them.*
- Explain, in your own words, what they consist of and the intention of the speecher using them.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning of (Philosophy)

- This implies students to remember and reflect about a realistic situation that may demonstrate, after students' self inspection, the validity of the argumentation in a given speech.
- The group will carry out an analysis and reflection on the chosen speech and assess its quality, regarding the logical argumentation.
- Requires previous readings in the manual and guidance from the teacher.
- It's expected that, later, this task prepares them for the refusal of invalid, false and therefore fallacious speeches in real life.

FINAL PRODUCT:

Writing a Dictionary of Fallacies, published in *Moodle platform,* whose technical terms to be defined are the fallacies explained from the cases analyzed in the speeches chosen by the students.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning of (Philosophy)

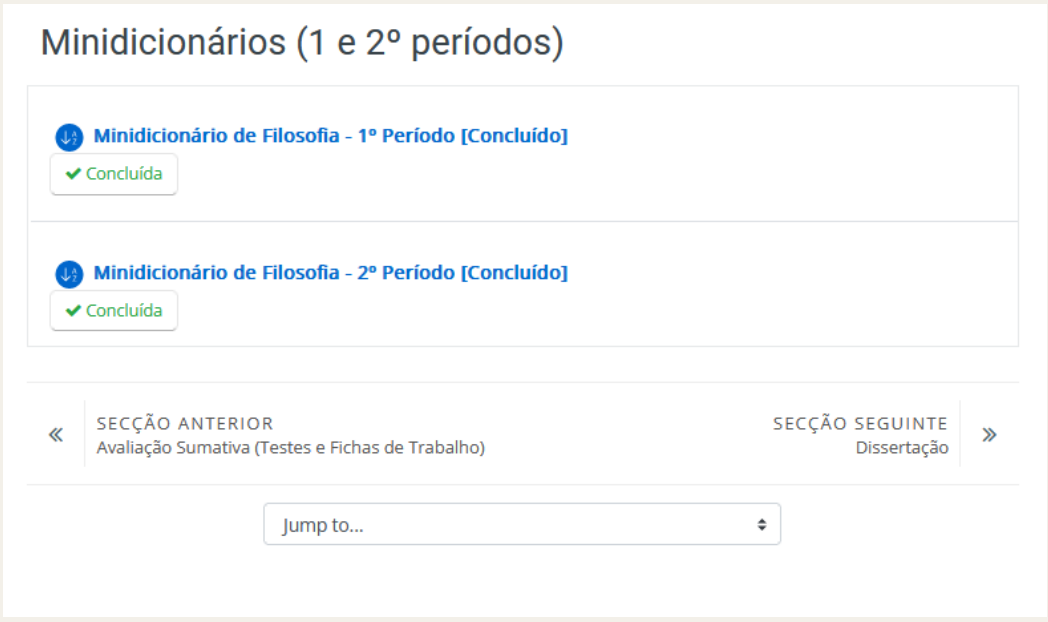
FINAL PRODUCT:

Writing a *Dictionary of Philosophy,* published in *Moodle platform,* whose "technical" terms to be defined are also the fallacies explained from the cases analyzed in the speeches chosen by the students.

The Dictionary is shared by all the students of the same level an may work as a self-made school manual under several specific subject contents.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning of (Philosophy)



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning of (Philosophy)



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Examples: an experiential learning (of Philosophy)

Valuing students' experiences for the consolidation of learning

- **10th grade. Unit:** argumentation and rhetoric. The means of rhetorical persuasion proposed by Aristotle: *ethos , logos and pathos* .
- **Clarifying** students about the importance of rhetoric in today's world, especially in the fields of politics and justice in democratic societies with market economies.
- It is suggested the integration of the subjects of Law, Economics and Portuguese, **taking into account todays' scenario of curricular flexibility** .

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A experiential learning (of Philosophy)

Proposed learning situation:

- use the Philosphy contents to **make a film or poster in order to persuade an audience using Aristotle rethorical strategies.**

<u>Themes proposed by the students for films and/or posters</u>:

- **fire prevention; alcohol and driving prevention; improve the environment condition, preventing domestic violence or *bullying*; promotion of tourism in the region; promotion of healthier lifestyles** , (…).
- Need to carry out a research, outside the scope of the subject, regarding current *marketing* and advertising techniques. Interactions with other school subjects are expected.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A experiential learning (of Philosophy)

Criteria:

- **It has to include one of the means of persuasion suggested by Aristotle.**
- It has to include, implicitly or explicitly, one of the three studied non-deductive arguments.
- **It may include, if necessary, one or more of the informal fallacies studied before.**
- It reveals creativity.
- It reveals clear and correct Portuguese text in syntax, punctuation and spelling.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A experiential learning (of Philosophy)

- Students have about a month to complete their work.
- Presentation to the class (or other classes) of the final product (10 to 15 minutes).
- The presentation of the works to the class or to other classes requires that, at the end of the presentation of the final product , the group explains to the class(es) what were the main persuasion strategies that are present (according to Aristotle's proposals) and were used, as well as the typification of arguments present in the work.
- Classmates who attend the presentation can ask for clarification regarding the effectiveness of the means of persuasion used and suggest alternatives.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Examples: an experiential learning (of Philosophy)

Involving students in carrying out (valuable) projects

The class as an opportunity for involvement in **actions with value** that may make the world socially fairer.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning (of Philosophy)

Activity (learning situation) to be proposed:

Contents to be learned: Values. (10th grade):

1 - Identificating and analysing cases of human rights violations in 20xx, according to **Amnesty International**.

2 – Groups of students write an **argumentative text** aimed to persuade countries governments, where there are evident situations of Human Rights violations, to change their practices.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

An experiential learning (of Philosophy)

Action in the Value Project

3 - Inclusion in the **Amnesty International** project, Marathon of *Letters*: it consists of sending signed postcards to Government officials in countries where situations violating human rights are identified and denounced. So:

The students involved in the activity include their texts in this project and and the school sends them to Amnesty International, who will take them to their destination.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

MARATONA DE CARTAS 2018

RESISTIMOS JUNTOS, VENCEMOS JUNTOS

OS CASOS DA MARATONA DE CARTAS



Atena Daemi – Irão

Tal como tantas outras pessoas, Atena Daemi sonha com o fim da pena de morte no Irão. Criticou o recorde de execuções do país nas redes sociais, distribuiu panfletos e participou num protesto pacífico contra a execução de uma jovem mulher, entre outras ações.

Inacreditavelmente estas simples ações foram usadas como "provas" para a condenar a sete anos de prisão. O seu julgamento demorou apenas 15 minutos e, já na prisão, foi alvo de ataques violentos e degradantes. É mais um exemplo cruel de como o Irão silencia o ativismo pacífico. Atena Daemi deve ser libertada hoje!



Marielle Franco – Brasil

Marielle Franco lutou destemidamente por um Rio de Janeiro mais justo. Lutou por mulheres negras, pessoas LGBTI, jovens e condenou as execuções ilegais cometidas pela polícia. Infelizmente foi silenciada, assassinada a tiro no seu carro. Uma ação que faz parte de uma tendência no Brasil, onde pelo menos 70 defensores de direitos humanos foram mortos em 2017. No Brasil, as pessoas que defendem os direitos humanos vivem com um medo permanente. Queremos justiça por Marielle Franco!



Nonhle Mbuthuma – África do Sul

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Bibliography

Breunig, Mary. Turning Experiential Education and Critical Pedagogy Theory into Praxis.

Journal of Experiential Education, Volume 28, Nº2, 2005.

David A. Kolb. Experiential Learning: Experience as the Source of Learning and Development. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1984

Dewey, John. Experience and Education. Touchstone Book, Simon & Schuster, Nova Iorque, 1997

Ferreira, Maria Luísa Ribeiro, Didáctica da Filosofia e Investigação, A Possível Aplicação do Projecto "Uma Filosofia no Feminino" ao Programa de Introdução à Filosofia. Os Actuais Programas de Filosofia do Secundário – Balanço e Perspetivas, Centro de Filosofia da Universidade de Lisboa, Departamento do Ensino Secundário do Ministério da Educação, Lisboa, 1998. (1998)

Freire, Paulo. A Pedagogia do Oprimido. Editora Paz e Terra, São Paulo, 1994.

Julinna Oxley, Ramona Ilea. Experiential Learning in Philosophy. Routledge (Taylor & Francis), Londres, 2015

Ministério da Educação. Perfil dos alunos à saída da Escolaridade Obrigatória, Editorial do Ministério da Educação e Ciência, Lisboa, 2017. Disponível em: https://www.dge.mec.pt/sites/default/files/Curriculo/Projeto_Autonomia_e_Flexibilidade/perfil_dos_alunos.pdf

Vicente, J. Neves. Subsídios para um paradigma organizador do ensino da Filosofia enquanto disciplina escolar da educação secundária. Os Actuais Programas de Filosofia do Secundário – Balanço e Perspetivas, Centro de Filosofia da Universidade de Lisboa, Departamento do Ensino Secundário do Ministério da Educação, Lisboa, 1998.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Erasmus+ KA2 Project
"The Future You Choose"
Joint Staff Training Event on **Experiential Learning**

An example of schoolwork in Geology using experiential learning by

Mr. Fidalgo, J.P. (Biology & Geology teacher)

Fundão, Portugal, 8th-13th May 2022

Cofinanciado pelo
Programa Erasmus+
da União Europeia

Agrupamento de Escolas do Fundão
Medalha de Ouro da Cidade do Fundão

Slope movements — modeling risk assessment of our neighbourhood



[1]

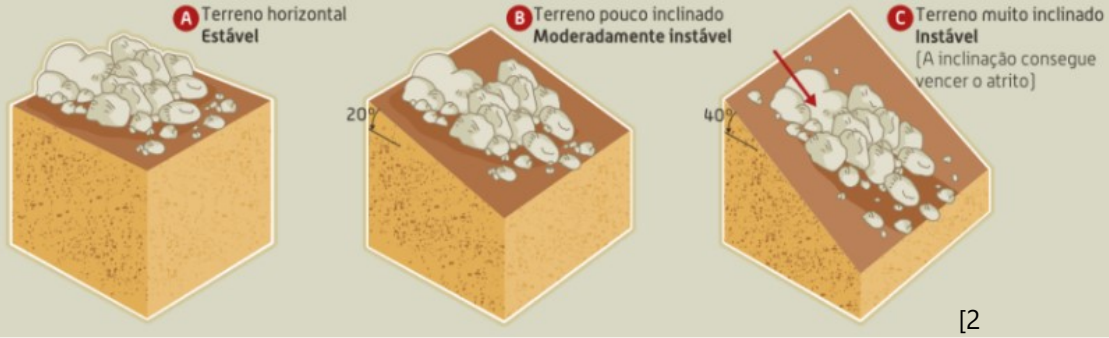
Experiential learning in high school education — 11th degree (16 year old students)

João Fidalgo, Agrupamento de Escolas do Fundão — Portugal

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Fatores condicionantes

Os movimentos em massa num terreno são, antes de qualquer outro fator, fortemente condicionados pela inclinação do terreno e, consequentemente, pela **força da gravidade**. Contudo, o contexto geológico e as características geomorfológicas da área considerada podem ser fatores determinantes.



[2]

Methods:

Traditional lecture using audiovisual media and low interactivity

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A potential STEM approach:

Scope: Geological risk and environmental risk assessment (integrating the anthropogenic occupation and planning problems)

Objectives:

- Mastering basic concepts about naturally occurring geological conditions
- Integrating knowledge of physics about motion on the inclined plane
- Recognizing triggering factors of natural accidents
- Developing observation and reasoning skills
- Building models
- Effectively communicating results

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Motivational session and getting started (1-2 hours)

- **Explanation of work methodology**
- **Display of some motivational videos on the frequency and severity of slope movements ⊛**
- **Task presentation**
- **Group formation**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

For a class of 24 students, 6 groups were formed, in which they were asked to group themselves by interests in subjects and not in people.

The subjects were:

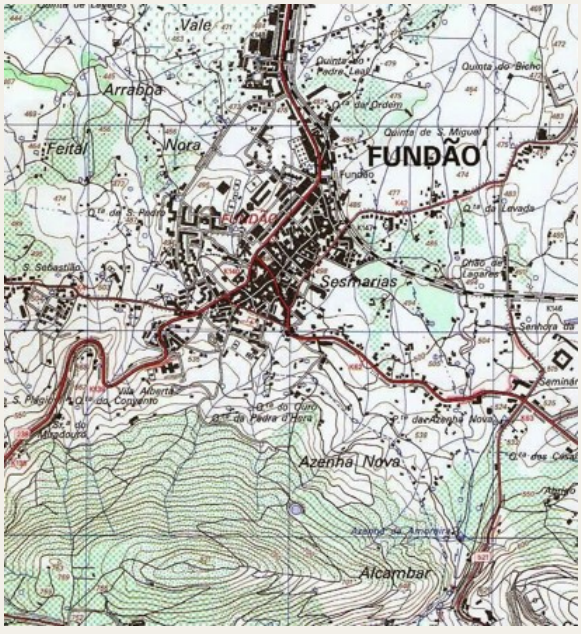
1. **“Department of Physics and Mathematics” — studies the slope**
2. **“Meteorology Department” — studies precipitation**
3. **“Geochemistry Department” — studies lithology and weathering products**
4. **“Biology Department” — studies the vegetation cover component**
5. **“Management Department” — studies laws that regulate the management of territory**
6. **“Engineering Department” — studies urban planning and land use**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

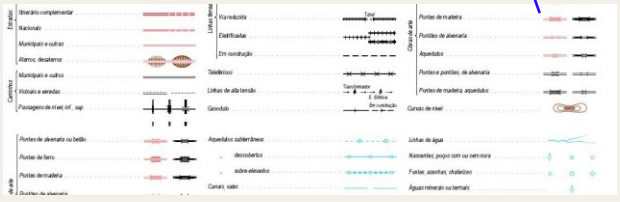
Initial task common to all groups:

Studying the graphic representation of Serra da Gardunha on military maps.

Understanding the meaning of the concepts associated with the legend of the cards, including the scales.



[3]



[4]

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

1. **“Department of Physics and Mathematics” — studies the slope**

- **Determining the approximate slope of various transects.**
- **Preparing a presentation on the methodology for determining the slope and the obtained results relevant as risk factors for landslides.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

2. "Meteorology Department" — studies precipitation

- **Accessing the IPMA website and the climate tab "climatological norms". Based on 3 stations in the region, determining the days and amount of maximum precipitation for each season.**
- **Based on the topographic map, making an estimate of the area of the watershed of one of the water lines that passes through the Fundão area.**
- **Next, estimating the water capable of draining after episodes of intense but short-lived precipitation (disregarding, at this stage, the components of infiltration, evaporation and evapotranspiration).**
- **Preparing a presentation on the subject.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

3. **“Geochemistry Department” studies lithology and weathering products**

- **Accessing available geological maps.**
- **Trying to characterize the geological aspects of Serra da Gardunha in terms of lithology, age and the main materials present.**
- **Preparing a presentation on the topic.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

4. “Biology Department” — studies the vegetation cover component

- **Based on the military map 1:25000, from the northern slope of Serra da Gardunha and based on satellite images (Google maps), outlining different patches of spontaneous and cultivated vegetation.**
- **Attempting to characterize the erosion risks of Serra da Gardunha based on flora and vegetation.**
- **Preparing a presentation on the subject.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

5. **“Management Department” — studies laws that regulate the management of territory**

- **Studying the regulatory documents of land occupation and use in the municipality of Fundão and synthetizing them.**
- **Preparing a presentation on the subject.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Other tasks:

6. “Engineering Department” — studies urban planning and land use

- **Cross-referencing data from aerial photography (Google maps) and a topographical map (military map 1:25000).**
- **Identifying potential risk areas on the slopes of Serra da Gardunha and/or along water lines.**
- **Preparing a presentation on the subject.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Observation on the slopes of Serra da Gardunha, over Fundão, of possible risk situations.





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Contrast between the wooded area and new areas cleared for cherry orchards.





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

The new challenge — a multidisciplinary team

- **The former members of each group, constituted by interests in a particular area, are invited to join new groups, constituting a multidisciplinary team.**
- **Each new group was proposed to study how a variable could influence the eventual occurrence of slope movements, building models with recycled materials.**
- **Students were free to build and test the models.**
- **They were asked to reliably measure the results.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Creating and testing





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Creating and testing





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Creating and testing





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Creating and testing





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Communication

The last phase was designed to make students face the need to communicate their results to the community. Two proposals were made:
— Poster communication;
— Face-to-face communication with the community.

Unfortunately, general confinement arrived and only the first proposal was implemented...

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Poster communication



A contribuição das raízes na fixação do solo - o caso específico da Serra da Gardunha

Bruno Justino, Constança Lopes, Raquel Brites - Agrupamento de Escolas do Fundão

Introdução: A Serra da Gardunha, apresenta regimes declivosos e, por consequinte o risco de derrocadas neste local é elevado, situação agravada pelas alterações climáticas que aparentemente favorecendo regimes torrenciais, isto é, fenómenos de elevada precipitação num curto espaço de tempo. Com a realização deste trabalho, pretendemos estudar qual o tipo de raiz que fixa melhor o solo e consequentemente, tem um maior efeito preventivo no risco de deslizamento de terra. As raízes estudadas são provenientes das árvores mais abundantes na Serra da Gardunha, nomeadamente o Carvalho, (*Quercus pyrenaica*), o Pinheiro-bravo, (*Pinus pinaster*) e a Mimosa, (*Acacia dealbata*), a primeira exótica e as seguintes introduzidas.

Metodologia: Na tentativa de recriar o mais fielmente possível o ambiente natural destas espécies, plantaram-se vários exemplares jovens das espécies referidas anteriormente. Estes exemplares, bem como o solo onde se foram crescer foram recolhidos, com o maior dos cuidados, na Serra da Gardunha. As plantas cresceram todas segundo as mesmas condições ambientais (mesma quantidade de solo, água e luz).

A seguir o procedimento experimental, as plantas foram expostas a uma inclinação de 29º - inclinação máxima que se encontra na Serra da Gardunha (determinada após estudo da topografia local em saída de campo e por estudo da carta topográfica militar (IGE, 1999)). Nas condições experimentais, foram medidas a massa de água e a quantidade de solo perdidas em cada ensaio, quando sujeitos a condições de precipitação. Os ensaios utilizados foram quatro - três deles possuíam exemplares de cada uma das espécies de plantas estudadas e, utilizou-se ainda um quarto grupo, de controlo, onde não havia qualquer tipo de vegetação.

Fig.1- Montagem Experimental

Fig.2- Método de rega

O sistema de rega utilizado, com o qual se pretendeu simular precipitação foi elaborado a partir de uma garrafa de água (330ml). De modo a que a água caísse sob a forma de chuva foram feitos 8 furos na rolha da garrafa. A garrafa utilizada foi a mesma em todos os grupos.

Fig.3- Sistema utilizado para determinar a massa de solo e o volume de água obtido

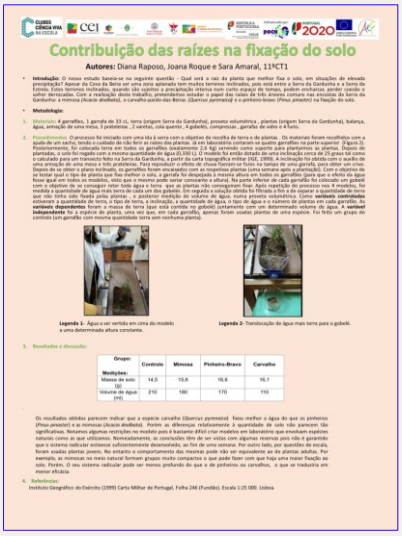
De modo a determinar o volume de água e a massa de solo de cada grupo de árvores, bem como do controlo colocou-se um gobelé ao fundo da montagem. Assim, foi possível através do método de filtração, separar o solo da água, para fazer as medições necessárias.

Tab.1- Resultados obtidos nas quatro condições testadas.

Grupo:	Controlo	Mimosa	Pinheiro-Bravo	Carvalho
Medições:				
Massa de solo perdida (g)	14,5	15,6	16,6	16,1
Volume de água perdida (ml)	210	180	170	110

Discussão: De acordo com os resultados apresentados na tabela 1 verifica-se que, das três espécies estudadas, o que favorece mais o escoamento das águas provenientes da chuva é a Acácia dealbata (mimosa), sendo que, por conseguinte é a raiz que têm um maior efeito preventivo no risco de derrocadas. Verifica-se ainda, que o escoamento das águas atinge o maior valor quando o solo não possui vegetação. Os resultados obtidos não foram conclusivos, pois as plantas utilizadas não apresentavam um desenvolvimento que pudesse ser comparado com o das árvores que se encontram na Serra da Gardunha.

Referências:
Instituto Geográfico do Exército (1999) Carta Militar de Portugal, Folha 246 (Fundão). Escala 1:25 000. Lisboa.



Contribuição das raízes na fixação do solo

Autores: Diana Raposo, Joana Roque e Sara Amaral, 11ºCT1

- **Introdução:** O nosso estudo baseia-se na seguinte questão - Qual será a raiz da planta que melhor fixa o solo, em situações de elevada precipitação? Apesar da Cova da Beira ser uma zona agrícola tem muitos terrenos inclinados, pois está entre a Serra da Gardunha e a Serra da Estrela, são propensas a derrocadas. Estas dependem de diferentes factores como: declive do terreno, tipo de solo, quantidade de precipitação por unidade de tempo, tipo/densidade de vegetação existente, etc. Com o objetivo de conhecer melhor os factores subjacentes às derrocadas e aos movimentos em massa, foi decidido estudar a influência do tipo de solo (classificado com base na rocha-mãe que o originou) no risco de derrocadas/movimentos em massa.
- **Metodologia:**
  1. Materiais: 4 garrafões, 1 garrafa de 33 cL, terra (origem Serra da Gardunha), proveta volumétrica , plantas (origem Serra da Gardunha), balança, água, arrolação de uma mesa, 3 prateleiras , 2 varetas, cola quente , 4 gobelés, compressas , garrafas de vidro e 4 funis.
  2. Procedimento: O processo foi iniciado com uma ida à serra com o objetivo de recolha de terra e de plantas . Os materiais foram recolhidos com a ajuda de um sacho, tendo o cuidado de não ferir as raízes das plantas .Já em laboratório cortaram-se quatro garrafões na parte superior (Figura 2). Posteriormente, foi colocado terra em todos os garrafões (aproximadamente 2,6 Kg) servindo como suporte para plantarmos as plantas. Depois de plantadas, o solo foi regado com a mesma quantidade de água (0,330 L). O modelo foi então dotado de uma inclinação cerca de 25 graus tal como a encontrada na Serra da Gardunha (determinada após estudo da topografia local em saída de campo e por estudo da carta topográfica militar (IGE, 1999)) e uma arrolação de uma mesa e três pratelerias. Para reproduzir o efeito de chuva fizeram-se furos na tampa de uma garrafa, para obter um crivo. Depois de se obter o plano inclinado, os garrafões foram encaixados com as respetivas plantas (uma semana após a plantação). Com o objetivo de ser possível medir a água que passa pelo solo, foram colocados gobelés por baixo dos garrafões. Para que a quantidade de água fosse igual em todos os modelos, visto que o mesmo pode variar consoante a altura). Na parte inferior de cada garrafão foi colocado um gobelé com o objetivo de se conseguir reter toda água e terra que as plantas não conseguiram fixar. Após repetição do processo nos 4 modelos, foi medida a quantidade de água mais terra de cada um dos gobelés. Em seguida a solução obtida foi filtrada a fim a ela separar a quantidade de terra que não tinha sido fixada pelas plantas , e posterior medição do volume de água, numa proveta volumétrica. Como **variáveis controladas** foram a massa de solo (que está contida no gobelé) juntamente com um determinado volume de água. A **variável independente** foi a espécie de planta, uma vez que, em cada garrafão, apenas foram usadas plantas de uma espécie. Foi feito um grupo de controlo (um garrafão com mesma quantidade terra sem nenhuma planta).

Legenda 1- Água a ser vertida em cima do modelo a uma determinada altura constante.

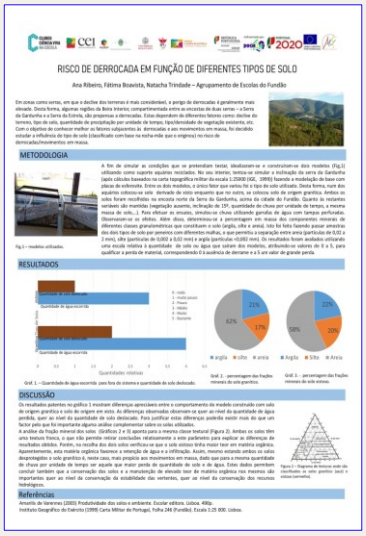
Legenda 2- Translocação de água mais terra para o gobelé.

3. Resultados e discussão:

Grupo:	Controlo	Mimosa	Pinheiro-Bravo	Carvalho
Medições:				
Massa de solo (g)	14,5	15,6	16,6	16,1
Volume de água (ml)	210	180	170	110

Os resultados obtidos parecem indicar que a espécie carvalho (*Quercus pyrenaica*) fixou melhor a água do que os pinheiros (*Pinus pinaster*) e as mimosas (*Acacia dealbata*). Porém as diferenças relativamente à quantidade de solo não parecem tão significativas. Notaram-se algumas restrições no modelo pois é bastante difícil criar modelos em laboratório que envolvam espécies naturais como as que utilizamos. Nomeadamente, as conclusões tiro de ser vistas com algumas reservas pois não é garantido que o sistema radicular estivesse suficientemente desenvolvido, ao fim de uma semana. Por outro lado, por questões de escala, foram usadas plantas jovens. No entanto o comportamento das mesmas pode não ser equivalente ao de plantas adultas. Por exemplo, as mimosas no meio natural formam grupos muito compactos e que pode fazer com que haja uma maior fixação ao solo. Porém. O seu sistema radicular pode ser menos profundo do que o de pinheiros ou carvalhos, o que se traduzira em menor eficácia.

4. Referências:
Instituto Geográfico do Exército (1999) Carta Militar de Portugal, Folha 246 (Fundão). Escala 1:25 000. Lisboa.



RISCO DE DERROCADA EM FUNÇÃO DE DIFERENTES TIPOS DE SOLO

Ana Ribeiro, Fátima Boavista, Natacha Trindade – Agrupamento de Escolas do Fundão

Em zonas como serras, em que o declive dos terrenos é mais considerável, o perigo de derrocadas é geralmente mais elevado. Desta forma, algumas regiões da Beira Interior, compartimentada entre as encostas de duas serras – a Serra da Gardunha e a Serra da Estrela, são propensas a derrocadas. Estas dependem de diferentes fatores como: declive do terreno, tipo de solo, quantidade de precipitação por unidade de tempo, tipo/densidade de vegetação existente, etc.
Com o objetivo de conhecer melhor os fatores subjacentes às derrocadas e aos movimentos em massa, foi decidido estudar a influência do tipo de solo (classificado com base na rocha-mãe que o originou) no risco de derrocadas/movimentos em massa.

METODOLOGIA

A fim de simular as condições que se pretendiam testar, idealizaram-se e construíram-se dois modelos (Fig.1) utilizando como suporte aquários reciclados. No seu interior, tentou-se simular a inclinação da serra da Gardunha (após cálculos baseados na carta topográfica militar da escala 1:25000 (IGE, 1999)) fazendo a modelação de base com placas de esferovite. Entre os dois modelos, o único fator que variou foi o tipo de solo utilizado. Desta forma, num dos aquários colocou-se solo derivado de xisto enquanto que no outro, se colocou solo de origem granítica. Ambos os solos foram recolhidos na encosta norte da Serra da Gardunha, acima da cidade do Fundão. Quanto às restantes variáveis são mantidas (vegetação ausente, inclinação de 19º, quantidade de chuva por unidade de tempo, a mesma massa de solo,...). Para efetuar os ensaios, simulou-se chuva utilizando garrafas de água com tampas perforadas. Observaram-se os efeitos. Além disso, determinou-se a percentagem em massa dos componentes minerais de diferentes classes granulométricas que constituem o solo (argila, silte e areia). Isto foi feito fazendo passar amostras dos dois tipos de solo por peneiros com diferentes malhas, o que permitiu a separação entre areia (partículas de 0,02 a 2 mm), silte (partículas de 0,002 a 0,02 mm) e argila (partículas <0,002 mm). Os resultados foram avaliados utilizando uma escala relativa à quantidade de solo ou água que saíram dos modelos, atribuindo-se valores de 0 a 5, para qualificar a perda de material, correspondendo 0 à ausência de derrame e a 5 um valor de grande perda.

Fig.1 – modelos utilizados.

RESULTADOS

Gráf. 1 – Quantidade de água escorrida para fora do sistema e quantidade de solo deslocado.

Gráf. 2 – percentagem das frações minerais do solo granítico.

Gráf. 3 – percentagem das frações minerais do solo xistoso.

DISCUSSÃO

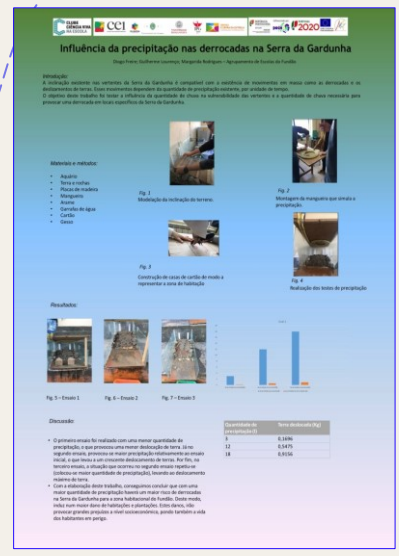
Os resultados anteriores no gráfico 1 mostram diferenças apreciáveis entre o comportamento do modelo constituído com solo de origem granítica e solo de origem em xisto. As diferenças observadas observam-se quer ao nível da quantidade de água perdida, quer ao nível da quantidade de solo deslocado. Para justificar estas diferenças poderão existir mais do que um factor pelo que foi importante alguma análise complementar sobre os solos utilizados.
A análise da fração mineral dos solos (Gráficos 2 e 3) aponta para o mesmo classe textural (Figura 2). Ambos os solos têm uma textura franca, o que não permite retirar conclusões relativamente a este parâmetro para explicar as diferenças de resultados obtidos. Porém, no recolha dos dois solos verificou-se que o solo xistoso tinha maior teor em matéria orgânica. Aparentemente, esta matéria orgânica favorece a retenção de água e a infiltração. Assim, mesmo estando ambos os solos despenteados e solo granítico é, neste caso, mais propício aos movimentos em massa, dado que para a mesma quantidade de chuva por unidade de tempo ser aquele que maior perda de quantidade de solo e de água. Estes dados permitem concluir também que a conservação dos solos e a manutenção de elevado teor de matéria orgânica nos mesmos são importantes quer ao nível da conservação da estabilidade das vertentes, quer ao nível da conservação dos recursos hídricos.

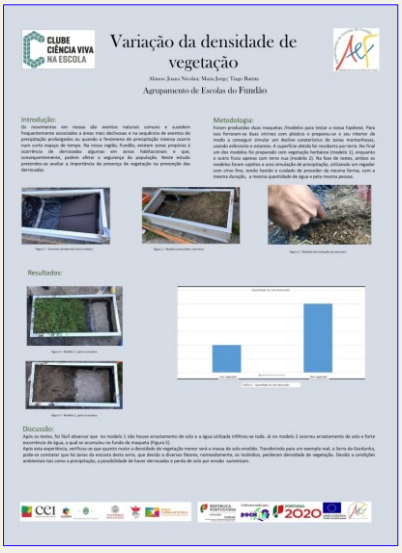
Figura 2 – Diagrama de textura onde são classificados os solos graníticos (azul) e xistosos (vermelho).

Referências
Amaral, de Varennes (2005) Produtividade dos solos e ambiente. Escolar editora. Lisboa. 490p.
Instituto Geográfico do Exército (1999) Carta Militar de Portugal, Folha 246 (Fundão). Escala 1:25 000. Lisboa.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Poster communication







© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Conclusion

- **The project includes STEM activities that combine different subjects (biology, chemistry, geology, physics).**
- **It also includes some abilities (observation, using maps, team work, developing models using recycled materials, producing reports using unusual software and communicating it).**
- **The work resulted in the mastering of new knowledge and abilities fundamental in certain research problem solving.**
- **Experiments offer a possibility for the teacher to involve students on the understanding of science concepts more easily.**

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Image credits

[1] Guerner Dias, A.; Guimarães, P. Rocha, P. (2008) Geologia 11; Biologia e Geologia 11.ºano. Areal editores. Porto
[2] Zêzere, J.L. (2001) Distribuição e ritmo dos movimentos de vertente a norte de Lisboa. Centro de estudos geográficos; área de geografia física e ambiente; Relatório nº 38, *in*: https://repositorio.ul.pt/bitstream/10451/39440/1/Zezere_2001_acesso%20aberto.pdf, 1/5/2022.
[3] Carta Militar 1:25000; Instituto Cartográfico do Exército
[4] http://mapas.dgterritorio.pt/ , 1/5/2022 (adapted).

Other images - author with the consent of all the participants.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Erasmus+ KA2 Project
"The Future You Choose"
Joint Staff Training Event on **Experiential Learning**

An example of school work in Physics using experiential learning by

Mrs. Ramos, M.T. (Physics & Chemistry teacher)

Fundão, Portugal, 8th-13th May 2022

Cofinanciado pelo
Programa Erasmus+
da União Europeia

Agrupamento de Escolas do Fundão
Medalha de Ouro da Cidade do Fundão

Presenting myself and the subject

Hello everyone!

Before we begin let me introduce myself briefly and the subject of this talk.

I’m Teresa and I teach Physics and Chemistry at this school.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Presenting myself and the subject

I want to give you an example of how I have used Experiential Learning with some of my students in my Physics class.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Introduction

+ I will begin by outlining the subjects of Physics that the students learn in secondary school.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Introduction

+ Then I will go on to highlight what is a cansat and how cansats offer a unique opportunity for students to have a first practical experience of a real space project.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Introduction

+ Finally, I will briefly present what my students did in the Final CanSat competition in Ponte de Sor in September 2021.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A little experiment

I would just like to know how you feel about experiential learning.

May I ask you to stand up, please?

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A little experiment

Could everyone who believes that experiential learning is important sit down.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A little experiment

+ Those of you who are still standing may sit down now as well.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

A little experiment

+ Most of you consider that experiential learning is important.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What do students learn in Physics?

+ Motion and Forces
+ Energy
+ Electromagnetism
+ Telecommunications

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is CanSat?

CanSat is an initiative of the European Space Agency that challenges students from all over Europe to build and launch a mini satellite the size of a soda can.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is CanSat?

The challenge for the students is to fit all the major subsystems found in a satellite , such as power, sensors and a communication system into the volume and shape of a soft drink can.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is CanSat?

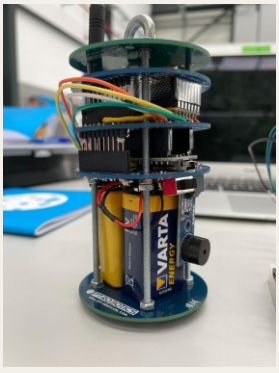
The CanSat is then launched by a rocket up to an altitude of approximately one kilometre.

Then its mission begins. This involves carry out a scientific experiment achieving a safe landing , and analysing the data collected.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

What is a CanSat?





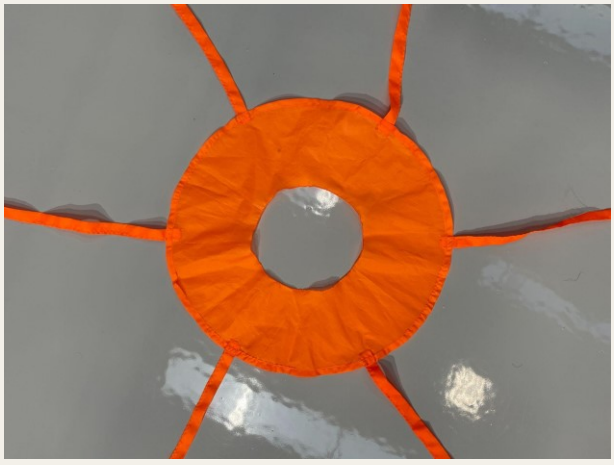


1st image - The parachute, the electronic structure and the Yagi antenna

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

THE PARACHUTE





2nd image - A parachute with a hole in the centre

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

THE PARACHUTE

What is the purpose of the hole in the parachute?

To stabilize the trajectory, allowing the can to fall in a straight line instead of spinning around.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

PARACHUTE TEST





3th image - Release of the Cansat from the top of a fire engine ladder in December 2021

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

PARACHUTE TEST

The velocity of fall must be between 8 and 11m/s

The average velocity of the can was calculated by the students.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

CANSAT LAUNCH AND RELEASE

The rocket launches up to an average of 1000m at which point the can is released.

1st video - The rocket launch

https://youtu.be/qbmDr93-zcw

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

FORCES ACTING IN THE PARACHUTE

What forces act in the parachute immediately after it leaves the rocket?

The forces acting on the parachute reach 500N (approximately 50kg)

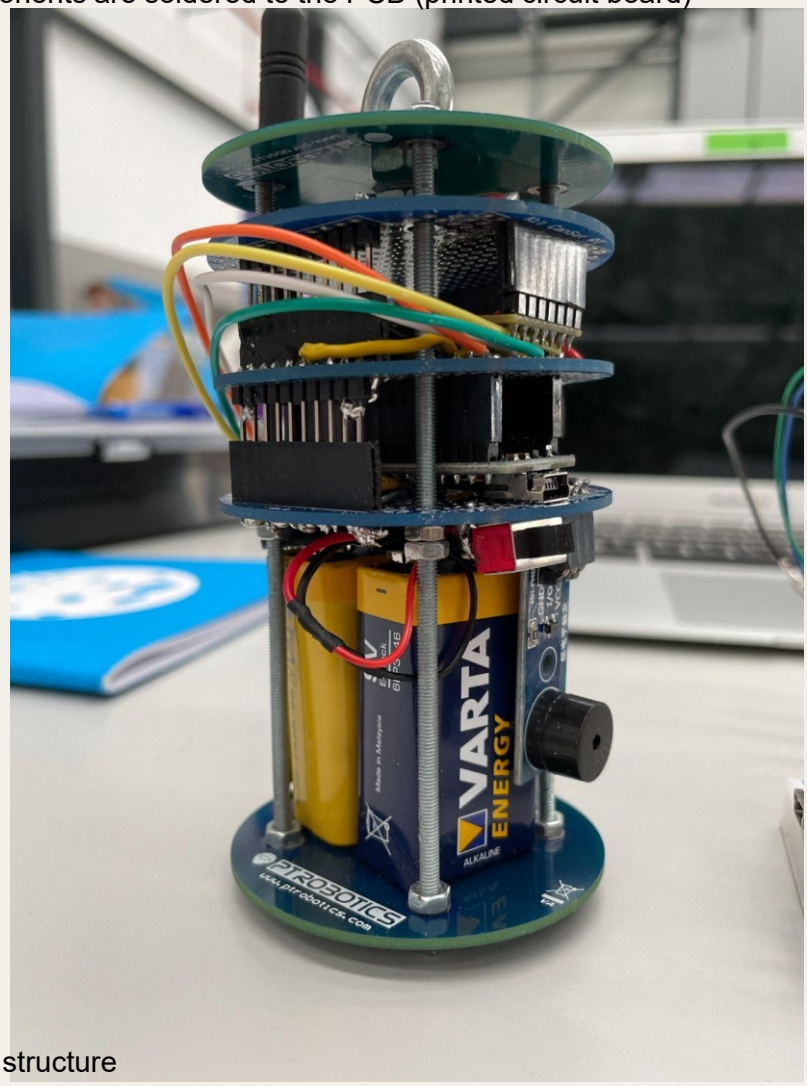


4th image - Parachute traction test, in UBI in March 2020

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

THE ELECTRIC STRUCTURE OF THE CAN

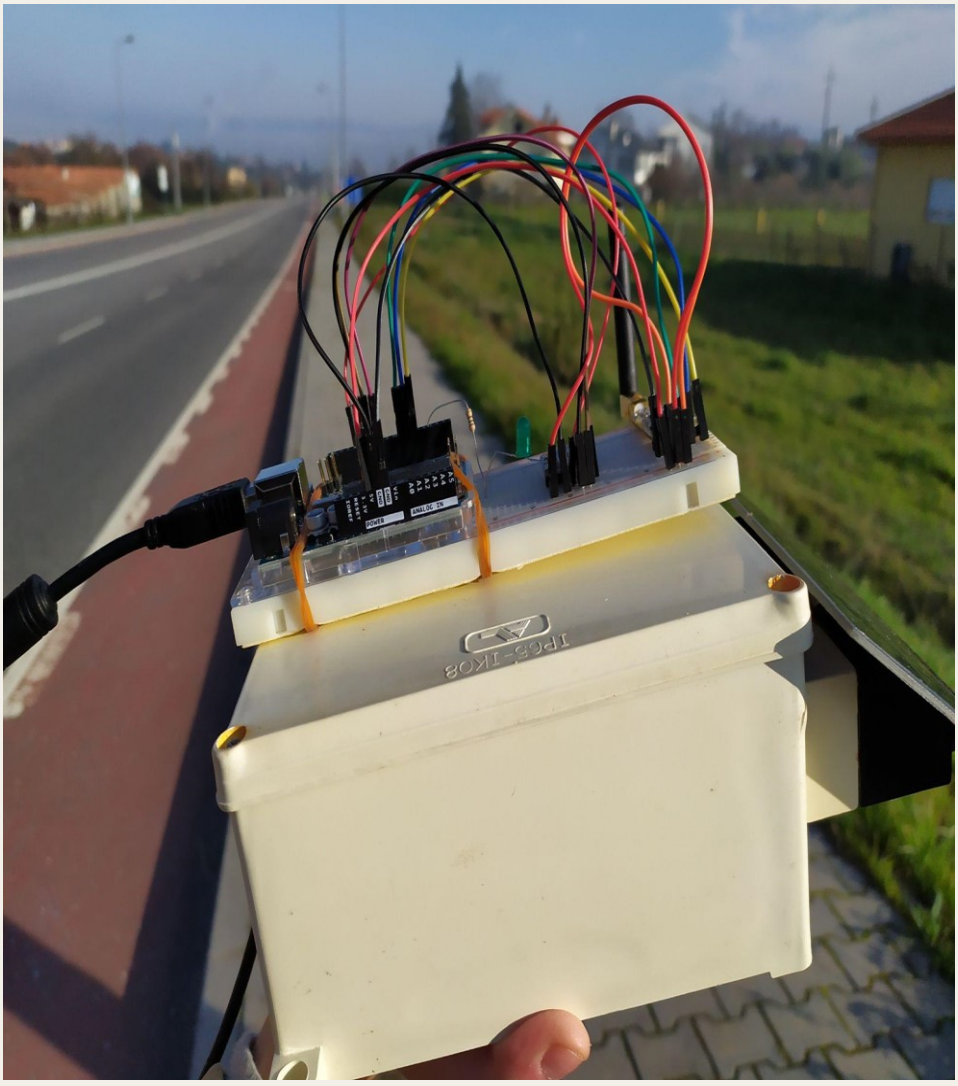
The electrical components are soldered to the PCB (printed circuit board)



5th image - Electric structure

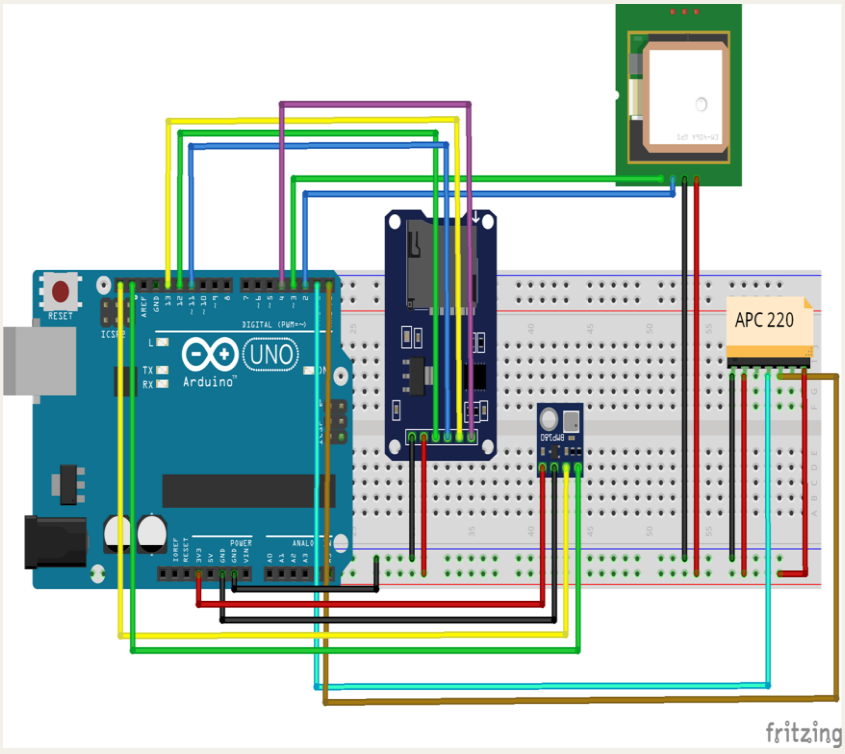
© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

ELECTRIC CIRCUITS ON THE BREADBOARD



© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

SCHEMATIC OF THE ELECTRONICS



7th image - Circuit drawn on Fritzing which is a CAD (Computer Aided Design) for the design of electronics hardware

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

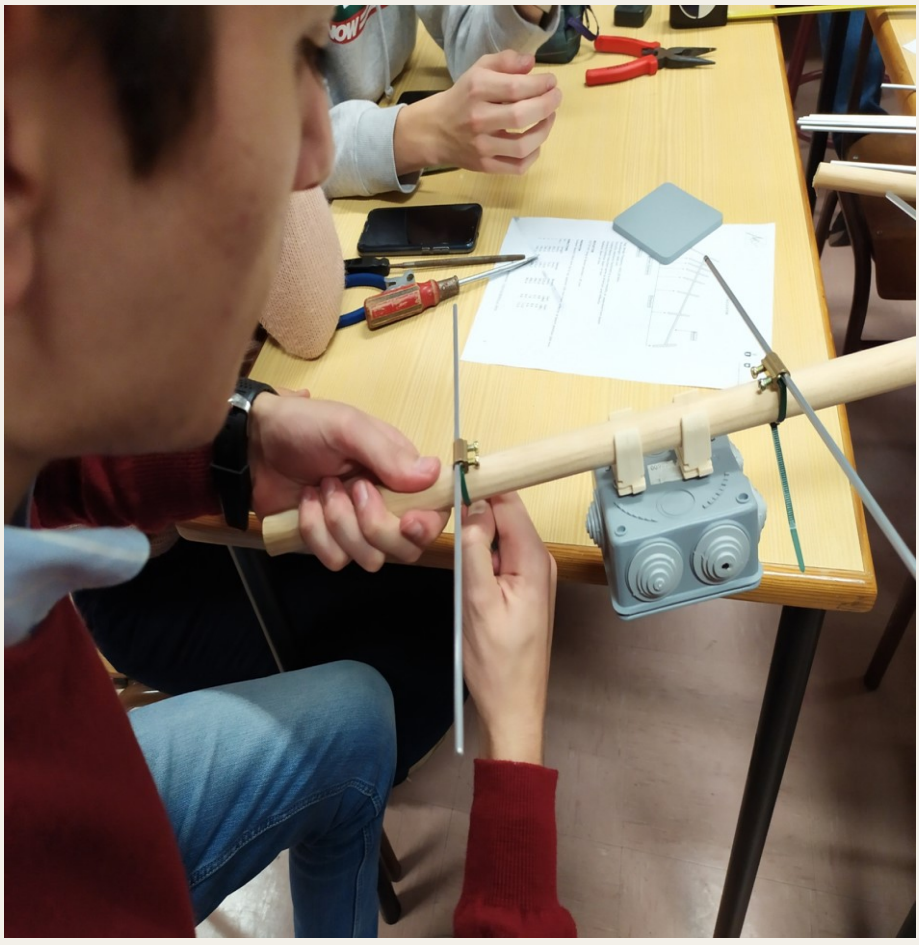
TELEMETRY COMMUNICATION BETWEEN THE CAN AND THE GROUND-STATION



8th image - The Yagi antenna pointed to the Can

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

CONSTRUCTION OF THE YAGI ANTENNA



9th image - Construction of the Yagi antenna in the Institute Polytechnic of Castelo Branco (IPCB), November 2019

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

1st problem and solution - The electrical structure was too big for its shell

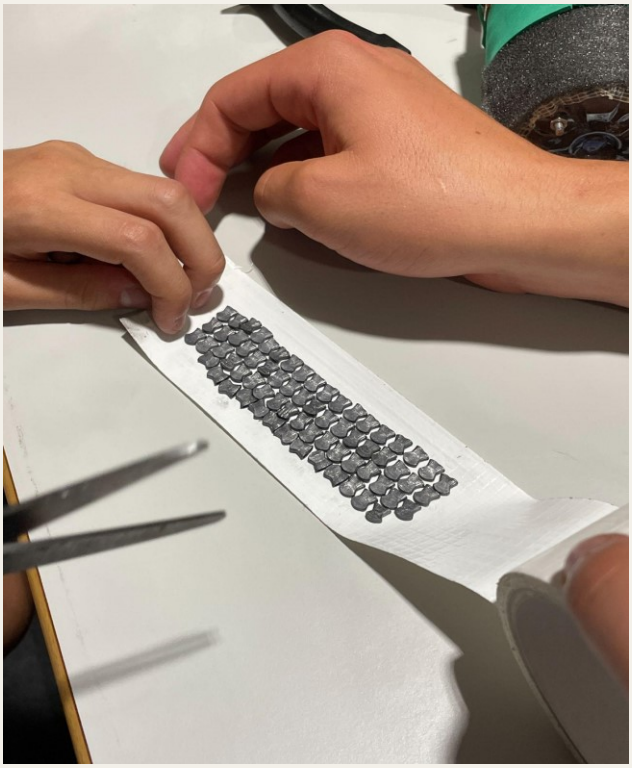




10th image - A can with the electrical structure mounted on top

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

2nd problem - The overall mass of the can was too low at under 300 g



11th image - Lead pieces being crushed and fitted into the can so that the mass was between 300 g and 350 g.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

PRIZE FOR THE BEST INTERPERSONAL COMMUNICATION



12th image - Picture of the trophy stgudents won

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

The Cansat 2021 Team in Ponte de Sor



13 th image - Picture of the Team with the trophy

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

The CanSat experience met by Rute Dionísio, a former student from our school

2nd video - Rute Dionísio on her experience with CanSat

https://www.youtube.com/watch?v=JS8noXwk3ro&ab_channel=TeresaRamos

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Rute’s account of her experience in the CanSat experiment

Rute Dionísio, 19 years old, Biomedical Sciences student, 2nd year

«My favourite part of the Cansat project were the tests we did on a freezing morning with antennas and people passed by and asked us if we were from the police! »

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Rute’s account of her experience in the CanSat experiment:





© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Rute’s account of her experience in the CanSat experiment:

«I also loved the moments of happiness when we finally understood the mistake that was causing everything to go wrong. »

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Rute’s account of her experience in the CanSat experiment:

«Additionally, I’ve always found the space interesting, so this project fulfilled my wish as a child of being an astronaut because it always felt like I was part of a team from a movie about space.»

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Rute’s account of her experience in the CanSat experiment:

«Despite my subjects not being about Physics and Mathematics, participating on this project helped me understand how to work in a team, especially when we are around other teams that are also working on the same thing and there’s a strong feeling of companionship and solidarity and also, how to keep calm when something unexpected happens.»

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

Thank you for your attention

I hope that you enjoyed my presentation and if you have any questions, I will be happy to answer them, if I can.

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE

This brochure contains the summary of the Joint Staff Training Event on Experiential Learning by teachers João Teodósio, João Paulo Fidalgo and Maria Teresa Ramos, from Agrupamento de Escolas do Fundão, as part of the Erasmus+ Project 2020-1-RO01-KA229-080161_6, «The Future You Choose».

Representatives from the following partnership schools were present:

BELGIUM - Onze-Lieve-Vrouw-van-Lourdescollege, Edegem
CZECHIA - Gymnazium J. K. Tyla, Hradec Králové
ESTONIA - Iisaku Gümnaasium, Iisaku
PORTUGAL - Agrupamento de Escolas do Fundão, Fundão
ROMANIA - Scoala Gimnaziala "Principesa Margareta", Bucharest
TURKEY - Sehit Yildiz Gursoy Kiz Anadolu Imam Hatip Lisesi, Edirne

Fundão, Portugal, May 2022

Cofinanciado pelo Programa Erasmus+ da União Europeia

© ERASMUS+ 2020-1-RO01-KA229-080161_6 THE FUTURE YOU CHOOSE