

SPAIN

BRITEC – Bringing Research Into the Classroom Learning Scenario 1

1. Title

Are hand-made traps to trap sand flies so effective as commercial ones?

Author(s)

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Area of research

Entomology (Biology)

Subject(s)

Natural Science

Arts

Maths

Topic

Vector borne diseases related with environmental health

Age of students

12-13 years old

2. Introduction

Contribution of the CS project to Science in general

The aim of the present project is to involve students in Citizen Science in and around the classroom to study effectiveness of phlebotomine sandflies light traps. In order to achieve this goal, students will do the following:

- Get information about flying insects which transmit leishmaniosis, a very important topic regarding canine and human health in Madrid region
- Analyse Madrid human leishmaniosis outbreak and its link with environmental health
- Analyse effectiveness of hand-made and commercial light traps based on real data collected by researchers
- Draw appropriate conclusions to explain the results obtained

Aim of the activities plan and learning objectives

The activities planned will include the following competences: Linguistic communication, Mathematical and basic competences in Science and Technology, Digital competence and Learning to learn. Moreover, the aforementioned goals will be achieved through different subjects:

NATURAL SCIENCE:

- **Human being and health**
- **Living organisms**
 - a. Classification of living organisms
 - i. Know kingdom classification of plants and animals, identifying their general characteristics
 - b. The animal kingdom
 - i. Identify the characteristics by which animals are distinguish from other living organisms.
 - ii. Identify the characteristics by which vertebrate animals are distinguished from invertebrate animals.
 - iii. Know and distinguish different types of animals
 - c. Scientific methodology. Skills, abilities and strategies.
- **Matter and energy. Technology, objects and machines**
 - a. Use word processing to carry out written work

- b. Knows and applies access and work strategies on the Internet
- c. Do a responsible use of ICT information sources.

- **Biodiversity on the Earth**
- **The ecosystems**
- **Research project**

- ARTS:

- **Photograph, poster, comic and animated cinema**
 - Approach reading, analysis and interpretation of art, as well as, fix and in movement images, in their cultural and historical contexts, understanding critically their meaning and social purpose, being able to make new images from the knowledge acquired.
 - Make posters including information taking into account concepts such as size, harmony or colour, and using texts and the most convenient typography

- MATHS:

- **Statistics and probability**
 - Realization of tables and interpretation of simple graphs
 - Use templates to collect data and analyse them
 - Make and complete simple tables to collect data
 - Understand simple graphs (pictograms and bar graphs)

Summary of activities

Number of activity	Name of activity
1	Initial questionnaire
2	Watching of an explanatory video about the scientific topic
3	Discussion. Answer the questions of edpuzzle
4	Talk by Rosa Gálvez (researcher visit to school)
5	Make a Poster: What do you know about phlebotomine sand flies and how could we study them?
*6	Construction of our own light trap
*7	Capture phlebotomine sand flies in the playground of the school

- 8 Presentation of the researcher notebook
- 9 Answer the questions included in the researcher notebook
- 10 Final questionnaire

***Due to the COVID-19 restrictions these activities could not be implemented**

3. Detailed description of each activity (to be completed as many times as activities are implemented)

Activity 1 ¹: Initial questionnaire

First Part: Aim of the activity

Students will fill in an initial questionnaire to find out what do they know about the scientific topic which will be addressed.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	Copies of the initial questionnaire (go to annex 1)
* Guidance for teachers	Constructivism takes into account students prior conceptions in order to conduct a proper teaching process adapted to its initial assumptions.

Third Part: Advice on methodology

Individual activity, it could be done in class or at home.

¹ Osborne, R. J., Bell, B. F. i Gilbert, J. K. (1983). Science teaching and children's views of the world. *European Journal of Science Education*, 5(1), 1-14

Activity 2: Watching of an explanatory video about the scientific topic

First Part: Aim of the activity

Watch a video about Leishmaniosis outbreak in Madrid, so students will get a general understanding of the research problem that took place in Bosque Sur and the risk that it supposes in the Autonomous Community of Madrid.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Online teaching material	Video about Bosque Sur and phlebotomine sandflies https://www.youtube.com/watch?v=zFNNAKtEPUU&t=2s
* Guidance for teachers	Leishmaniosis has been in the spotlight since 2009, when the largest human leishmaniosis outbreak in Europe affected the south-west area of the Madrid region. Moreover, Madrid region has been traditionally considered endemic for canine leishmaniosis. Hence, the control of leishmaniosis needs to be based on an in depth knowledge and understanding of the biology of sandflies.

Third Part: Advice on methodology

Try to use a popular science video which does not include many technical concepts.

Fourth Part: Educational analysis

Visual Search & Learning: images and multimedia are more powerful than verbal stimuli.²

² Pintó, R., Couso, D.; Hernández, M. I. (2010). An Inquiry-oriented approach for making the best use of ICT in the classroom. *eLearning Papers*, 20.



Activity 3: Discussion. Answer the questions of edpuzzle

First Part: Aim of the activity

After the video, all the aspects shown will be discussed. Then, students will answer an edpuzzle survey.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Online teaching material	Edpuzzle survey https://edpuzzle.com/media/5f947cc52fdaaf40ebdba830
* Guidance for teachers	Edpuzzle is an app which let you make interactive surveys for students. We will use it to know what students have understood after watching the previous video.

Third Part: Advice on methodology

It's convenient to guarantee that students have paid attention and make sure that they have understood the video information. Henceforth, that's why we will use this tool.

Fourth Part: Educational analysis

Visual Search & Learning **Błąd! Nie zdefiniowano zakładki.**

Activity 4: Talk by Rosa Gálvez (researcher visit to school)

First Part: Aim of the activity

A researcher specialised in this topic will come to class to give a lecture about the biology of phlebotomine sand flies and its relevance in animal and public health. The contents will be in accordance with the curriculum of the educational level considered. A powerpoint presentation would be convenient to be used for this lesson; the ppt file is below. Then, a commercial phlebotomine sand fly light trap could be shown to students and its functioning could be explained.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Online teaching material	<p>Powerpoint presentation https://dauam-my.sharepoint.com/:p:/g/personal/rosa_galvez_uam_es/ESYyFzA53y5AiNW8SKAV5g0BcGDxzfuhsxhR34FflHOYA?e=v8x8Jj</p> <p>Video about the field work carried out by an entomologist using light traps https://youtu.be/PEXr2-o4t74</p> <p>Video about adults phlebotomine sand flies in the lab https://www.youtube.com/watch?v=NoJ4m0SqP_c</p>
Citizen science purpose of the activity (if any) *	Understand and recognize the morphology of phlebotomine sand flies and their impact to animal and public health ³

Third Part: Advice on methodology

It should be great to encourage students to participate during the activity asking questions to the researcher

³ Killick-Kendrick, R. (1999). The biology and control of phlebotomine sand flies. *Clinics in Dermatology*, 17(3), 279-289.

Fourth Part: Educational analysis

Visual Search & Learning: images and multimedia are more powerful than verbal stimuli.
Błąd! Nie zdefiniowano zakładek.

Activity 5: Make a Poster: What do you know about phlebotomine sand flies and how could we study them?

First Part: Aim of the activity

Students will make a poster (using a poster board or any computer program such as <https://www.genial.ly/es> or <http://edu.glogster.com/>) showing what do they know about phlebotomine sand flies.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Online teaching material	https://www.genial.ly/es http://edu.glogster.com/
Offline teaching material	Paper, glue, poster boards, scissors, felt-tip pens, ruler, etc.
* Guidance for teachers	Additional material for teachers will be given so that they know which concepts should be included in the poster

Third Part: Advice on methodology

Try to motivate students. In our case, we will use a gamification technique. After making the poster, students were rewarded with an entomologist card (go to annex 2)

Fourth Part: Educational analysis

Vocational Education: An increased focus on vocational (not academic) skills in the curriculum.

Game Based Learning & Gamification: learning is mixed with games or with game



mechanisms⁴

Activity 6: Construction of our own light trap

First Part: Aim of the activity

Students will make their own trap with material we will provide them by using our own protocol.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	The materials needed to make the plastic trap are: a one liter plastic bottle, a piece of plastic net, recycled fan of a desktop computer, two nylon flanges, power supply of a small home appliance such as a handheld vacuum or a printer, a piece of perforated pcb board, 2 pin plug-in screw terminal block connector, a white LED lamp, hot melt glue and a rope. The materials needed to make the mesh collection bag are: a piece of wire, adhesive tape, hot melt glue, a sheet of wedding veil, a rubber band.
Citizen science purpose of the activity (if any) *	Making the apparatus needed to solve the scientific question
*Guidance for teachers	Each teacher will have a ready-made trap to capture sandflies and show their operation to their students. The prototype has been already designed as a citizen science small project in Medialab Prado for BRITEC

Third Part: Advice on methodology

Due to COVID-19 restrictions this experimental activity could not be carried out.

Fourth Part: Educational analysis

Project-Based Learning
Collaborative Learning

⁴Khan, A. A., & Malik, M. (2017). Use of digital game based learning and gamification in secondary school science: The effect on student engagement, learning and gender difference. *Education and Information Technologies* , 2767-2804.

STEM Learning⁵

Activity 7: Capture phlebotomine sand flies in the playground of the school

First Part: Aim of the activity

Students will capture phlebotomine sand flies. We plan that pupils will choose several places around the school to collect sandflies. Sand flies present nocturnal activity so traps will be placed late afternoon and recovered early morning next day.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	Hand-made light traps and commercial light traps to use them as control
Citizen science purpose of the activity (if any) *	Capture phlebotomine sand flies with our hand-made light trap in order to get results for further analysis
*Guidance for teachers	Adequate location of light traps is important and best catches are made where cover is good and the humidity is relatively high. School garden surrounding area could be a good place.

Third Part: Advice on methodology

It is important not to put traps if there are signs of rain because adult sandflies will not leave their rest places to bite. Traps should be suspended 1 to 1.5 m above the ground and far away from other sources of artificial light or sites exposed to strong winds. A single trap usually reflects sandfly flight activity within a buffer of 250-500 meters of its location.

Fourth Part: Educational analysis

Project-Based Learning

⁵ Freedman, M. P. (1997). Relationship among laboratory instruction, attitude toward science, and achievement in science knowledge. *Journal of Research on Science Teaching*, 34(4), 343-357



Collaborative Learning

STEM Learning **Błąd! Nie zdefiniowano zakładki.**

Activity 8: Presentation of the researcher notebook

First Part: Aim of the activity

Research was modified due to the COVID-19 restrictions, that's why students were provided with real data collected by researchers which was included in a **Researcher Notebook**. In this activity, we will explain what is included in this notebook and how it is going to be used.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	Researcher Notebook
Citizen science purpose of the activity (if any) *	Non-analyzed data collected by researchers necessary to answer the scientific question

Third Part: Advice on methodology

Make sure that students know the importance of the data collected and how it has to be analysed in order to draw proper conclusions

Fourth Part: Educational analysis

Project-Based Learning⁶

STEM Learning **Błąd! Nie zdefiniowano zakładek.**

⁶ Blumenfeld, P., Soloway, E., Marx, R., Krajcik, J., Guzdial, M. i Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26(3&4), 369-398.

Activity 9: Answer the questions included in the researcher notebook

First Part: Aim of the activity

Students will answer the questions included in the *Researcher Notebook*

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	<i>Researcher Notebook</i>
Citizen science purpose of the activity (if any) *	Calculations and interpretation of results of the project
*Guidance for teachers	This activity is more focused on maths than biology

Third Part: Advice on methodology

Students should do a statistical analysis in the most precise way

Fourth Part: Educational analysis

Project-Based Learning **Błąd! Nie zdefiniowano zakładki.**

Collaborative Learning

STEM Learning **Błąd! Nie zdefiniowano zakładki.**

Activity 10⁷: Final questionnaire

First Part: Aim of the activity

Students will fill in a final questionnaire to know what they have learnt after doing the project. Moreover, students will draw their own conclusions after analysing real data.

Second Part: Suggested procedure

Preparation time	1 day
Teaching time	45 minutes
Offline teaching material	Final questionnaire
*Guidance for teachers	Assist students if they get stuck at any step.

Third Part: Advice on methodology

Individual activity, it could be done in class or at home.

⁷ Angelo, T. A., & Cross, K. P. (1993). *Classroom assessment techniques: A handbook for college teachers*. San Francisco: Jossey-Bass.



4. Assessment after implementation of the activities plan

Student's learning

The Activity 10 is the method used to assess the learning process of students after the implementation of this Learning Scenario. Students have to fill in a questionnaire (individually) about the contents addressed during the project in order to know what they have learnt.

Citizen Science experience

The main problem in FLEBOCOLLECT project was to implement it without any experimental activity. Henceforth, the implementation was not as enriching and interesting as it was planned to be, because all the field work had to be suppressed due to the COVID-19 pandemic. Furthermore, the contents addressed were not in accordance with the curriculum. Consequently, an activity plan could not be followed due to the incongruency with the curriculum and the restrictions of the COVID-19 pandemic. Apart from this, all the activities carried out made students being interested in a scientific problem close to their environment.

5. Bibliography

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6. Annexes

Annex 1: Initial questionnaire

Flebocollect Project: SOS stop leishmaniasis

INITIAL QUESTIONNAIRE

Name:

Class:

Flebocollect Project: SOS stop leishmaniasis: INITIAL QUESTIONNAIRE

1.- Find in the following word search THREE alterations of the environment caused by human beings.



Indicate if the next sentence is true or false:

2.- "The alteration of the environment due to human beings could cause the outbreak of new illnesses"

T / F



If you have said that the previous sentence is true, would you be able to give an example?

3.- Do you know that mosquitoes could transmit illnesses to us? (do a circle to indicate your answer)
Yes / NO

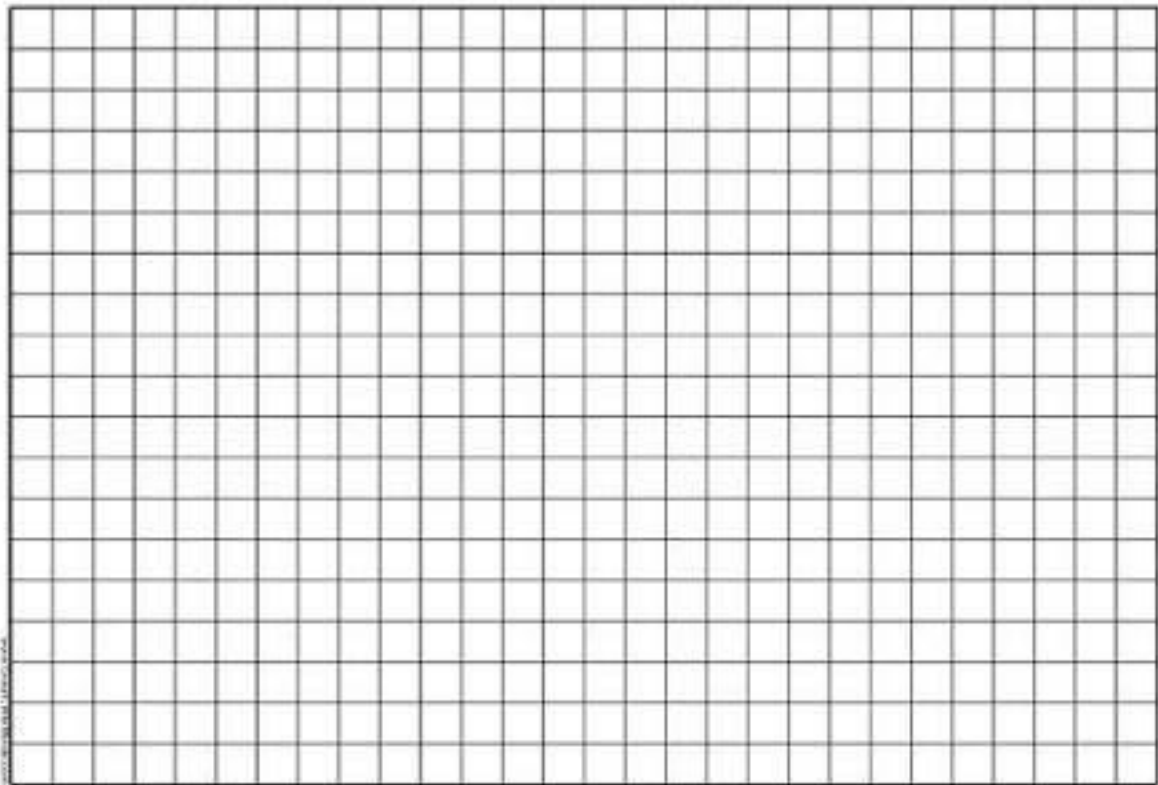
If you have said yes, do you know any illness transmitted by mosquitoes?

4.- Have you heard something about leishmaniasis before? (do a circle to indicate your answer)
Yes / No

If you have said yes, could you describe to what does it sounds to you?

5.- Some researchers are capturing mosquitoes in three different towns of the Autonomous Community of Madrid. Represent, doing a bar graph, the number of mosquitoes captured in each town based on the data showed in the following chart (there's a graph paper which you can use to help you):

Town	Number of mosquitoes
Fuenlabrada	14
San Agustín de Guadalix	4
Majadahonda	9






Annex 2: Entomologist card



Carnet de **ENTOMÓLG@**

Nombre

Curso

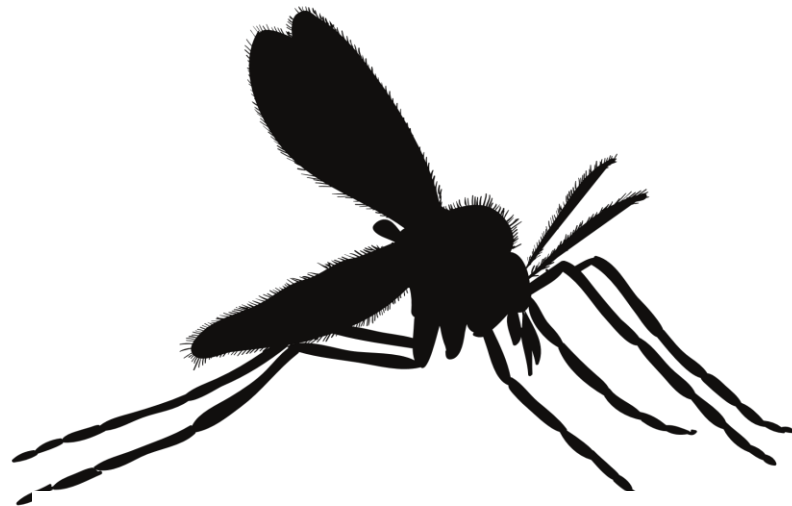

 Universidad Autónoma
 de Madrid



FleboCollect

Annex 3: Researcher Notebook

FleboCollect



RESEARCHER NOTEBOOK

2020/2021



LET'S DO SOME RESEARCH...

INTRODUCTION TO SCIENTIFIC ACTIVITY

Congratulations! You have achieved your entomologist card and you already are recognised entomologists.



The Autonomous Community of Madrid needs light traps to capture phlebotomine sand flies but they are too expensive, so it was decided to design new ones with recycled materials... but researchers do not have enough time to test them.

Can you help us? How can we prove the effectiveness of these hand-made traps?

What is the difference between the number of phlebotomine sand flies captured by the hand-made light trap and the commercial one?

Data:

Researchers went sample the 29th of July 2020. They putt raps at 8.00 pm and were collected the next day at 8.00 am. They put 3 commercial traps and 4 hand-made traps.

	COMMERCIAL TRAP	HAND-MADE TRAP
IMAGE		
CODES	C1 C2	H1 H2



	C3	H3

COLOUR OF THE LIGHT	Yellow	White
POWER OF THE FAN	1x	2x

We provide you with the images that researchers have observed through the microscope.



Identify the phlebotomine sand flies which have been captured in each trap and if they are male or female. Fill in the following charts.

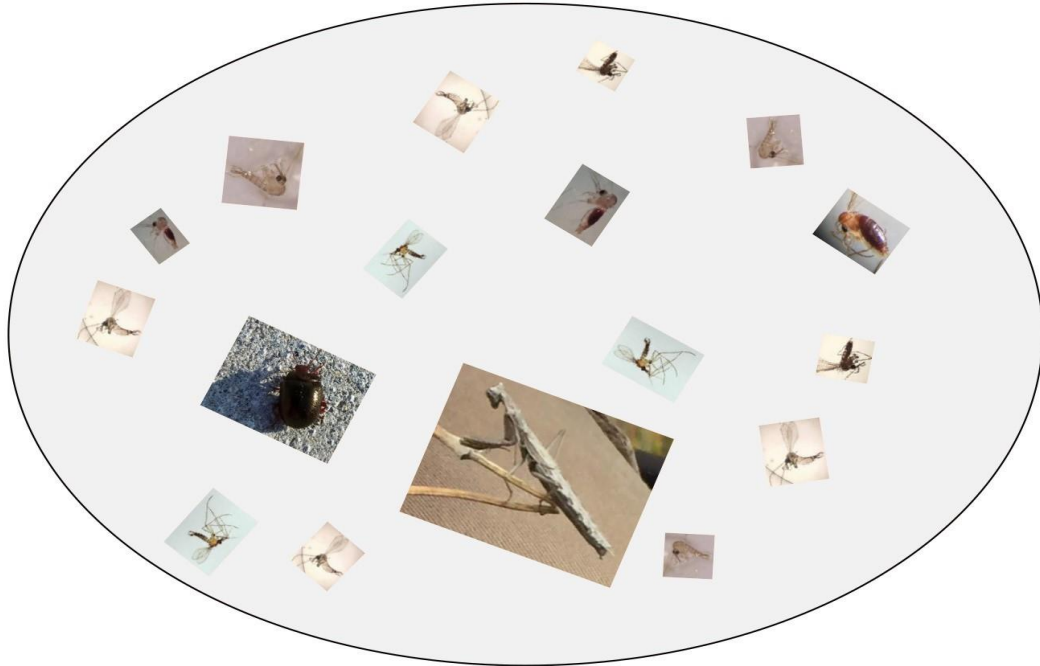


Figure 1. Examples of captures made by a sand fly phlebotomine light trap

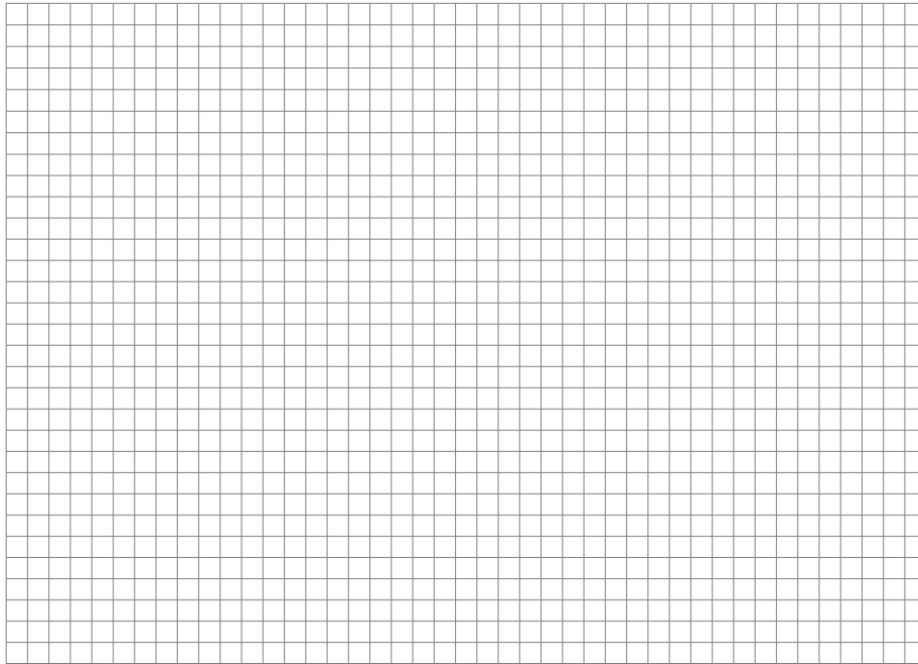
Make your own charts to show the number of male and female phlebotomine sandflies captured by each trap:

Commercial trap code	Number of male phlebotomine sandflies	Number of female phlebotomine sandflies	Total phlebotomine sandflies
C1			
C2			
C3			
...			
Total			

Hand-made trap code	Number of male phlebotomine sandflies	Number of female phlebotomine sandflies	Total phlebotomine sandflies
H1			
H2			
H3			
...			
Total			



Make a graph which helps you to know which light trap is more effective.



Come to a conclusion based on the results obtained:



Annex 4: Final questionnaire



Name:

Class:

Projecto Flebocollect: SOS stop leishmaniasis: FINAL QUESTIONNAIRE

Once you have participated in this project, you are ready to answer the following questions:

1.- What is leishmaniasis and who it affects?

2.- How is leishmaniasis transmitted?

3.- When is produced an outbreak of an illness?

- when the cases of an illness suddenly grow in a certain place
- when an illness is characteristic of a certain place

4.- Where was there an outbreak of leishmaniasis in late 2009?

5.- What human modification of the environment caused an increase in human cases of leishmaniasis?

6.- Which reservoir played a key role in this outbreak of human leishmaniasis?

the rabbit

the dog

7.- What is a phlebotomine sandfly?

8.- When a phlebotomine sandfly can bite me and transmit leishmaniasis?

at any time of the year

only when adult phlebotomine sandflies are present, from May to October



9.- Did you enjoy participating in this project? How would you rate the project from 1 to 10?

10.- Point out what you have learned by participating in this project that you did not know before.

11.- Draw an adult female phlebotomine sandfly highlighting its characteristics and pointing out the parts that you remember.



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About the BRITEC project

BRITEC – Bringing Research into the Classroom project (<https://britec.igf.edu.pl/>) aims to introduce the Citizen Science (CS) approach in schools as a way of engaging pupils in research practices. This project has been funded with support from the European Commission within ERASMUS+ Programme and is coordinated by the Institute of Geophysics, Polish Academy of Sciences.