OrganKits for STEAM

Co-funded by the European Union

GUIDE FOR TEACHERS

to implement **OrganKits**

SPORTSHEALTH & DEPENDENCE

organkitsproject.eu

CONTENT

This guide focuses on the
SPORTSHEALTH&DEPENDENCE
resource kit.

We recommend the first time you consult the Teacher Guide you start from the beginning and review the information we provide.
Once you have consulted the information on project-based learning and STEAM teaching recommendations in the guides of other Organ Kits, you can go directly to **section 4.**

1 INTRODUCTION

The continuous evolution of education means that teachers have to be aware of new methodologies, resources and pedagogical tools that enrich the learning experience of students. It is in this context that the **European project OrganKits** arises, aimed at the design, production and implementation of **plastinated organs in Secondary Education.** In this context we are pleased to present this teacher's guide that accompanies the resource kit that you will use.

The guide you are holding in your hands is intended to be an **agile, simple and practical tool** to help you introduce and implement plastinated resources in your subject.

Plastinate resources are an innovation in teaching, enabling a deeper understanding of anatomy and biology. This project aims to introduce these resources through project-based learning and with the involvement of the different subjects taught in secondary education.

That is why throughout this guide we will address the essential principles of project-based learning and also offer a series of **recommendations for teaching STEAM**. We will then dive right into explaining the case, how to use it, and tips and recommendations for its proper implementation.

We will explore how to use this case effectively to give you a clear and accurate picture of what you have in your hands along with practical guidelines for introducing it in your secondary classroom.

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PROJECT BASED LEARNING

Project-based learning is a methodology that promotes the active participation of students and their learning through the implementation of projects with a series of specific objectives. Among the most outstanding aspects of this methodology, we find:

It is a **methodology focused on problem solving** and application of theory to **real world problems.** Students work with projects that will allow them to investigate, plan and execute certain actions.

Interdisciplinarity is an important element since this methodology addresses topics that involve different subjects, which encourages the interconnection of knowledge and skills from different subjects.

Students become **active agents** of their own learning, **make decisions**, and **collaborate with their peers** in solving problems in a given context.

Collaboration is key in this methodology that allows students to develop **communication, negotiation** and **problem solving skills** in teams to achieve common goals.

It improves student **motivation** and engagement.

Project-based learning is a powerful tool in secondary education and in working with plastinated organs.

2. PROJECT BASED LEARNING

Project-based learning allows students to **be involved** in their own learning process, generating more authentic and meaningful learning. However, what do we have to take into account for its proper use in the secondary classroom? Here are some of the **issues** that you should consider in order to carry it out:

- **The objectives must be clear and relevant.** The first thing to do is to define the objectives you want the students to achieve. These objectives should be realistic, achievable and evaluable. You can also try to make these objectives relevant to the students' reality.

- Select a **relevant topic** that connects with the students' interests, which will help them to be more motivated throughout the activity.

- Create a **key problem or question** that will guide students throughout the project. It is important that it is well worded and understandable to the learners as they may need to return to this question throughout the project. You can add a challenging touch to this question to act as a challenge to push the learners.

- Divide the project into **different stages** or key milestones to be achieved. Allow time to research, collaborate, create.

- Consider **when the plastinated resources will be introduced** and how they will be used by the students. You must select the appropriate resources for the project and give students access to them. In addition, if the project requires it, you should complete the materials in the briefcase with sources of information that you can provide to the students or encourage them to look for them.

- When you are clear about the steps to follow in the project, **assess what other subjects may be involved** and how to relate them and integrate them into the work to be done.

- Define **roles and responsibilities** so that each student is clear about his or her role in the group. Depending on the age or maturity of the students, you can allow them to decide which role to assume.

- Define the **evaluation criteria** from the beginning and make sure that the students understand them.

- Act during the process as a **support and guide and anticipate possible problems.** Reviewing and monitoring the process is key to progressing correctly and not resulting in a final product that is not as expected.

- **Encourage reflection** on the project itself and on the use of the resources plastinated. Ask the students what they have learned and what the use of the plastinated resources has given them: have the plastinated resources allowed them to learn more than if they had not used them?

2. PROJECT BASED LEARNING

Project-based learning is a very powerful methodology, but it requires **good prior planning.** Do not leave room for improvisation and anticipate the difficulties that may arise. At the beginning you may encounter difficulties in carrying it out, but little by little you will see that the great results achieved will make the effort worthwhile.

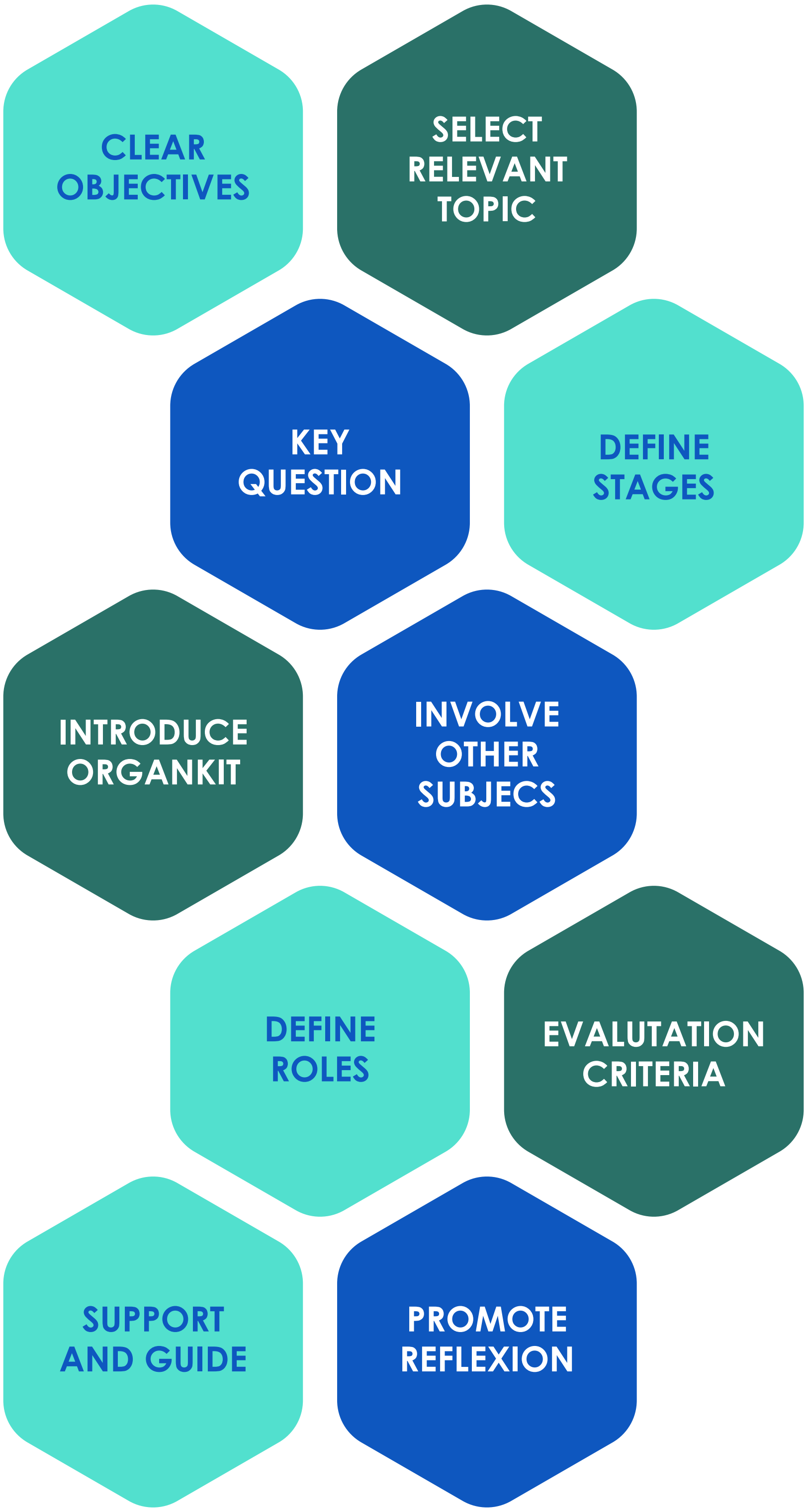

Figure 1. Project Based Learning Principles to use Organkits.

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EDUCATIONAL RECOMMENDATIONS TO TEACH STEAM

When designing activities to implement the plastinated organs, it is advisable to take into account the STEAM (Science, Technology, Engineering, Arts and Mathematics) perspective in this design.

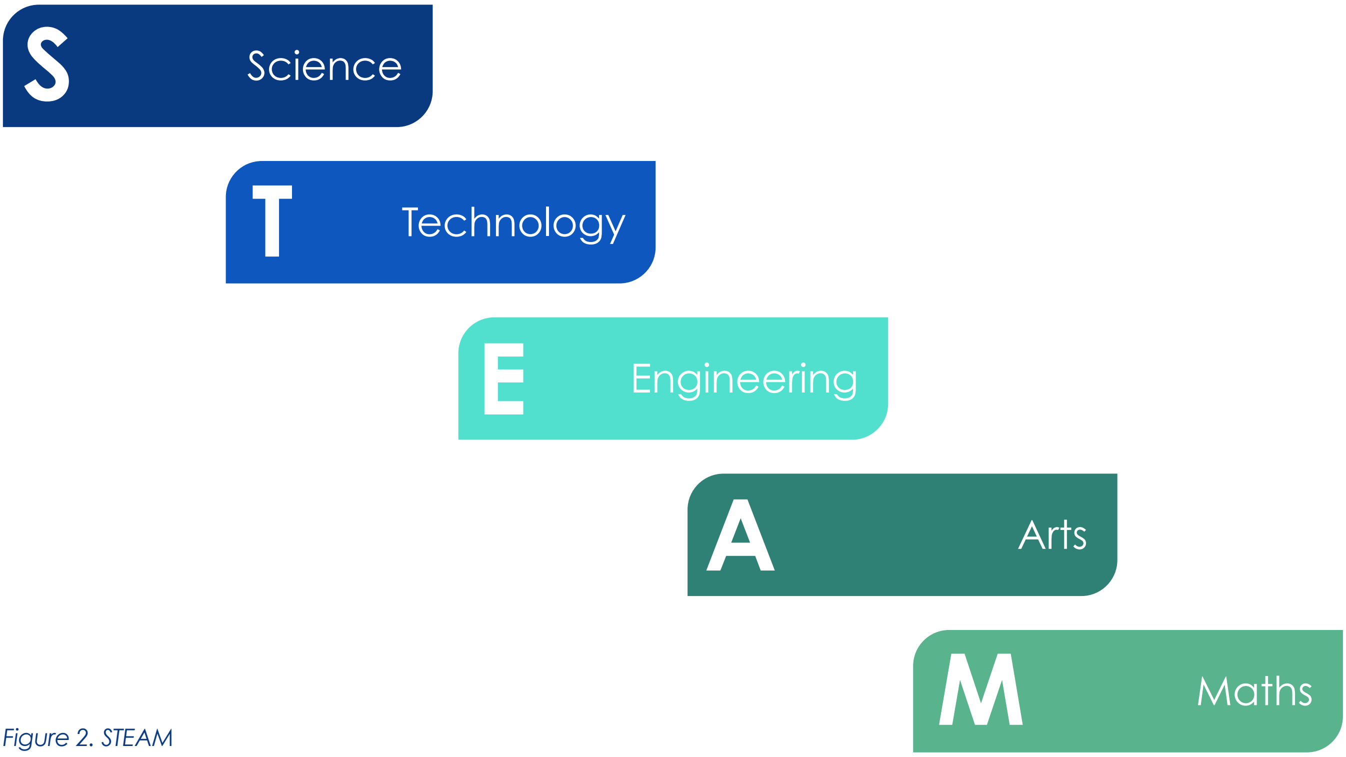

Figure 2. STEAM

This perspective can be quite beneficial for high school students in fostering critical thinking, problem solving and creativity. For this reason, you should **take into account:**

Encourage **collaboration between teachers from different areas** to ensure interdisciplinarity in a way that helps students to see the connections between knowledge. We talked about interdisciplinarity in the previous section, but in the STEAM perspective it is even more important.

Make sure that the **project contributes to the learner's personal development** understanding STEAM as a general idea (it is not simply the sum of many components or specialized knowledge, but holistic for its various interrelations): STEAM as holistic approach

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4.1. SHORT DESCRIPTION

This briefcase contains:

BOVINE ELBOW JOINT

This specimen allows us to evaluate the mobility of the joints. The elbow is a synovial joint capacitated for flexion and extension movements. The humerus, ulna and radius bones are included, all of them partly sectioned. In ruminants the ulna and the radius are fused together, which impedes the supination movement, typical of other mammals such as humans and cats. The joint also includes the articular cartilage and the two collateral ligaments (medial and lateral).

TRANSPARENT SECTION OF THE KNEE JOINT

This is a mid-sagittal section of the knee joint. It is a complex joint, involving the femur, tibia, and patella, which is subdivided into a femorotibial and a patellofemoral joint.

The compact and spongy or trabecular bone of the femur and tibia is very well depicted. The bone marrow is distributed among the trabecular bone.

Between the femur and the tibia are the cruciate ligaments (anterior and posterior). Together with the menisci (not present in the image) are essential for keeping the stability of the joint.

In the joint between the femur and patella, the articular cartilage can be observed.

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OVINE LEG MUSCLES

This specimen shows a dissection of the muscles located in the leg of a sheep. Muscles extend from the knee region to the digits, therefore producing flexor and extension movements of the knee joint, as well as the tarsal and digital joints. Flexor muscles of the tarsus are positioned in the anterior (cranial) part of the specimen, whereas their opponent extensor tarsal muscles are in the posterior (caudal) part. The common calcaneal ligament (Aquiles tendon) is a relevant landmark of this specimen.

Muscles are attached proximally to the femur and tibia, mainly. Distally the leg muscles have long and strong tendons which terminate in the tarsal, metatarsal or phalangeal bones.□It is worth noting the presence of the common peroneal nerve, which is a ramus of the sciatic nerve responsible for the contraction of flexor tarsal muscles. Integrity of the nerve is necessary for muscle contraction.

This specimen also includes the dissection of the knee joint. Collateral ligaments (lateral and medial), and patellar ligament are well depicted.

4.2. RECOMMENDATIONS

HOW TO USE?

TIPS AND ADVICE

1.Try to ensure a **safe space to work** with the suitcases.

2.Read the **Educational Guide** before starting, there are many activities to be understood and shared with the students and teachers. Access to the Educational activities is provided by the QR code.

3.The teacher should arrange the **groups of students to promote inclusion and diversity.** Consider that this material is idoneous for tactile learning in visually impaired students.

4. Maybe you need **help when carrying the briefcases** to the classroom. Students are usually proud of cooperating with this task.

5. Explain to the students what is inside the briefcases before opening them. The different **organs** belong to real animals, so **use them respectfully.**

6. Due to the plastination process, the organs have a special colour, texture and smell. If required, **explain** the students the **process of plastination** *(https://discover-in.com/en/the-plastination/)* to make them understand that this is normal.

7. Plastinated specimens **are not a toy,** but tailor-made and unique anatomical material, so students should make responsible use of them.

8. These specimens can be handled in any teaching scenario. **No gloves are necessary.**

9. Prevent them from humidity and excess of light. Store them in a **dry place.**

10. Specimens are made of silicon. In case of any **cutaneous reaction** when handling, wash your hand and contact the doctor for advice.

4.2. RECOMMENDATIONS

HOW TO USE?

TIPS AND ADVICE

- The Sportshealth Organkit organs include joints that allow movement but must be **handled carefully to avoid breaking** or excessive stretching of some structures (tendons, ligaments, etc)

- The short description of the specimens above **helps to identify the most relevant anatomical landmarks** for the students.

OrganKits for STEAM

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