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THE RESEARCH GAME TEACHERS' GUIDE



motivating secondary school students
to learn research methodology in science



Authors

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Find more information on the project website www.researchgame.eu



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*A guide to accompany you
through the game*

The Game guide is designed to give you indications on how to use the project with your students.

The project is addressed to high school students and **teachers**, and it consists of a series of consecutive steps leading to the final game. The project includes a number of supporting materials deepening the themes approached in the course of the game; each of them described in detail throughout this guide with indications on the teacher's role.

If you would like to further understand the pedagogical basis and background of this project, please visit [our website](#).

1. INTRODUCTION: *A step by step guide*

1.1 WHAT IS THE LINK BETWEEN SCHOOLS, THE GAME AND STUDENTS?

In a Europe that needs to adapt to a rapidly changing business and learning environment, it is critical for students to understand how science and technology provide the basis for the fundamental advances in education and the workplace. The goal of the Research Game is to develop a new teaching approach and pedagogical strategy for learning a methodology useful in all the subjects of the scientific research, and also to realize and apply creative and innovative thinking.

Today science and scientific methodologies cannot be limited to the small percentage of science students in schools, all students must understand these processes and the part they will play in their future educational paths and careers.

The use of new technologies, including different types of games that go in the direction of the Problem Based Learning, will make a discipline more appealing and engaging for students of new generations. Therefore we propose a project that involves students and **teachers** giving them the opportunity to know and use new technologies and interact with each other in Europe.

4. NATIONAL CONTACT POINTS

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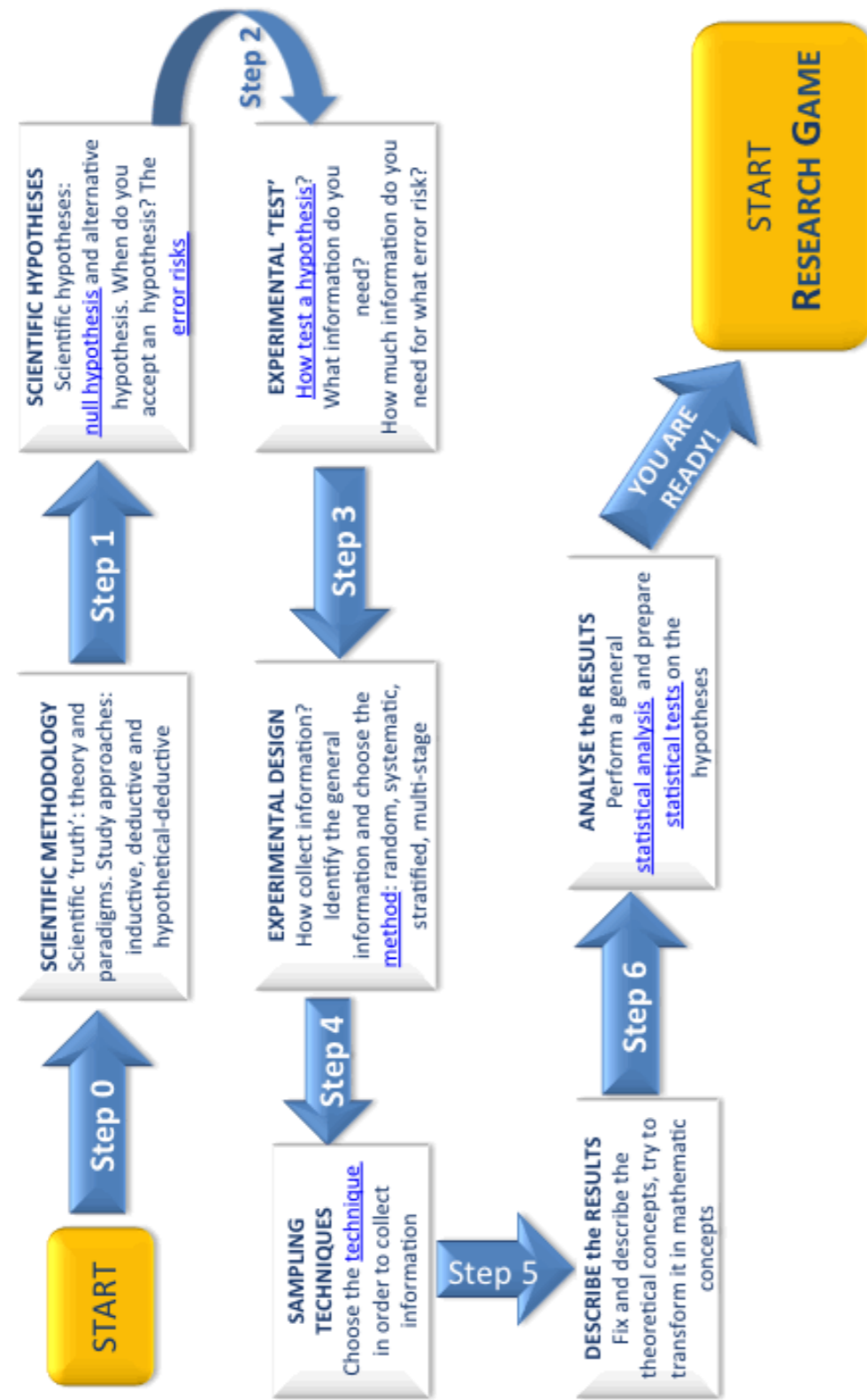


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RESEARCH GAME 'The scientific methodology'

step by step



1.2 AIMS OF THE PROJECT

What is the Research Game?

The Research Game is an online project open to all schools in Europe. It is suitable for 10 year-old or older students. Your pupils and you will be invited to test students' skills on the scientific method and biodiversity research.

The Research Game project will motivate secondary school students by replicating the excitement of scientific research. The Project has created an Internet-based game to develop an understanding of the research work and teach its best practices.

Why participating?

Playing the games proposed by the project, your students will improve their knowledge concerning the scientific way to study the reality around them, particularly biodiversity. By 'doing' these activities, students will become able to plan on their own new exciting ecological researches. Moreover students will participate in a big final European competition, during which they will be demanded to interact with peers from other European schools!

During the Research Game, your pupils will collaborate internationally across Europe, to build hypotheses, research and test the validity of their hypothesis, and finalize a theory based on their findings. They will be expected to share their research findings with the other groups.

Students will learn in a fun and engaging way the logical thinking and deductive reasoning, a core skill required not only in science, but also in all their futures activities

What is the Research Game’s aim?

The project aims at:

For students	<p>motivating young people towards research and enhancing their ability to realize creative thinking, apply test and hypothesis, get confidence and practicality, and develop research projects as a valuable tool for their future careers</p> <p>helping young people to acquire the basic life-skills and competences necessary for their own personal development and future employment opportunities</p> <p>helping the promotion of creativity and competitiveness in the working environment.</p>
For teachers	<p>supporting European teachers to use these proposed innovative approaches to set up a research work</p> <p>supporting the development of innovative ICT-based contents, services, pedagogies and practices for lifelong learning</p> <p>improving the volume of partnerships among schools in different Member States.</p>

→ **Step 0:** students can read on the scientific methodology in order to learn more (see project website).

→ **Step 1:** students make the scientific hypothesis, null and alternative hypotheses, about the research topic.

→ **Step 2:** students test the scientific hypothesis and have to know how much information is necessary to test it.

→ **Step 3:** students organize the experimental plan on the research work fixing each point to set up.

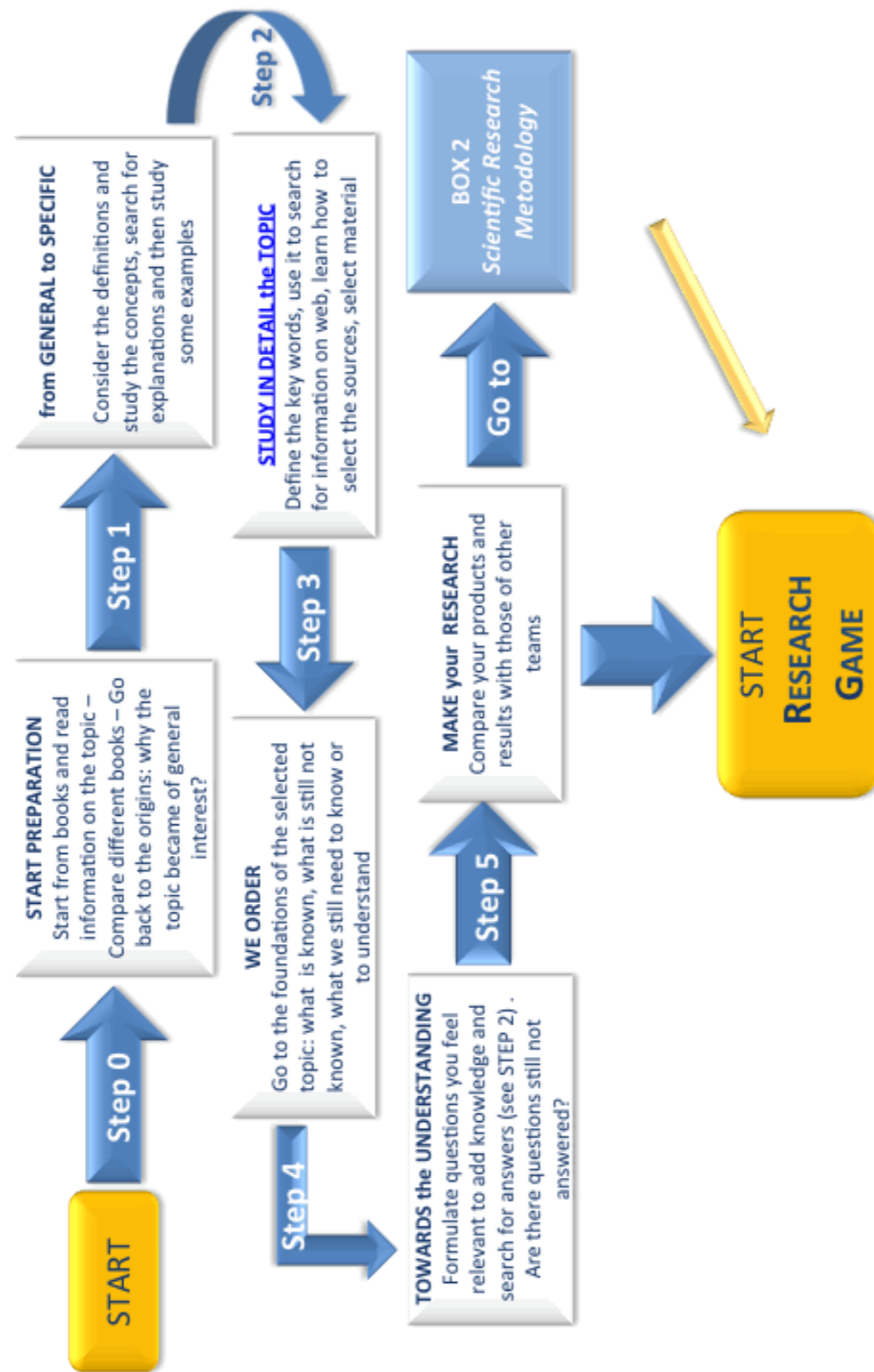
→ **Step 4:** it is time to go to the field and collect data following the steps decided in the experimental plan.

→ **Step 5 - step 6:** students organize their data in order to perform a simple statistical analysis. At the end of this step, they will get one or more products of their work.

European students interacting during working group activities – photo courtesy of the project EuroLink Virtually international school



RESEARCH GAME 'The subject' step by step



1.3 WHY PLAYING THE RESEARCH GAME AND LEARNING THE SCIENTIFIC METHOD?

Why do young people need science and the scientific method in their life?

- Do they take pills?
- Do they use a mobile?
- Do they surf on the Internet?

All these normal, everyday activities are based on the scientific method and research, the basis of science. Even simple everyday things need science for their development and manufacture. Today and tomorrow, young people will use the scientific method and its analytical structure for their education and careers.

In this context the Research Game represents an opportunity for young people to learn more about the scientific method.

The Game has been conceived for secondary school students and will show how the scientific method is the system that all those who want to develop an effective and productive education and career need to understand. Without the scientific method, and its way of thinking, it is hard to progress in the modern world.

Moreover, the Research Game allows students to find out how to do a lot of the things summarized in the learning outcomes:

- develop an understanding of scientific methodologies
 - improving clarity about different stages of problem solving
 - developing an understanding of how to formulate hypotheses, identify relevant variables, collect and analyse data, interpret findings
 - stimulating, inspiring and enhancing their motivation to undertake research projects and apply the scientific methodology
 - developing their ability to deal with uncertainty
- develop skills and competencies in a wide range of environmental research domains
 - improving students' awareness and knowledge of biodiversity
 - becoming active citizens and stewards of the environment
- make learning more engaging and relevant to young people
 - developing logical reasoning and critical thinking skills

- provide challenge and the opportunity to communicate with students from all over Europe
 - developing logical reasoning and critical thinking skills
- connecting local investigations to global issues.

The game will challenge students to complete a scientific research on Biodiversity, this field has been chosen as it includes a number of different areas of science and is relevant to everyone. Studying Biodiversity your pupils can learn more about the genetic diversity, the diversity in terms of species, the diversity in terms of ecosystems and landscapes.

1.4 WHAT WILL HAPPEN DURING THE PROJECT?

The Research Game includes three main steps and can be played either as part of the curriculum, or as an extra-scholastic activity. It includes:

- training components, with entry-level materials available on the project website and tools for deepening their knowledge
- self-training sessions, to practise and earn points in the game, designed on the basis of *a learning by doing* and *cooperative learning approach*
- a final competition played through an online game.

The fundamentals of the game are:

- students' autonomy
- use of English, or other common languages, to communicate within each col-

3. EXPLORING BIODIVERSITY IN THE FIELD

In the following schemes, **teachers** can realize the main steps of the experimental work on biodiversity that each team will carry out in order to get scores.

Teachers will oversee their students during the practical work.

During the experimental work, teams can follow these steps as guidance for both the 'subject' and the 'methodology'.

- • **Step 0 - step 3**: students need to learn about the subject and collect information about the research topic from books, scientific papers, the web.
- • **Step 4 - step 5**: students make a general question about the topic, interacting with their peers. It is now time to go to the 'methodology'.

will determine the overall score of each team.

How getting scores

There will be two ways to get scores in the game: a *self-training session*, the so called learning by doing, during which all teams are encouraged to develop a complete research activity in the field of biodiversity to learn and understand all aspects of the scientific method through direct experience. Then the online competition, in which teams will have to face simulating research activities showing that they have understood the scientific method and have been able to apply it in a correct way to the case that they encounter in the online game.

Teachers will have a key role mainly in the *self-training session*, encouraging the teams to develop their researches, stimulating teams to discuss on all points and aspects of their researches and participating as senior scientists to these discussions.

laborative international group – game submission languages depend on teams' language competencies

→ **teachers as facilitators and mentors ONLY**

→ students as key actors of the game – *learning by doing*

structured appropriate documentation for students and **teachers**

→ game templates.

Students running an experiment in a school laboratory –
photo courtesy of the project EuroLink Virtually international school



2. A QUICK GUIDE TO THE RESEARCH GAME

2.1 TRAINING COMPONENTS

Should you want to know more about the training components aspects (see section 1.4), different types of material about the general characteristics of the project, Ecology and Biodiversity and background documents on the scientific method will be available on the project [website](#).

2.2 LEARNING BY DOING AND COOPERATIVE LEARNING

The activities that **teachers** and students have to perform during the ‘learning by doing and cooperative learning’ phase are summarized in the following scheme. As soon as the registration of the teams opens, they will have access to the Research Game website and begin with the process that will lead them to the final competition, improving their score at every step completed along the process.

Starting from the training sessions, **teachers** will discuss with the components of their teams the learning approach to the game, having the open option to acquire information about the topic of the game and the methodology from the project [website](#), where they will find specific sections dedicated to these aspects.

Com- parison & reporting	Draw the conclusions	Drafting the conclusions. Formats: document and video	Guidance (on request)
	Compare with a paired school	Repeating the experiment (if possible) Drawing the critical conclusion	Guidance (on request)
What I have learnt game	The online game	Playing the online game based on aspects of the scientific method	In-game guidance
	Questionnaires	Automatic compilation of results	Guidance (on request)

The results of the students’ work will be presented as:

- video records of the work and the reached conclusions - including field research / conclusions. In the video (a very student friendly medium) students will be presenting their idea and research approach in maximum 3 minutes.
- ‘one or two page summary’ reporting their findings in a more structured and official way.

2.3 THE FINAL COMPETITION

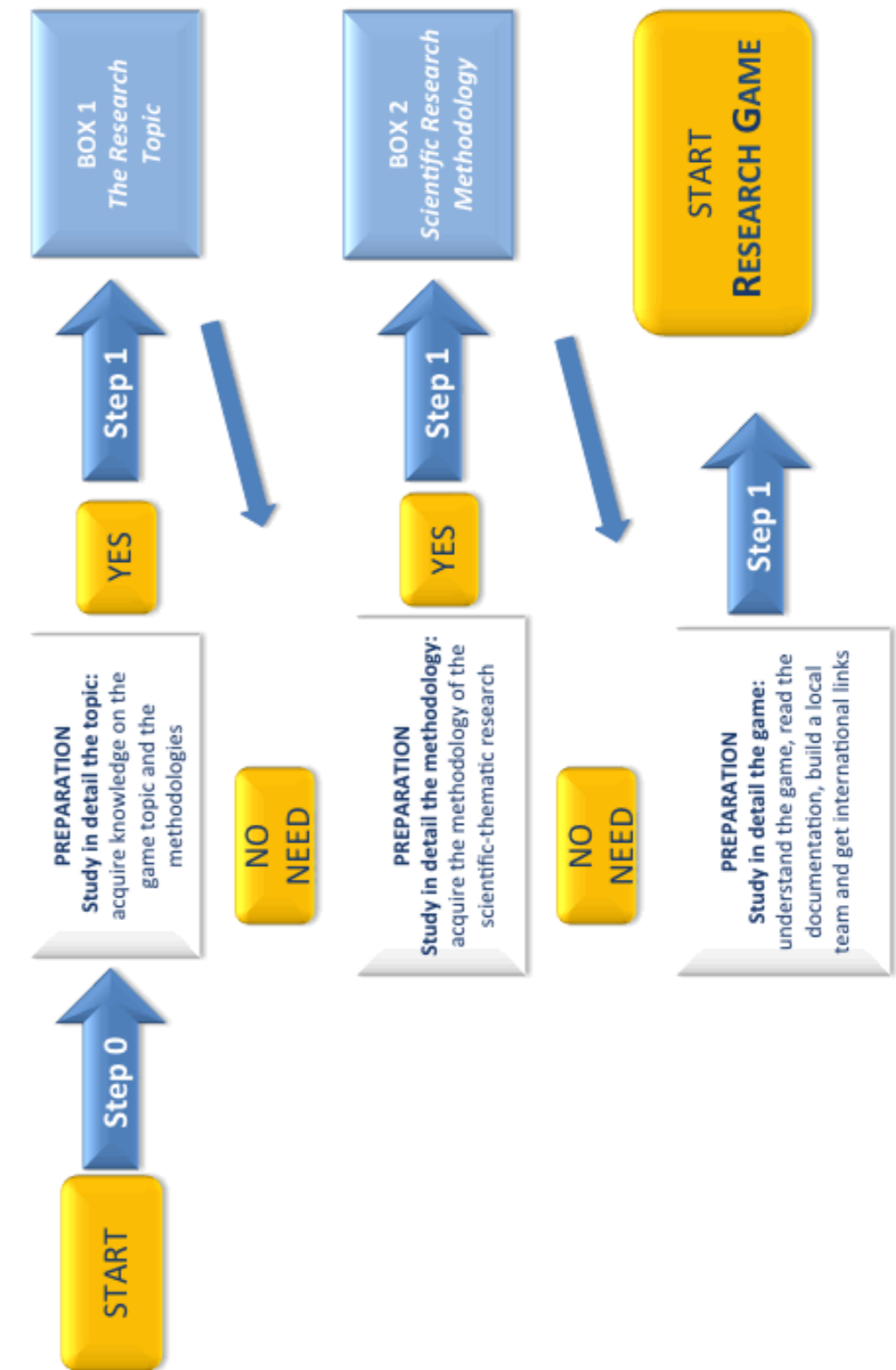
The online competition will be actually composed by different levels, each one asking different questions to the players with an increasing degree of difficulty. All levels will address aspects of the scientific research methodology on biodiversity that are expected to have been treated by the teams in the training and self-training preparatory sessions.

However, the online competition is set at a quite difficult level. Each team has to play collaboratively in order to get a high score. The competition will be performed on **Monday, 29th April 2013**.

The points earned in the *learning by doing* session and in the final online competition

	Game Stage	Students	Teachers
Activities	Introduction to the project		What we are going to do Introduction the creation of a hypothesis on environment - Question based
	Pre-game / preparation	Completing pre-questionnaires to asses expectations & past experience	Completing pre-questionnaires to asses expectations
	Team	Composing the teams	Oversight
	Hypothesis	Selecting the idea (hypothesis)	Oversight
	Observation	Observing and taking notes	Oversight
	Desk study	Preparing & completing desk researches Studying the chosen topic using books, the internet or other resources; identifying what is known	Guidance (on request)
	Ask questions	Formulating work hypothesis	Guidance (on request)
	Field and/or laboratory study	Preparing & completing field researches Designing sampling or laboratory experience (test of hypothesis; use of the controls; choice of the tecniques)	Guidance (on request)
	Compile and analyze data	Organize data; apply data analysis methodologies	Guidance (on request)
	Discuss results	Comparing with what is known	Guidance (on request)

RESEARCH GAME step by step



Learning by doing and cooperative learning' description

The 'learning by doing and cooperative learning' is in itself a self-training session for the teams and has to be intended as a preparation for the final game. This phase will be included in the overall evaluation. Although schools from all countries will be invited to participate to this phase, this will be consider a facultative session of the game. Teams will not be required to compulsory run any *learning by doing* session to be admitted to the final online competition.

In this session, the cooperative learning method is part of the active learning methodologies, based on the positive interdependence among group members. It is useful to underline that the cooperative method is a situated and motivating educational approach, able to value the different intelligences and learning approaches of the groups' members. Teams who had run the *learning* session will keep their scores when entering the final online competition. Few schools from the six countries composing the project's partnership, England, Germany, Italy, Portugal, Turkey and UK, will be invited to participate also to a preparatory mini-pilot: a preliminary game that will help the project team to improve the final one. This will serve as pre-assessment of the key elements of the methodological components of the game.

During the learning session each team in the schools will carry out simple experiments

Researcher collecting samples at Stenness Lagoon, Orkney Island, Scotland



Researchers and students working in a laboratory

about the biodiversity following the schematic steps suggested by the project team in this guide. These may be field or laboratory experiments, as well as desk experiments, run on computers using available experiments and data sets. The teams will then enter their work results onto the Research Game project [website](#) and share the products of their own research work (e.g., video, paper, report). Teams will also be invited to review and evaluate the reports submitted by the others, highlighting limits in the methodology used and in the consistency of the results presented and the conclusions drawn on that basis. The teams' activities, including the experimental work done, the report and the review work on other teams' reports, will be evaluated by an Awarding Commission nominated by the Research Game project Partner 5 (the Ecological European Federation), which will evaluate every group's activity, granting credits that teams will use during the final competition.

All the necessary information/videos/documentation will be included within the game itself and all pre-required information to play the game will be made available on the project's platform. All resources, and the games themselves, will be provided in all partners' languages (English, German, Italian, Portuguese, Turkish).

The *learning* session includes the following stages:

- activities
- compare & report
- the "what I have learnt" game.

The different stages are described in the table below together with the roles of **teachers** and students composing each team.