

PAST RECOMMENDATIONS FRAMEWORK FOR HISTORY AND STEAM CONTENTS COMMON IN PARTICIPATING COUNTRIES

WORK PACKAGE 2

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1. Purpose and objectives

This document has been prepared within **Work Package 2: STEAM and History in School Curriculum (WP2)** of the Erasmus+ project *Pathways Across STEAM and Time: Where History Meets STEAM (PAST)*. It represents the outcome of **Activity A2.3 – Developing the PAST Recommendations Framework**, which builds directly upon the findings of Activity A2.2 and the report *Identification of Historical Contents Related to STEAM Subjects in High Schools' Curricula*.

While Activity A2.2 focused on identifying historical contents connected to STEAM subjects within the secondary school curricula of participating countries, Activity A2.3 aims to develop a common framework for selecting, classifying and recommending contents with the highest potential for interdisciplinary History - STEAM integration. The framework serves as a bridge between curriculum analysis and the subsequent development of educational resources within later project activities.

The primary purpose of this framework is to identify historical themes, events, processes and case studies that:

- ✓ demonstrate clear connections between STEAM disciplines;
- ✓ are relevant to contemporary educational priorities and competence-based learning;
- ✓ can be meaningfully explored through interdisciplinary approaches;
- ✓ possess potential for application across different educational and cultural contexts;
- ✓ support the development of shared European and international perspectives while respecting national historical specificities.

The framework distinguishes between:

- ✓ **National PAST contents** – historically significant themes reflecting the unique cultural, scientific, technological or environmental heritage of participating countries;
- ✓ **International PAST contents** – themes shared across curricula and educational traditions of participating countries, offering strong opportunities for cross-national learning and collaboration.

Selection Criteria

The following criteria were used to identify and select the most relevant national and international PAST contents. They were designed to ensure that the selected themes have clear educational value, support interdisciplinary links between History and STEAM subjects, and can be meaningfully applied across different partner countries.

- ✓ **Relevance for History and STEAM integration.** The selected content should show a clear link between historical developments and one or more STEAM disciplines. Students should be able to see how scientific discoveries, technological innovations, artistic movements, or environmental changes developed within a particular historical context. Priority should be given to topics where these connections arise naturally and can be explored through both historical and STEAM perspectives.
- ✓ **Educational relevance.** The selected content should relate to learning topics commonly included in secondary school curricula and offer opportunities to connect History with STEAM subjects. The themes should encourage students to explore evidence, ask questions, analyse information, and understand the links between historical developments and scientific or technological progress. The selected contents should also be flexible enough to be used in different educational contexts and with different groups of learners.
- ✓ **International significance.** Although national contents may be rooted in the history of a particular country, they should also reflect developments that are relevant in a wider European or international context. Students should be able to relate local examples to broader historical, scientific, technological, cultural, or environmental processes. For this reason, preference should be given to topics that illustrate connections between national experiences and wider developments shared across Europe or beyond.

- ✓ **Historical consensus and non-controversial character.** The selected content should be based on historical facts and interpretations that are widely accepted in educational and academic practice. Preference should be given to topics that are commonly taught and understood in a similar way across participating countries. Where possible, themes that may lead to conflicting national interpretations or divert attention from the educational purpose of the framework should be avoided. This helps ensure that the selected contents can be used by all partners and discussed within a shared educational context.
- ✓ **Uniqueness and complementarity.** The selected contents should complement rather than repeat one another. To ensure a balanced framework, similar topics should not be included in more than one category unless they are approached from clearly different perspectives. Together, the selected contents should represent different historical contexts and demonstrate a variety of ways in which History and STEAM can be connected.
- ✓ **Potential for pedagogical application.** The selected content should be easy to adapt for teaching and learning activities in secondary schools. It should provide opportunities for students to explore historical and STEAM topics through research, discussion, project work, problem-solving, and creative tasks. Preference should be given to themes that can be further developed into teaching scenarios and other educational materials within the PAST project.
- ✓ **Balance Between National and International Contents.** The framework should include a balanced mix of national and international contents. National topics should showcase examples that are closely linked to the history and heritage of individual partner countries, while international topics should reflect historical developments that are relevant across several countries. This approach allows the framework to represent both the diversity of national experiences and the common themes that connect them.

Objectives

The objectives of the *PAST Recommendations Framework* are:

- ✓ to synthesise the findings of national curriculum analyses conducted within Activity A2.2;
- ✓ to identify and classify examples of History–STEAM integration suitable for secondary education;

- ✓ to select **8 national PAST contents** (two contents from each participating country) representing unique national perspectives on History and STEAM integration;
- ✓ to identify **7 international PAST contents** common to participating countries and suitable for cross-national educational application;
- ✓ to establish transparent criteria for selecting and evaluating PAST contents;
- ✓ to create a concise and evidence-based foundation for future educational materials and teaching scenarios developed within the project;
- ✓ to contribute to the broader objectives of the PAST project by strengthening interdisciplinary learning and demonstrating meaningful connections between historical knowledge and STEAM disciplines in secondary education.

2. Selection of National PAST Contents

The selection of national PAST contents builds on the results of Activity A2.2 and the report *Identification of Historical Contents Related to STEAM Subjects in High Schools' Curricula*. Based on the curriculum review and the examples of interdisciplinary teaching practices collected by project partners, a number of potential History–STEAM topics were identified in each participating country.

From the topics identified in each country, two were selected for inclusion in the PAST framework. Together, they represent different aspects of national history and heritage and provide a good basis for interdisciplinary learning activities in secondary education. The selected national contents reflect the variety of topics identified during the national curriculum reviews. They provide the thematic basis for the educational materials and teaching scenarios that will be developed later in the project.

2.1 LITHUANIA

The selected Lithuanian contents focus on two closely related themes: the interaction between people and the environment, and society's response to environmental challenges. Both topics are well represented in the Lithuanian curriculum and show how historical developments can be studied together with geography, environmental studies,

demography, ecology, and other STEAM-related subjects. Their relevance for contemporary environmental and social issues also makes them suitable for interdisciplinary learning in secondary education.

Landscape and Demographic Change in Lithuania focuses on how natural landscapes and human communities have changed over time. The topic combines historical developments with geography, demography, environmental studies, and the use of statistical data. By examining migration, settlement patterns, urbanisation, and population change, students can better understand how social, economic, and environmental factors have shaped both Lithuanian landscapes and society. The topic also provides opportunities to connect local historical developments with wider European demographic and environmental processes.

Ecological Disasters and Environmental Movements examines the historical roots of environmental problems and the responses they generated. The topic brings together history, ecology, environmental science, geography, and civic education. It encourages students to analyse the causes and consequences of environmental degradation, the growth of environmental awareness, and the emergence of environmental protection initiatives in Lithuania. In addition to its historical dimension, the theme addresses issues of sustainability and environmental responsibility that remain highly relevant in contemporary society.

These contents cover different but complementary perspectives of History–STEAM integration and avoid overlap with the international contents selected for the PAST framework. They provide opportunities for inquiry-based learning, the use of historical and statistical sources, environmental analysis, and interdisciplinary cooperation between history, geography, biology, environmental studies, mathematics, and civic education.

2.2 SERBIA

The selected Serbian contents represent different aspects of Serbia’s historical heritage. One is related to cultural and architectural achievements, while the other focuses

on mining and technological development. Both themes show how historical developments were connected with scientific knowledge, engineering skills, natural resources, and artistic traditions, creating clear links between history and STEAM subjects.

Medieval Serbian Monastic Architecture (Nemanjić Dynasty) explores the development of medieval architecture, construction techniques, and artistic traditions during one of the most important periods of Serbian history. Monasteries built under the Nemanjić dynasty reflect the architectural knowledge, engineering solutions, geometric principles, and religious culture of the time. The topic brings together history, architecture, engineering, mathematics, visual arts, and cultural heritage studies. It also enables students to examine how technical knowledge and artistic expression were combined in the design and construction of religious buildings that continue to shape Serbia's cultural landscape today.

History of Serbian Mining and Metallurgy (Novo Brdo, Bor, Majdanpek) focuses on the role of mining and metal production in the historical development of Serbia. Mining centres such as Novo Brdo, Bor, and Majdanpek contributed to economic growth, trade, technological advancement, and the emergence of industrial activities in different historical periods. The topic connects history with geology, chemistry, engineering, environmental studies, and industrial technology. It also highlights how the use of natural resources shaped human settlements and economic development, while drawing attention to the environmental impact of mining activities and the challenges associated with resource exploitation.

2.3 POLAND

The selected Polish contents address to important stages in Poland's historical development. The first looks at the growth of early settlements and state formation, while the second examines the impact of industrialisation on society and the economy. Both themes connect historical developments with environmental, technological, and scientific perspectives and can be explored through an interdisciplinary approach.

Early Slavic Settlements and Medieval State Formation focuses on the development of early communities and the processes that led to the emergence of the Polish state. Archaeological discoveries, settlement patterns, building methods, and land use provide valuable insights into everyday life during this period. The theme brings together history, archaeology, geography, environmental studies, and elements of engineering. It shows how natural conditions and available resources influenced where people settled, how they organised their communities, and how the first political structures gradually emerged.

Industrialisation in Poland (19th–20th Century) traces the economic and technological changes brought by the growth of industry, transport, and modern infrastructure. The expansion of mining, metallurgy, manufacturing, and urban centres reshaped the country and influenced the lives of its inhabitants. The theme brings together history, geography, engineering, chemistry, physics, technology, and environmental studies. It also highlights the role of natural resources in industrial growth and draws attention to the social and environmental changes that accompanied industrialisation.

The selected Polish contents cover two distinct periods of the country's history. They show how people adapted to their surroundings, used available resources, and responded to economic and technological change. Together, the themes connect historical developments with environmental, technological, and scientific perspectives and illustrate a range of links between history and STEAM subjects.

2.4 ITALY

The selected Italian contents reflect two moments in history when new ideas changed the direction of science and culture. The first is associated with the Renaissance, while the second is linked to the scientific discoveries that led to the Atomic Age. Together, they highlight the close relationship between historical developments, scientific knowledge, and technological progress.

Humanism, the Italian Renaissance, and the Scientific Revolution centres on the new ideas that reshaped European culture between the 15th and 17th centuries. Developments in art, education, astronomy, mathematics, and the study of nature

challenged established ways of thinking and contributed to the growth of scientific knowledge. The topic brings together history, art, mathematics, engineering, astronomy, and the history of science. It also highlights the close relationship between artistic achievement, scientific observation, and technological development during a period of major cultural and intellectual change.

The Panisperna Boys, Nuclear Physics, and the Atomic Age is associated with the work of Enrico Fermi and the Via Panisperna group, whose experiments opened new directions in the study of atomic structure and nuclear processes. Their research became closely linked with the Atomic Age and with some of the most important scientific developments of the twentieth century. The theme brings together history, physics, technology, ethics, and the history of science. It also raises questions about the social impact of scientific discoveries and the responsibilities that accompany the use of powerful new technologies.

The eight selected national contents cover different periods and aspects of the history of the participating countries. They include themes related to cultural heritage, environmental change, industrial development, and scientific achievement. While each topic is rooted in a specific national context, all of them show links between historical developments and STEAM subjects. The selected contents also helped identify themes that are shared across countries and can be considered at the international level.

3. Selection of International PAST Contents

The international PAST contents bring together themes that are widely recognised in European and world history. Covering different historical periods, they include topics related to science, technology, culture, health, and the environment. These themes help connect historical developments with STEAM subjects and provide common points of reference for future learning activities.

Ancient Civilisations: Mesopotamia, Ancient Egypt, Ancient Greece, and Ancient Rome looks at the achievements of some of the earliest societies in areas such as mathematics, astronomy, architecture, engineering, and administration. Many ideas and techniques developed during this period continued to be used, adapted, and expanded by later generations.

The topic links history with mathematics, engineering, technology, astronomy, geography, and the history of science. Practical needs related to agriculture, construction, trade, navigation, and governance encouraged the development of new knowledge and technical solutions. The theme also draws attention to the exchange of ideas between different civilisations and to the spread of knowledge across regions and historical periods.

The study of ancient civilisations helps place many modern scientific and technological achievements in a broader historical context. It provides an opportunity to examine how knowledge was created, adapted, and passed from one generation to another over long periods of time.

Life under the Influence of Pathogens (Historical Epidemics, Immunity, and Public Health) deals with the effects of infectious diseases on human societies from antiquity to the present day. Epidemics such as the *Justinian Plague*, the *Black Death*, and later outbreaks of *plague*, *cholera*, and *typhus* influenced population change, trade, economic activity, and everyday life across large parts of Europe and the world.

History, biology, medicine, public health, geography, and environmental studies all contribute to the understanding of this theme. Population density, trade routes, migration, and living conditions played an important role in the emergence and spread of infectious diseases. Scientific research gradually revealed the role of microbes, bacteria, viruses, and immunity in the transmission of disease, making possible new approaches to prevention and treatment, including vaccination, improved sanitation, and modern public health measures.

Recent outbreaks such as HIV/AIDS, Ebola, and COVID-19 show that infectious diseases remain a global challenge. Together with earlier epidemics, they illustrate how advances in medical knowledge, public health measures, and human behaviour shape both the spread of disease and the ways societies respond to it.

Geographical Discoveries and Navigation (Early Modern Period) explores the voyages and discoveries that reshaped connections between different parts of the world during the fifteenth and seventeenth centuries. New sea routes expanded trade, encouraged cultural exchange, and increased knowledge about distant regions and peoples.

Long-distance navigation relied on advances in shipbuilding, cartography, astronomy, mathematics, and navigational instruments. These developments improved the ability to travel across oceans, produce more accurate maps, and better understand the Earth's geography. As

exploration expanded, so did the exchange of knowledge, technologies, plants, animals, and ideas between continents.

Geographical discoveries affected far more than maps and navigation. New connections between continents changed trade, communication, and the exchange of knowledge, plants, animals, and technologies. The topic provides a useful context for examining the historical role of geography, astronomy, mathematics, engineering, and navigation in shaping global connections.

Construction of Railways and Industrial Centres (19th Century) traces a period when steam power transformed production, transport, and communication. Factories no longer depended on watermills or local sources of energy, making it possible to concentrate industry in rapidly growing industrial centres. These changes marked a new stage in economic development and accelerated the growth of manufacturing, trade, and urbanisation.

Railways became one of the defining features of the nineteenth century. Faster transport reduced distances between regions, connected mines, factories, ports, and markets, and enabled goods and raw materials to be moved on a scale that had not previously been possible. New railway connections also increased mobility, encouraged migration, and strengthened economic links between different parts of Europe.

Engineering, physics, geography, economics, and technology all help explain the changes associated with industrialisation and railway construction. Railways altered the movement of people, goods, and information, while industrial centres became places where new technologies, skills, and forms of work emerged. Many features of modern transport systems and industrial economies can be traced back to these nineteenth-century developments.

Nikola Tesla and the Development of Electrical Technology reflects a period when electricity was becoming part of everyday life and modern industry. N. Tesla is best known for his work on alternating current (AC), electric motors, transformers, and systems for transmitting electricity over long distances. These developments helped make electrical power available to homes, businesses, and industry on a scale that had not previously been possible.

By the end of the nineteenth century, electricity was beginning to change everyday life. Electric lighting replaced gas and oil lamps in many cities, factories gained new sources of power, and electrical systems supported the growth of communication and transport

technologies. Access to reliable electricity became an important part of economic and social development in many countries.

Tesla's work demonstrates how scientific research, experimentation, and practical problem-solving contributed to technologies that continue to be used today. It also helps explain why electricity became one of the foundations of modern society.

Scientific Heritage (Łukasiewicz, Curie, and Czochralski) brings together three discoveries that left a lasting mark on science and technology. Although made in different periods and scientific fields, the work of Ignacy Łukasiewicz, Marie Curie, and Jan Czochralski continues to influence modern industry, medicine, and technology.

Ignacy Łukasiewicz developed methods for refining kerosene and designed one of the first practical kerosene lamps, helping to establish the foundations of the modern petroleum industry. Marie Curie discovered polonium and radium and became one of the pioneers of radioactivity research. Her work opened new possibilities in physics, chemistry, and medical treatment. Jan Czochralski developed a method for growing single crystals, now known as the Czochralski process. Today, this technique is widely used in the production of semiconductors, microchips, and electronic devices.

The influence of these discoveries extends far beyond the period in which they were made. From petroleum products and medical applications of radioactivity to modern microelectronics, the work of Łukasiewicz, Curie, and Czochralski remains part of technologies used throughout the world today.

Global Climate Change examines how the Earth's climate has changed during the twentieth and twenty-first centuries and how these changes affect both nature and human societies. Rising temperatures, changing rainfall patterns, melting glaciers, and more frequent extreme weather events have become increasingly visible in many parts of the world.

Research on climate systems, greenhouse gases, ecosystems, and environmental processes helps explain these changes. Information collected from weather records, satellite observations, glaciers, oceans, and other natural sources allows scientists to track long-term climate trends and better understand changes taking place in different regions.

Changes in climate affect ecosystems, agriculture, water resources, coastal areas, and many aspects of everyday life. The topic places current environmental challenges in a broader

historical context and shows how closely human societies depend on natural systems and environmental conditions.

The selected international contents cover a wide chronological range, from the achievements of ancient civilisations to contemporary environmental challenges. Together, they address developments that influenced science, technology, health, transport, communication, and the understanding of the natural world. Although rooted in different historical periods, these themes share a common relevance across countries and cultures and help place national experiences within a broader European and global context.

4. Summary

Work Package 2 focused on identifying historical contents that can be linked with STEAM subjects in secondary education. The first stage resulted in a common research framework that defined how curriculum analysis would be carried out in all participating countries. This was followed by a review of national curricula and examples of interdisciplinary teaching practice, leading to the identification of historical topics with connections to science, technology, engineering, arts, mathematics, and environmental studies.

The research findings made it possible to identify both national and international PAST contents. National contents reflect distinctive historical experiences and heritage, while international contents focus on developments that have influenced societies across Europe and the wider world. The recommendations presented in this document explain the selection of these contents and outline their relevance for interdisciplinary History–STEAM education.

With the completion of WP2, the project moves from research and content selection to the development of educational resources. The themes identified in this work package will be further used in WP3 for the preparation of teacher training materials, teaching scenarios, and other resources intended for classroom use.