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# Ark of Inquiry: Inquiry Awards for Youth over Europe

**A European project for a widespread dissemination of inquiry activities through a network of universities, schools, science centres and museums**

**Goal**: to initiate a change in youth awareness of Responsible Research and Innovation (RRI).
**Method**: we intend to achieve our goal by applying an inquiry-based science approach.
**Outcome**: we support the building of a scientifically literate society which will better enable European citizens to participate in the research and innovation process.

## Consortium:

(1) University of Tartu (Estonia) – coordinator
(2) Ellinogermaniki Agogi, Research and Development Department (Greece)
(3) University of Turku, Centre for Learning Research (Finland)
(4) University of Cyprus (Cyprus)
(5) The United Nations Educational, Scientific and Cultural Organization, Regional Bureau for Science and Culture in Europe, Venice (Italy)
(6) HAN University of Applied Sciences, Research Centre Quality of Learning (Netherlands)
(7) Bundesministerium für Bildung und Frauen (Austria)
(8) Humboldt-Universität zu Berlin (Germany)
(9) Bahcesehir Egitim Kurumlari Anonim Sirketi (Turkey)
(10) Ecole de l'ADN – Nîmes European DNA Learning Centre (France)
(11) Katholieke Hogeschool Limburg (Belgium)
(12) Hungarian Research Teachers' Association (Hungary)
(13) AHHAA Science Centre (Estonia).

## Project:

· funded by the 7th Framework Programme of the European Commission within Activity 5.2.2 Young People and Science;
· started in March 2014 and ends in February 2018;
· aims to provide young European citizens (7–18-year-olds) with a pool of engaging inquiry activities to
  · improve their inquiry skills,
  · increase their awareness and understanding of conducting "real" science,
  · prepare them for participating in RRI processes.

## Eight work packages:

**WP1:** Pedagogical framework
**WP2:** Collection of inquiry activities and environments
**WP3:** Supporting community
**WP4:** Training
**WP5:** Evaluation
**WP6:** Implementation
**WP7:** Dissemination
**WP8:** Project management

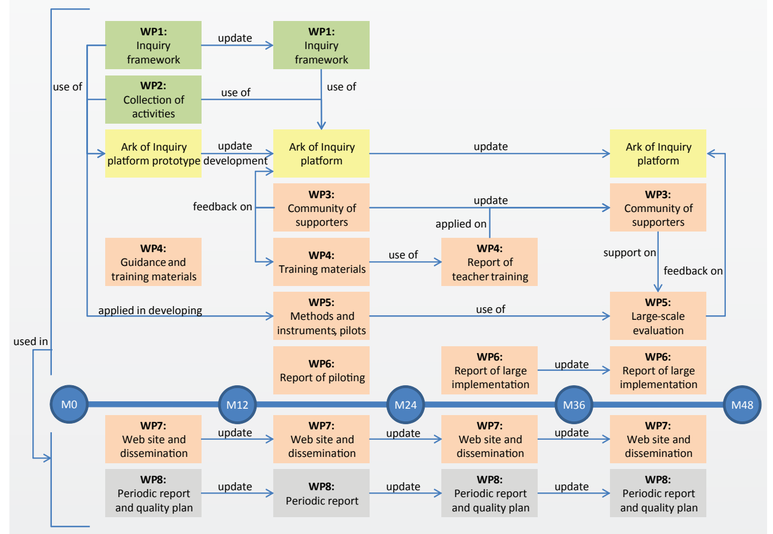


**Figure 1:** The work packages with an embedded timeline.

## Milestones:

· 12 months: Ark of Inquiry principles
· 18 months: piloting results in month 18
· 24 months: validation of the training and dissemination platform of inquiry activities
· 48 months: Ark of Inquiry exploitation

# Pedagogical approach

## Research problem

Inquiry-based learning has proven to be effective in stimulating interest in science. Several review studies also confirm that inquiry-based learning is more effective in achieving better learning outcomes when compared to "traditional" learning approaches such as direct instruction (Alafieri, Brooks, Aldrich & Tenenbaum, 2011; Carolan, Hutchins, Wickens & Cumming, 2014; d'Angelo, Rutstein, Harris, Bernard, Borokhovski&Haertel, 2014; Furtak, Seidel, Iverson & Briggs, 2012).

However, despite the proven success of inquiry-based science education and the learning environments developed to improve students' inquiry skills there are still some issues in applying inquiry learning more widely in everyday learning. One of the reasons could be the complexity of selecting and working through an inquiry cycle in order to develop inquiry skills. We aim to provide a solution.

## Framework for Inquiry Proficiency

In the Ark of Inquiry project we will create a system to describe inquiry proficiency across three levels: A (basic inquiry), B (advanced inquiry) and C (expert inquiry). The levels indicate how well a student can accomplish inquiry-based science.
We identified two dimensions for developing inquiry proficiency (Table 1):

(1) Self-regulation refers to how much control over the inquiry learning process is given to the learner. In terms of inquiry proficiency, the learner self-direction dimension divides into three levels according to whether inquiry activities are mainly teacher-led (A level), teacher-guided (B level) or student-led (C level).

(2) RRI awareness stands for the awareness of the relevance of research and research findings to people and society, as well as the responsibility to apply research and research findings in a balanced and respectful way in relation to the three pillars of sustainability: People, Planet and Profit (e.g., Slaper& Hall, 2011). Students advance in inquiry by gradually expanding this awareness.

**Table 1:** The Ark of Inquiry Framework for Inquiry Proficiency.

| Inquiry Phase | Inquiry Level | | |
|---|---|---|---|
| | A (basic inquiry) | B (advanced inquiry) | C (expert inquiry) |
| ORIENTATION | Teacher-led | Teacher-guided | Student-led |
| CONCEPTUALISATION | | | |
| INVESTIGATION | Predefined problems | Ill-defined problems in a predefined problem space | Ill-defined problems in an ill-defined problem space |
| CONCLUSION | | | |
| DISCUSSION | Aimed at skilfulness<br>Learning to report and present | Aimed at independency<br>Learning to communicate | Aimed at interdependency and societal relevance<br>Learning to discuss and reflect |

## Criteria for selection of inquiry activities including societal and gender dimensions

In general all activities should:
· promote inquiry kind of learning (and curricula) in STEM domains;
· be productive and engaging for students at various age and skill levels;
· be gender inclusive;
· promote students' awareness of societal responsibility.

In specific there are three mandatory core criteria:
· activity needs to be targeted in a STEM domain;
· activity needs to support inquiry learning;
· activity needs to support at least one of the inquiry phases.

## Future activities

· Selecting a vast number of inquiry activities that have been successfully applied in Europe or in particular countries;

· Collecting activities or links into the Ark of Inquiry platform, describing metadata and recommending inquiry activities according to learners' personal characteristics (e.g., inquiry experiences and skills);

· Offering learning support to the community of peers (in order to conduct group activities and practice scientific communication); especially important here is the community of teachers to ensure sustainable implementation of the Ark of Inquiry in school programmes across Europe;

· Providing rigorous face-to-face training for teachers to support their pupils' engagement in the Ark of Inquiry activities.

## Acknowledgement

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