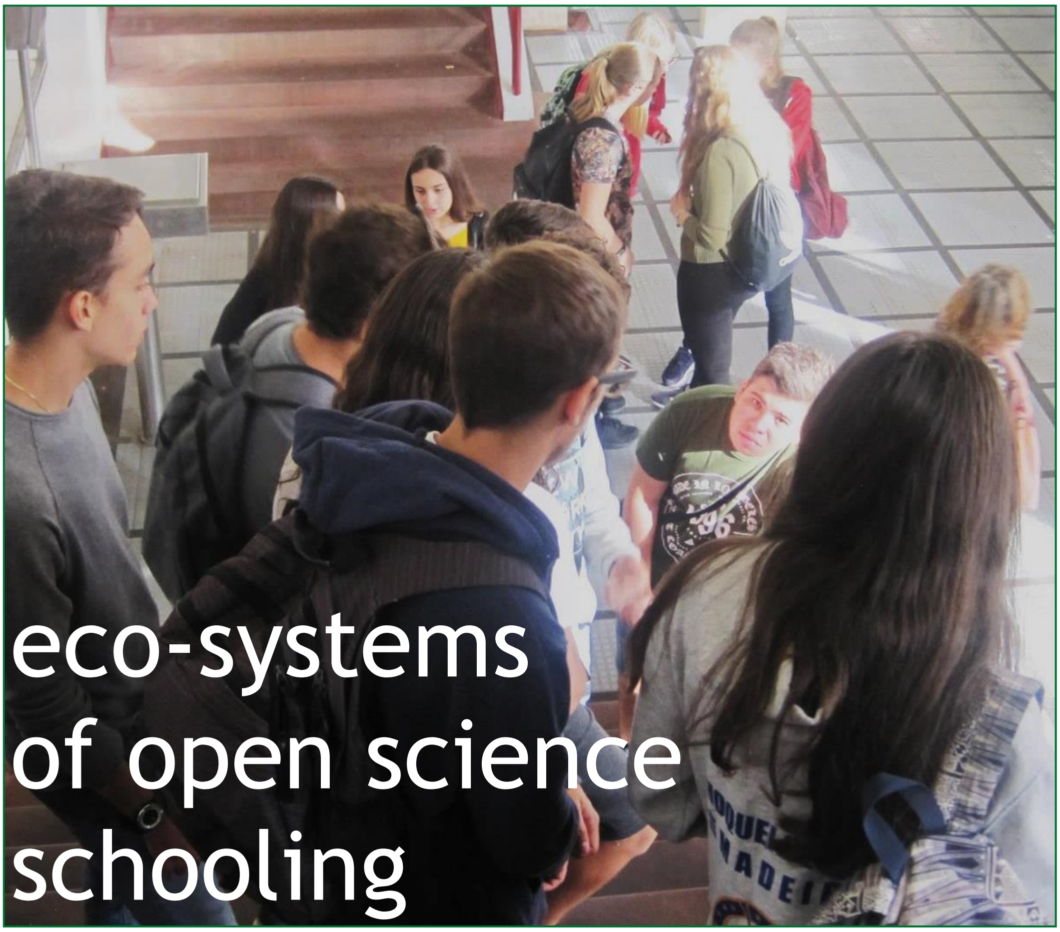


ATTACHMENT PACK

APPLICATION ATTACHMENT 1

DETAILED WORK PROGRAMME

INTRO

What are the reasons for the specific construction of the project's work programme?

The project's work programme is designed to create and test eco-systems of open science schooling in 5 European countries.

The work programme will allow the project to progress towards the eco-systems of open science schooling guidance to share with schools and science teachers in Europe.

The emerging eco-systems of science learning will precisely be tested by student teams' real-life and real-time science engagement in various forms of science missions – testing the usability, relevance and resources of the emerging eco-systems.

The final results of the project will therefore be based on 20 4-6 months' science missions and on solid knowledge creation from this practice.

The key players in the work programme are:

THE SECONDARY SCHOOL/THE SCHOOL TEAM
- management representation + lead science teachers + student team captains

THE STUDENT TEAMS
- 2 teams per 5 schools, each involving around 5 students between 14 and 16, or alternatively between 12 and 16, of age, in total 50 students in the project

THE ECO-SYSTEMS OF OPEN SCIENCE SCHOOLING/THE COMMUNITY SCIENCE RESOURCE TEAM
- relevant science and community resources brought together to form a permanent eco-system of open science schooling to support and enable the students new form of science learning, driven by the school teams

SCENARIO 1

CONSENSUS

TIMING

2 months – project months 1-2

OBJECTIVE

In the first scenario the project will focus on the creation of strong consensus among practice partners, school teams and student teams.

Strong consensus will be created to create a common platform of understanding of:
- what is open science schooling?
- what are eco-systems of open science schooling?
- how students learn through engaging in those eco-systems?
- how to test the eco-systems through the student teams' science missions
- what is a science mission?
- how to approach and engage science and community collaborators?

The consensus creation will be guided by initial guidance material produced by the project.

KEY ACTIVITIES

Planning a highly dynamic kick-off

Local discussions in the 5 school teams and in the 10 student teams in preparation of the kick-off – and supported by the project's initial guidance material

Planning of the school teams eco-system empowerment mobility

Creating simple strategies for the 5 school teams to start driving the new eco-systems of open science schooling

Creating high quality and attractive guidance to potential science and community collaborators

TRANSNATIONAL

Partner meeting 1 – month 2 - NL

<u>Objectives</u>

Creating strong consensus and capacity among the key players, based on the local discussions
Interaction with the local school team, student teams and key collaborators – to the extent possible
Detailed planning of scenario 2

Discussing in detail the initial guidance provided

Participation

Knowledge partners – 2 professionals
Practice partners – project manager + school team lead + 2 student team captain
Quality assurance partner – 2 professionals

PROCESS OUTCOMES

The process outcomes have 4 purposes:
- creating evidence from a scenario
- creating support tools for the project participants
- continuously feeding into the project's website
- contributing to the project's raw material base on which the final outcomes can be created

01
Introduction to Eco-systems of open science schooling - Schools

02
Introduction to Eco-systems of open science schooling – Student teams

03
Introduction to Eco-systems of open science schooling – Eco-system science collaborators

04
How can the school teams create and drive new eco-systems of science collaboration in the community?

05
How to prepare for the science missions?

06
Design and organisation of the School team eco-system empowerment mobility

SPECIAL CHALLENGES

Strong focus on creating consensus on project objectives and work methods

SCENARIO 2

ECO-SYSTEMS OF OPEN SCIENCE SCHOOLING

TIMING

4 months – project months 3-6

OBJECTIVE

The school teams will drive these scenarios.

They will, in collaboration with the student teams, analyse the various communities, science resources and create an “open science schooling resource map”.

The overall aim of the scenarios is to create the first versions of the local/regional eco-systems of open science schooling through intense dialogues with relevant community and science resources.

Such potential community and science resources might for example be:
- the local government and relevant departments
- science centers
- companies deeply involved in research and innovation
- various entrepreneurial hubs engaged in science
- civil organisations engaged in local or global (critical) science activities
- higher educations doing science research
- and similar

Each of the school teams will create the basic versions of the new eco-systems of open science schooling by inviting and engaging a team of the most relevant general science and community resources.

At the end of the 4 months, the first basic eco-systems are ready to work with the student teams science missions.

KEY ACTIVITIES

Key activities in the practice communities are:
- building the relevant general science resources map
- creating very attractive invitations to relevant community and science resources
- organising an open workshop for interested community and science resources, co-driven by the student teams
- establishing a first science learning eco-system team as a result of the workshop
- individual dialogues with the team resources: what’s in it for you?
- adding new resources to the team, if relevant and needed
- organising a final eco-system team workshop to prepare scenario 3 and the first round of student teams science missions
- documenting the process with high quality and sharing with the other practice communities
- preparing the school teams’ empowerment mobility and evaluation the mobility in the local school teams

TRANSNATIONAL

SCHOOL TEAM ECO-SYSTEM EMPOWERMENT MOBILITY

3 days school teams empowerment event
Madeira/Portugal

<u>Objectives</u>
Empower the school teams to create the first version of the eco-systems of open science schooling

<u>Key topics during the mobility</u>

- what is open science schooling in practice?
- what is a “student team science mission” and how can the science teacher guide the students?
- how to guide the students to work with science resources in the community?
- how can the schools start building up the local eco-systems of open science schooling?
- how can the science teachers motivate the students to use their global social and gaming network in the science missions?

Participation
School management representative from practice partners
Two lead science teachers from practice partners
1 project manager from practice partners
2 professionals from the coordinator
2 professionals from knowledge partners
2 professionals from the quality assurance partner

The mobility will include a mini partner meeting session for project professionals.

PROCESS OUTCOMES

The process outcomes have 4 purposes:
- creating evidence from a scenario
- creating support tools for the project participants
- continuously feeding into the project’s website
- contributing to the project’s raw material base on which the final outcomes can be created

07
The stepwise creation of the local/regional eco-systems of open science schooling – guidance for school teams and student teams

08
The results of the school teams’ creation of eco-systems of open science schooling in 5 European communities – the 3 perspectives

09
Results of the school teams’ empowerment mobility

10
Inspiration for the student teams to work in the first round science missions

11
How to document and tell the stories from the science missions?

SPECIAL CHALLENGES

Focus on, demonstrate and document how the creation of the eco-system works from the 3 different perspectives.
First knowledge creation from this scenario is important.

SCENARIO 3

ECO-SYSTEMS TESTING - SCIENCE MISSIONS 1

TIMING

6 months – project months 7-12

OBJECTIVE

Scenario 3 will provide the first testing of how the student teams can learn science through open science schooling supported by the eco-systems of open science schooling in the practice communities.
The scenario is student driven, with support from the school teams.

This will happen through the creation of science missions for the 10 student teams in the practice countries.

In this first round testing the student teams will focus the science missions on the local/regional (physical) community, combined with various science communities if possible.

The ultimate objective of the first round of eco-system testing is to create considerable first practical experience about how the students' open schooling is supported by the emerging eco-systems of science collaboration.
The experience will be heavily documented with a variety of media and the documentation will feed into the project's knowledge creation.

The results of the knowledge creation will be discussed in the project in scenario 4 and shared through the project website and relevant social media.

KEY ACTIVITIES

The 10 student teams will test the emerging eco-systems by working through their science missions.
The science missions will be guided by the project's 10-steps science mission methodology:

STEP 1
Students as science detectives
STEP 2
Science engagement dialogues with the school team and with the eco-system of science resources
STEP 3
Agreeing on science missions driven by the student teams
STEP 4
Science learning on demand and dialogues with mission resources and stakeholders
STEP 5
Discussions with end-users, involved people and institutions and others with an interest in the science mission
STEP 6
Designing the science missions and negotiating needed resources
STEP 7
Working in the science missions (student teams, school team, eco-system)
[Kindly refer to Attachment 5]

STEP 8
Evaluation of successes and failures
STEP 9
Sharing the experience with the other teams and in the project and with creative media – story-telling
STEP 10
Lessons learned

[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)

[Kindly refer to Attachment 3 – ECO-SYSTEM ILLUSTRATION: THE ECO-SYSTEM AT WORK]

TRANSNATIONAL

PROCESS OUTCOMES

The process outcomes have 4 purposes:
- creating evidence from a scenario
- creating support tools for the project participants
- continuously feeding into the project's website
- contributing to the project's raw material base on which the final outcomes can be created

12
Raw material from the first round of science missions testing the eco-systems of open science schooling in 5 European communities, including summary

SPECIAL CHALLENGES

A very strong focus on testing the eco-systems through authentic science missions and documenting the mission experience from the 3 perspectives: schools, students/teachers and eco-systems of open science schooling.
The documentation will focus strongly on the functioning of the emerging eco-systems and how the eco-systems support the students' open science schooling.

SCENARIO 4

EVALUATION AND KNOWLEDGE CREATION

TIMING

2 months – project months 13-14

OBJECTIVE

This short but intensive scenario, organised around the second partner meeting, will cover 4 very important actions, ensuring a qualified transition between the two long eco-system testing scenarios:

- evaluating the lessons learned from the first round of eco-system testing

- ensuing a strong focus on evaluating the functioning of the eco-systems from the 3 different perspectives: school, student/teacher and the community based on eco-system of science resources

- evaluating the documentation of the student teams' science missions, and ensuring that qualified knowledge about how the student's learn science through engaging in science missions and eco-systems can be created

- creating improved guidance to schools, student teams and eco-systems for the second round testing of the emerging open science schooling eco-systems

KEY ACTIVITIES

At the end of scenario 3, practice partners, schools and student teams will create raw material from the eco-system testing and the science missions. This raw material will be structured and edited by the project's knowledge partners and presented at the second partner meeting.

Also at the end of scenario 3, the project will guide the local partners to capture the experience from the eco-system players in the form of individual and collective testimonies and make this material available at the partner meeting.

The project's knowledge partners will critical review and improve the guidance provided for the second round eco-system testing, based on the lessons learned, documentation and testimonies from the first eco-system testing scenario.

Last, but not least, these scenarios will include detailed planning of the student team mobility: the "student teams' co-creation empowerment mobility".
The planning will be co-created by the student teams.

TRANSNATIONAL

Partner meeting 2 month 12 or 13 - FI

Objectives

The key progression objectives of the second partner meeting are:
- evaluating the lessons learned from the first round of eco-system testing
- ensuing a strong focus on evaluating the functioning of the eco-systems from the 3 different perspectives: school, student/teacher and the community based eco-system of science resources
- evaluating the documentation of the student teams' science missions, and ensuring that qualified knowledge about how the student's learn science through engaging in science missions and eco-systems can be created
- creating improved guidance to schools, student teams and eco-systems for the second round testing of the emerging open science schooling eco-systems

Participation

Knowledge partners – 2 professionals
Practice partners – project manager + school team lead + 2 student team captain
Quality assurance partner – 2 professionals

PROCESS OUTCOMES

13
Lessons learned from the first round of eco-system testing, including from the 3 different player perspective

14
Successes and failures from the students' science missions: what works, what does not?

15
How can the school teams improve, widen and qualify the eco-systems in the second long practice period?

16
Improved and revised guidance for student teams for the second round of science missions and eco-system testing

SPECIAL CHALLENGES

Special focus needed in scenario 4 on to what extent sufficient knowledge can be created from the 6 months eco-system testing and science missions, and to what extent the student teams' mobility can contribute with important material for further knowledge creation.

SCENARIO 5

ECO-SYSTEMS TESTING - SCIENCE MISSIONS 2

TIMING

6 months – project months 15-20

OBJECTIVE

Scenario 5 will, based on the improved guidance produced in scenario 4, provide the second testing of how the student teams can learn science through open science schooling supported by the eco-systems of open science schooling in the practice communities.
The scenario is student driven, with support from the school teams.
The second round testing is expected to be significantly more efficient than the first testing, as all players are now to be regarded "experienced open science schooling eco-systems' learners and resources".

This will happen through the creation of science missions for the 10 student teams in the practice countries.

In this first round the student teams focused the science missions on the local/regional (physical) community, combined with various science communities if possible.
In the second round the student teams will focus the science missions on virtual communities, combined with various science communities if possible.

The ultimate objective of the second round of eco-system testing is to create considerable further practical experience about how the students' open schooling is supported by the emerging eco-systems of science collaboration. The experience will be heavily documented with a variety of media and the documentation will feed into the project's knowledge creation.

The results of the knowledge creation will be discussed in the project in scenario 6 and will feed into the project's website and final outcomes.

The documentation and story-telling from scenario 5 will be strongly supported through the student teams' 5 days mobility, precisely missioned to enable the student teams to co-create the results of the project.

KEY ACTIVITIES

The 10 student teams will test the emerging eco-systems in this second round by working through their science missions. The science missions will be different from the first round missions, as the second round missions will be focused on virtual communities in possible combination with local/regional science communities.

The science missions will be guided by the project's 10-steps science mission methodology:

STEP 1
Students as science detectives
STEP 2
Science engagement dialogues with the school team and with the eco-system of science resources
STEP 3
Agreeing on science missions driven by the student teams
STEP 4
Science learning on demand and dialogues with mission resources and stakeholders
STEP 5
Discussions with end-users, involved people and institutions and others with an interest in the science mission
STEP 6
Designing the science missions and negotiating needed resources
STEP 7
Working in the science missions (student teams, school team, eco-system)
STEP 8
Evaluation of successes and failures
STEP 9
Sharing the experience with the other teams and in the project and with creative media – story-telling
STEP 10
Lessons learned

[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)

[Kindly refer to Attachment 3 – ECO-SYSTEM ILLUSTRATION: THE ECO-SYSTEM AT WORK]

TRANSNATIONAL

Student teams co-creation empowerment MOBILITY – month 19 or 20 Apeldoorn NL

Objectives

The student teams' mobility has 3 major objectives:
- students' sharing their science mission and eco-system experience
- empowering students to co-create the project's final outcomes
- producing key elements for the student teams' video movie, IO 2

Key topics

- intensive sharing of open science schooling and science missions experience
- workshops on the video material produced by the student teams
- editing of the video and production of additional material, including students' testimonies
- how to create useful and exciting multipliers and make them work for the local eco-systems?
- how to transfer the eco-systems to the new students?
- how will we continue to engage in science learning and science at local and global levels?
- how can we work with science in our social and gaming networks?
- how can we create personal portfolios demonstrating what we learned and what new competences we acquired?

Participation

Knowledge partners: 2 professionals each
Practice partners: 1 project manager + 1 lead science teacher + 8 students per practice partner
Quality Assurance partner: 2 professionals

The mobility will include a mini partner meeting session for project professionals.

PROCESS OUTCOMES

The process outcomes have 4 purposes:
- creating evidence from a scenario
- creating support tools for the project participants
- continuously feeding into the project's website
- contributing to the project's raw material base on which the final outcomes can be created

17
Raw material from the second round of science missions testing the eco-systems of open science schooling in 5 European communities, including summary

18
Design and organisation of the "Student teams co-creation empowerment mobility"

19
The student teams' mobility: what and how did the students co-create?

20
Final evaluation of the science missions, the eco-systems of open science schooling and the testing of the eco-system

SPECIAL CHALLENGES

A very strong focus on testing the eco-systems through authentic science missions and documenting the mission experience from the 3 perspectives: school, students/teachers and eco-systems of open science schooling.

A strong focus must be put at the sufficient and relevant production of documentation and testimonies from the second round eco-system testing, as the final knowledge creation will be based on this raw material.

SCENARIO 6

FINAL OUTCOMES AND SHARING

TIMING

4 months – project months 21-24

OBJECTIVE

The ultimate objective of the sixth and final scenario is to complete the project's movement from experience to knowledge creation and to final outcomes.

To accomplish this, the scenario will create lessons learned from the second eco-system testing phase based on evidence from the 10 student teams' science missions in the practice countries, backed up and supported by the increasingly mature eco-systems of open science schooling.

Scenario 6 will therefore bring together the material produced from the various project sources:
- the progressive versions of the project guidance
- the documentation from the in total 20 different science missions
- the evaluation of the two long eco-system testing scenarios
- interviews and testimonies from the eco-system resources
- the project's continues knowledge creation

To ensure a most qualified creation of the final outcomes based on this rich material, the project has dedicated 4 months to accomplish this.

KEY ACTIVITIES

Knowledge partners collect, review and edit available material at the end of scenario 5 and make the results available for debate at the third and final partner meeting.

Knowledge partners will take action to create missing elements for the final outcomes, in particular for IO 01.

The third partner meeting will discuss the final editing and publishing of the project's results – including its dissemination in the website and in relevant social media.

Based on the discussions at the partner meeting, the project's IO leads will create the final versions of the IO's.

TRANSNATIONAL

Partner meeting 3 - month 21 - LT

Objectives

The third partner meeting will discuss the final editing and publishing of the project's results – including its dissemination in the website and in relevant social media.

Participation

Knowledge partners – 2 professionals
Practice partners – project manager + school team lead + 2 student team captain
Quality assurance partner – 2 professionals

PROCESS OUTCOMES

Only product outcomes expected in this final scenario.

Those are:

1
Eco-systems of open science schooling – The Guidance Pack

2
How we learned science through the eco-systems – The student video

3
Policy paper: what (more) does it take to make open science schooling a reality?

4
Research paper: what (more) needs research and experimentation to make open science schooling a reality?

SPECIAL CHALLENGES

The final scenario is the project will pay much attention to the quality criteria for the final outcomes, in particular:

- is the Guidance Pack practically useful, realistic and attractive to secondary schools and science teachers? - is the student video as authentic as expected? Does it allow insight into the world of the new generations of students and their attitudes towards science and towards innovative science learning? - are the policy and research papers able to provide precise recommendations for further experimentation in the field of eco-systems of open science schooling, from which the various levels of the European community can take action?

[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)

[Kindly refer to Attachment 3 – ECO-SYSTEM ILLUSTRATION: THE ECO-SYSTEM AT WORK]

APPLICATION ATTACHMENT 2

INNOVATION VOCABULARY

- In support of the reader's full appreciation of the project innovation

Agent of community and agency
The expression "agency" is used by the OECD, the European Commission as well as by leading learning pioneers and increasingly by educational researchers.
The term "agency" is at the very heart of the project innovation.
Agency means "the capacity to act" and not just to "know" or "remember".
The project is strongly linked to the learning approach that learning becomes effective, useful and relevant when the students are engaged in real-life science in the community.
This also means that the term "agency" forms part of a learning credo, a new way to think education and a new way to learn – not primarily linked to the community or to the specific science topics addressed.
Last, but not least, the "capacity to act" and "to learn through taking action", should be developed all along the educational system, from kindergarten and onwards.
These are in fact the very words of the European Commission.

Co-creation
Co-creation is a term linked to the modern innovation discourse: problems, solutions and designs can be co-created by for example end-users or students.
Co-creation does not mean that the ones co-creating are responsible for the final outcome, but it means that the co-creators play important roles in the creation of solutions or outcomes.
In our context co-creation is linked to the students: they will be co-creators of the project implementation as well as the project outcomes.
We believe that true educational innovation cannot be created without the students being authentic co-creators of the innovation.
This is even truer now than ever: *for the simple reason that we do not really understand how the new generations learn, live and think.*
"Millennials worldwide are more similar to one another then to older generations within their nations." - *Time Magazine, 2014*
This makes co-creation in educational innovation urgent and indispensable.

Community
In the *Eco-systems of Open Schooling* project "community" should be understood in its widest sense: local physical community, the region, various science communities – and virtual communities.
The globalised world and the 21st century students do not separate these worlds in the way the present educational systems do.
They work with the physical and virtual communities as one world – and local science engagement might very well include considerable virtual social networking.
This is why the project invites the student teams to work in different forms of communities in the two long science mission phases.

Community and science collaborators
When secondary schools and student teams start acting in the community, they will collaborate with a wide range of people and institutions.
These community collaborating resources have many names, so to speak.
Therefore some clarification might be useful:
In the field of "eco-systems of open science schooling" - where schools become agents of science collaboration in the community and students become agents of science missions in the community – there are basically two types of people and institutions collaborating with the schools and the student teams:
1
THE ECO-SYSTEMS OF OPEN SCIENCE SCHOOLING
These are permanent teams of open science schooling collaboration, driven and facilitated by the school team.
The mission of these resources is to provide an infrastructure or platform of resources for the student teams' science missions.
Examples of such eco-system players are:
- Public authorities with an interest in science learning and science in the community
- Various forms of science educations and research bodies, private or public
- Open science centres in the community or region
- Entrepreneurial hubs engaged in science in various ways
- Citizens' organisations working with science-related challenges in the community, such as science in society
2
MISSION BASED SCIENCE RESOURCES
Whereas the eco-systems of open science schooling are permanent bodies, ad hoc teams of science resources linked to specific science topics will be created through the student teams' science missions.
Such science resources might be any resources working directly with challenges linked to the student teams' science missions.

Eco-systems of open science schooling
Even though this expression might appear a bit complicated, its emergence is quite simple:
As strongly recommended by the European Commission we are trying to re-think and fundamentally innovate science education in secondary school, as very many

young people grow a strong resistance to science education precisely in secondary school and in their teenage years.
The most efficient and attractive innovation of science education is precisely open science schooling.
Open science schooling is defined across the application and also in this vocabulary.
The open science schooling approach is based on young students learning science through science missions carried out in the communities.
This is where the eco-systems come in:
If open science schooling is to be made a reality and yield the expected innovation, then the student teams' science missions must be realistic, possible and efficient.
Now, the problem is that student teams cannot be expected to build up important collaborative infrastructures each time they set out to accomplish a science mission.
This is why we say: if the student teams are going to act successfully in the community, then the schools also need to act successfully in the community.
The basic science and community resources should therefore be permanent resources the students can tap directly into and get support from in their science missions.
As stated by the Commission, *such infrastructures of science resources must be readily available to teachers and students*.
These permanent open science schooling resources are called "eco-systems", as the resources are expected to be a living organism of a wide range of different resources – and therefore adjusting and changing according to the needs of the students' science learning.
Examples of such eco-system players are:
- Private companies with science-related activity
- Public authorities with an interest in science learning and science in the community
- Various forms of science educations and research bodies, private or public
- Open science centres in the community or region
- Entrepreneurial hubs engaged in science in various ways
- Citizens' organisations working with science-related challenges in the community, such as science in society

Implementation methodology
To ensure the accomplishment of the project's missions, the project is driven by two different but strongly interacting methodologies: the implementation methodology and the innovation methodology.
The two methodologies are necessary to accomplish the project mission for the following reasons:
- Even if the project from a "project" point of view is well implemented, that does not guarantee that the project's innovation has been successful
- Even if the project has managed to work successfully with the project innovation, that need not lead to successful project results if the project – as a "project" – is not well implemented
Erasmus+ projects constantly struggle with unbalances between these two forms of methodologies.
The implementation methodology answers the question:
"How will the project ensure the progression towards quality outcomes?"
The answer is:
- the project outcomes will result from qualified knowledge creation along the project; this knowledge creation is based on the transformation of documentation of the project practice and experimentation; the project will ensure proper documentation of practice and proper transformation of documentation to knowledge on which the outcomes can be based

Unlike the innovation methodology, covering the most important structural quality parameters in the project, the implementation parameter is about the quality of the project progression – as a project.
It is concerned with the question: *to what extent is the project able to progress well towards its final outcomes?*
This means that the implementation of the project phases (the "scenarios") is crucial, that the transition between the phases is crucial – and that the phases progressively build up to the final outcomes.
The successful application of the implementation methodology is supported by a set of critical quality criteria, forming part of the project's quality assurance platform.
The methodology is further detailed in the application's methodology section.

Innovation methodology
To ensure the accomplishment of the project's missions, the project is driven by two different but strongly interacting methodologies: the implementation methodology and the innovation methodology.
The two methodologies are necessary to accomplish the project mission for the following reasons:
- Even if the project from a "project" point of view is well implemented, that does not guarantee that the project's innovation has been successful
- Even if the project has managed to work successfully with the project innovation, that need not lead to successful project results if the project – as a "project" – is not well implemented.
Erasmus+ projects constantly struggle with unbalances between these two forms of methodologies.
The innovation methodology serves to ensure that the project innovation is well guided, that the innovation is practiced in real-life, that the practice is documented and is leading to sound knowledge creation and thereby to good final results.
The innovation creation logic:
- state of the art and lessons learned based guidance to create the first basic eco-systems of open science schooling
- double practical testing of the eco-systems through 2 x 6 months student mission engagement in open science schooling based on the eco-systems
- 3 x evaluation processes, ultimately leading to the final outcomes
The successful application of the innovation methodology is supported by a set of demanding quality criteria, forming part of the project's quality assurance platform.
The methodology is further detailed in the application's methodology section.

Knowledge creation
Knowledge creation can mean very many things in different contexts.
In an Erasmus+ level project the final outcomes cannot be based on research and the final results of the project should be based on practical experience.
However, to produce useful and reliable outcomes the project practice needs to be transformed into knowledge elements from which the final outcomes can be created.
It is not possible to base final outcomes directly on practice, as practice only exists as a line of actions carried out.
These actions and the lessons learned need to be transformed into what we might call "building bricks of knowledge" to inform the project's guidance outcomes.

The most critical process is, then, to document practice and to transform this documentation to knowledge elements. If the transformation to knowledge elements is successful, then useful outcomes can be created.
In any Erasmus+ project this process is closely linked to quality assurance, asking the following questions:
- is the project practice being sufficiently documented?
- is the project able to transform the documentation into meaningful knowledge elements?
- is the project able to create useful outcomes from these knowledge elements?
This is why, in this project, the partnership consists of knowledge partners, practice partners and a dedicated quality assurance partner.

Learning on demand
In traditional education the students are taught through the principle of “learning when scheduled”. That is: learning math Tuesday from 10-12.
To the students of the 21st century this is definitely an abstract justification of the learning.
The learning is organised to please the education system, not to support the students’ learning.
“Learning on demand” totally changes this approach: the students learn when they need to learn, when it is relevant, when they are motived, and first of all: the students learn when they need to learn *to accomplish their science missions*.
This form of learning is based on the students’ interest, not the systems’.
In the project this is called “time-outs for learning on demand”.
When the students work in their science missions, they often get stuck: we cannot progress from this point. We need to learn something first, or in parallel. Then we can progress.
Learning when scheduled leads to remembering, whereas learning on demand leads to deep sustainable learning and the capacity to act.
Obviously, schools need to learn how to organise such “learning on demand” – in collaboration precisely with the eco-systems of open science schooling.

Modernization of science education
In recent years very many attempts to “modernize” science teaching have been carried out.
Such “modernizations” might be visits to science resources outside the school, punctual engagement in science activities in the community, new work forms in the class – or participation in various forms of science competitions.
A popular “modernization” is to use new technology and even digital games.
The European Commission states, however, that this is not enough.
We need to re-think the fundamentals of science education and we need to develop dramatically new ways of engaging young people in science.
This is why the Commission invites experimentation with open science schooling.

Open science schooling
The European Commission calls for re-thinking education, and open science schooling is one of the educational changes increasingly recommended by the Commission as well as by critical research.

Open science schooling refers to education that works with real-life challenges in the community and globally, allowing students to learn through engaging in science challenges, problems, and innovation.
This indicates that the learning is no longer linked to the classroom but to the world outside the school.
Obviously, this is no less than a revolution in education, and more so as open science schooling goes far beyond punctual activities outside school such as visits to a science centre or similar.
Open science schooling is incorporated in the schools as drivers of eco-systems methodology, and this methodology in fact takes open science schooling further: not only engaging in science challenges relevant to the community, but creating capacity to take critical action among the students, critical action through long and deep science missions.
A key point is to take open science schooling to a level where the students accomplish something real.

Re-thinking science education
The short version of this complex concept is that it is not enough to “modernize” traditional science education, or to add new features such as project work.
The new generations of students and the new and constantly changing global reality call for fundamental re-thinking of what science education is and should be: re-thinking the very basic axioms of and the very discourse of traditional science education.
As the European Commission says, it will take a sea change for education in Europe to accomplish this radical and urgent mission.

School teams
The project involves one school team from each of the participating secondary schools from the practice countries.
The school teams are drivers and facilitators of the emerging eco-systems of open science schooling and will support the student teams’ science mission.
The school teams represent all major levels of the schools:
- Management representation
- Lead science teachers
- Student captains
It is therefore of great importance that vertical consensus is created along the first two scenarios: from management to student.
Management representation and lead science teachers from the school teams in the different practice countries will meet and interact during the 3 days school teams’ empowerment mobility.
The school team will be represented by a lead science teacher and the student team captains at all partner meetings.

Science missions
In traditional teaching the students work with text books, artificial cases and lots of theory and abstract knowledge.
In open science schooling students learn through working with real-life science challenges and in real-time.

Students do not look at the reality around them through subjects, classrooms and texts, but engage directly in science challenges of all kinds and in close collaborations with community science resources.
This completely alters the traditional educational set-up and places moreover teachers in brand new roles: as guides, as facilitators and as critical friends to the student teams. And, by the way, as learners alongside the students…
Students work in teams to learn through engaging in long missions of science challenges in the various forms of communities.
“Community” in this context is a very broad term; it might mean local physical community, region, or even virtual community.
The way they learn through taking action in the community is to define, create and accomplish science missions.
Missions are projects carried out in real-life and in collaboration with real-life science players. We use “mission” instead of “project” for several reasons:
- The term “project” was once very innovative, such as in project based learning; however, today the term can mean everything and nothing
- The term “mission” is much stronger: it refers to strong intentions, the will to accomplish and the ability to critical engagement
- The term “mission” is used in all sorts of video games and most young people are familiar with the meaning of missions: working through levels and steps to be allowed to advance in the game and to finally accomplish
The infrastructure of a mission is the 10 steps methodology:
This method is developed for the project, but builds on more than 15 years of educational innovation experimentation.
The expression refers to the typical steps that student teams need to work through to accomplish their science missions.
The method is a pragmatic method helping the schools and the students understand and implement the missions – in close interaction with the emerging eco-systems of open science schooling.

Missions might, of course, look different, but the 10 steps are quite typical for most science missions:

STEP 1
Students as science detectives
STEP 2
Science engagement dialogues with the school team and with the eco-system of science resources
STEP 3
Agreeing on science missions driven by the student teams
STEP 4
Science learning on demand and dialogues with mission resources and stakeholders
STEP 5
Discussions with end-users, involved people and institutions and others with an interest in the science mission
STEP 6
Designing the science missions and negotiating needed resources
STEP 7
Working in the science missions (student teams, school team, eco-system)
STEP 8
Evaluation of successes and failures
STEP 9
Sharing the experience with the other teams and in the project and with creative media – story-telling
STEP 10
Lessons learned

Student teams
The project will involve 10 student teams of around 5 students each from 5 different countries along the entire project.
The student teams are at the centre of the project and will co-create its outcomes: innovation WITH, not TO.
In particular the student teams will be drivers of the two 4-6 months long testing of the eco-systems of open science schooling.
The teams will do this through their real-life and real-time science missions.
The most important things linked to the deep involvement of the around 50 secondary school students are for the project to learn about the following challenges:
- In what ways are the students learning science differently through the open science schooling method?
- In what ways are the eco-systems of open science schooling giving support to the new form of science learning?
The student teams will meet and collaborate during the 5 days student teams' empowerment mobility.
The student captains will participate in all partner meetings.

APPLICATION ATTACHMENT 3

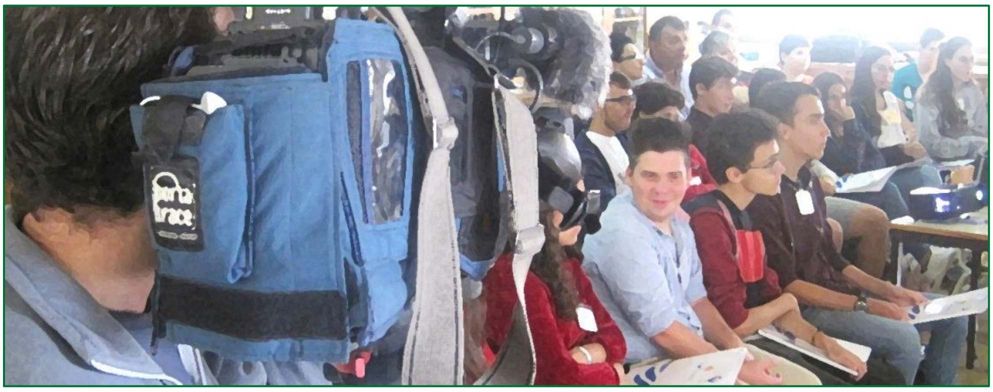
ECO-SYSTEM OF OPEN SCIENCE SCHOOLING ILLUSTRATION

What's the basic concept in the *Eco-systems of Open Schooling* project?
How does the project work?
How will it create useful guidance on eco-systems of open science schooling to interested schools and science teachers in Europe?

We will throw some light on these questions by providing a short example of a fictive eco-system at work.

The eco-system at work - an eco-system of open science schooling case

ROBOTICS WITH DIGNITY



The Socrates secondary school is located in the town of Heidelhof.
The school formed a school team of open science schooling one year ago, and since then the school team has been working to build up an eco-system of open science schooling in the community and in the nearby bigger city.
The idea was to start working with science missions among 14-16 years old students, and for that the school needed to ensure available resources of the community and of science resources in the community and in the nearby city.

The school team managed to engage a number of possibly useful community and science resources in the eco-system, and at some point they named the collaboration "ScienceHof".
The resources in the eco-system were from the beginning:
The local municipality – the educational and innovation departments
The open science centre in the nearby bigger city
The local chamber of commerce – the entrepreneurial team
A local NGO engaging interested citizens in various forms of science activities

Of course the school also participated in the eco-system – as did a representative from a research department at the university in the nearby bigger city.

The “ScienceHof” agreed to maintain and qualify the eco-system by organising open science learning workshop every second month.
In addition to the eco-system resources, interested stakeholders and community players were invited as well – to make the eco-system known and accepted in the community.
The overall aim of the workshops was to create a dynamic eco-system of open science schooling in the community and beyond – in support of the new initiatives at the school to make science much more attractive to the young students, in particular to young girls.

Then 6 young students created their mission team, and they named it Ulysses as they expected to travel around the community quite a lot!

The idea was for them to create a serious and challenging science mission – in parallel to the scheduled science teaching.
The scheduled science teaching was reduced by 50% for one semester, thereby creating the needed time and space for the science missions.

The first challenge to the Ulysses team was to play science detectives: what kind of interesting science activities were happening in the community and in the nearby bigger city?
The team had to decide on a special topic from which the science mission could be designed.

A lot of physical and online work followed.
And, several meetings with the resources in the “ScienceHof”, giving the student team many good ideas to work with.

After some weeks of science detecting one of the team members, during a talk with the entrepreneurial people from the chamber of commerce in the “ScienceHof”, happened to hear about a small but very dynamic programming team working in the community’s entrepreneurial centre.
What made the team member curious was that this programming team apparently was creating important series of programming for the fabrication of robots at the university in the nearby city.

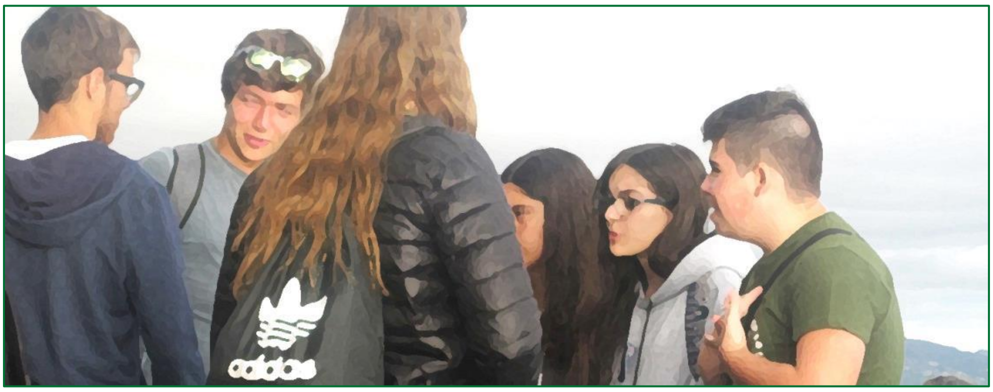
The team members told the team about this in a very enthusiastic way and they agreed to go deeper into this opportunity.
Through the “ScienceHof” eco-system they managed to talk directly to the small company who did the programming, and the company even made it possible for the team to visit the robotics production centre in the nearby bigger city.

The dialogues and visits to the robotics people were a big chock and eye-opener for the team: *they found out that the robots were designed to take care of old people in their homes!*
The young students had no idea that robots were used for that. They thought they were used for car production and similar.

At the same time the team was extremely impressed by the advanced programing and technology they saw.

What then happened in the team was that the fascination of the technology and the hesitation towards using robots for old people converged into a strong interest in getting deeper into all this: *the excitement was transformed into the student team's semester science mission!*

The more precise mission emerged suddenly when one of the team members asked one of the programmers of the robots: "But how do you know if the old people like caretaking from robots?"
The programmer was not able to give a good answer, neither were the producers of the robots.



This made the team formulate the follow science mission:

"What can robots do for old people and what will the old people like the robots to do?"

The first thing the student team did now was to talk seriously to the eco-system collaborators about this mission. What did they think about the mission? How could they support the mission?

The team was surprised to see the dedication of the eco-system collaborators when they presented the mission.
The municipality was excited about a mission that might create some knowledge about what the old people wanted, and some critical perspectives as well.
The social department offered to organise whatever dialogues with old people the team needed.
The chamber of commerce was also interested, as they could spot some new entrepreneurial innovation opportunities in the field of "old people and robotics".
The citizens' NGO was even more interested as they were basically critical towards using robots for care of elderly.
Last, but not least, the school was very pleased, as the topic robotics for old people offered very many highly interesting and challenging science missions in the future.

So, in short the eco-system provided the needed platform for the students' science mission.

They now designed the science mission in detail. They decided to work in 3 directions in parallel:
- following and trying to understand the work of the programmers and the robot producers to the extent possible
- creating learning on demand time-outs to learn basic things about programming, robotics and the application of robotics in social life

- organising a small research project in which they would interview old people, social workers and people with different opinions about using robots for old people

A lot of activities, a lot of learning, a lot of collaboration – and from time to time a lot of frustration: not enough time, not enough knowledge, not enough resources…

Some of the most interesting activities along this journey were:
- Discovering that LEGO actually had developed material and tools for kids to precisely experiment with programming robotics; they got access to these tools through the open science center in the nearby city
- Through the school team they engaged in the narrative genre called science fiction, and they learned a lot about how people and different cultures imagined robots in different times (actually, this made the educational department in the municipality create an interesting "case" for the primary schools in the community: a mix of science fiction and real-life robotics)
- they learned a lot about how to talk to old people and how to make the old people express own interests and hesitations towards the plans about technology and robotics in their own homes

Last, but not least, the student team engaged in long dialogues in their social and gaming networks to find out what other people in other countries had to say about robots for caretaking of old people.
They were presented to all the different arguments for and against placing robots in old people's homes:
- robots might save money for the public budgets
- old people might lose their dignity of cared for by robots

At the end of more than 4 months work, the Ulysses team turned back to their mission:

"What can robots do for old people and what will the old people like the robots to do?"

The team decided to create a final 3-step process, with support from the school team, to complete the mission:
1. To summarize what they learned into a number of critical questions
2. To organise open workshops with groups of old people to help them formulate their opinions about robotics for care of old people, in particular to formulate how technology could be used for caretaking preserving the old people's dignity
3. To create a small video for YouTube as the final result of the science mission, telling about what they had learned and explaining the most important dilemmas when society introduced robotics for old people's care instead of human caretakers

This final process lasted several weeks, but the wider impact of the Ulysses team's science mission was impressive:

Community benefits:

For the first time old people had a voice in the community about how they should be taken care of

The social services were from now on very careful to invest in technology for old people that did not contradict the old people’s dignity and privacy rights

The robotics programmers and producers learned to interact with the end-users early in the innovation and design process

The eco-system of open science schooling used the student team’s science mission to include more critical questions into the open science learning collaboration, such as: “what does science for and with society mean?”

And the secondary school students?

Well, besides learning a lot about science and science in society that created some new images and understandings of science, what science is and could be and how science works in society along and as a result of the dramatic and challenging science mission.

Of course, all this would have been very difficult, perhaps even impossible, without the support from the “ScienceHof” – the community’s eco-system of open science schooling ☺

[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)

APPLICATION ATTACHMENT 4

DETAILED METHODOLOGIES

What's the basic concept in the *Eco-systems of Open Schooling* project?
How does the project work?
How will it create useful guidance on eco-systems of open science schooling to interested schools and science teachers in Europe?

THE CORE CONCEPT

The ultimate mission of the *Eco-systems of Open Schooling* project is to help secondary schools and science teachers change traditional science teaching into science learning through science missions in collaboration with permanent eco-systems of open science schooling resources – as this approach is expected to engage students in brand new ways and to help them create new and different images of what science is and could be for them.
Or, at least help the science teachers to include periods of such open science learning in the life of schools.

So, how to "help" those schools and science teachers?
Through qualified, realistic and relevant guidance, of course…

How to produce this guidance?
Through creating and testing such eco-systems of open science schooling in practice, in real-life and real-time.
And through creating practical experience about how such eco-systems of science resources can help students engage in real-life and real-time science missions in the community.

In the *Eco-systems of Open Schooling* this real-life and real-time testing of the eco-systems of open science schooling will include 50 secondary school students working through a total of 20 science missions, each of which will last between 4 and 6 months!

The project expects to create high quality knowledge from this rich bank of practical experience, and if so the project will be able to produce really useful final outcomes – for secondary schools and science teachers from across Europe.

The *Eco-systems of Open Science Schooling* project will be accomplished through the application of a double methodology created to optimize the project's success:
An INNOVATION METHODOLOGY ensuring the proper implementation of the project innovation, and an IMPLEMENTATION METHODOLOGY ensuring that the project stepwise moves towards its results as expected and as described in the application.

The two methodologies interact and are mutually supportive.
Each methodology is equipped with a number of *quality focuses*, indicating key challenges for the methodology to be successfully applied, and at the same time constituting the infrastructures of the project's quality assurance design.

INNOVATION METHODOLOGY

The innovation methodology answers the question:
"How will the project's innovative outcomes be produced?"

Through a crystal clear innovation creation logic:
- state of the art and lessons learned based guidance to create the first basic eco-systems of open science schooling
- double practical testing of the eco-systems through 2 x 6 months student mission engagement in open science schooling based on the eco-systems
- 3 x evaluation processes, ultimately leading to the final outcomes

The project guidance results will therefore be based on authentic practical experimentation.

The schools will at school level drive the eco-systems of open science schooling, while the student teams will drive the science learning missions to test the usability of the new eco-systems.
Therefore the project includes two different mobilities as both groups of players need considerable empowerment as innovation drivers.

Moreover, the innovation methodology is defined as limited number of key principles making it possible to create the expected project innovation: four basic principles need to be put to work and interact to produce the expected innovation.

In short, the innovation methodology is concerned with the interplay between school capacity, student teams' science missions capacity and the community collaboration's ability to provide the needed support for the students.

The parameters are structural innovation parameters, running through the entire project, unlike the progression parameters ensuring as horizontal parameters the project progression towards its results.

The innovation methodology consists in four innovation parameters, representing three drivers of the innovation, including being conditions for the innovation, and one parameter representing their interplay:

School as driver capacity parameter
To be able to drive eco-systems of science learning in the community and thereby create the needed platform for the student teams' learning through their science missions, the schools must build capacity, consensus and community orientation.
This will happen through the empowerment of a joint school team, consisting of the school manager, lead science teachers and the student teams' captains.

The empowerment includes a new form of dialogues and collaboration between the different school players, but also with key science learning collaborators. The capacity parameter includes initial empowerment as well as continuous empowerment as a result of the 2 x 4-6 months student mission engagement.

Quality focuses:
1 The schools are able to create the new form of collaboration between the different schools players, from management to student teams
2 The schools are able to build strong consensus in the school team about the methodologies and objectives of schools as drivers of eco-systems of science learning
3 The project is able to support and direct the empowerment of the school teams
4 The school team is able to use the project's long practice experimentation scenes to continuously qualify the school's capacity to facilitate the eco-systems of science learning
5 The school team's eco-system capacity provides the needed science infrastructures to allow the student teams to implement and accomplish their science learning missions

Student teams' science missions parameter
The project intends to create its open science schooling guidance to schools and teachers from across Europe from student teams' authentic science missions in the community, thereby testing the usability of the emerging eco-systems.
The student teams' capacity to design, implement and accomplish their science missions is therefore crucial to the project's production of results.
The parameter encompasses the major challenges for student teams' to engage in the eco-systems and to learn in new ways through their science missions.

Quality focuses:
1 The project is able to empower the student teams to such an extent that they are able to undertake the science missions and to learn from this activity
2 The student teams are, as science detectives, able to detect and analyse important science activities in the community in such a way that it leads to the design of powerful and valuable science missions, providing the project with the needed experimental material for knowledge creation
3 The student teams are able to design valuable community science missions relevant and important to the community or to groups of people in the community, and they are able to describe community actions and science learning challenges linked to the missions
4 The student teams are able to increasingly manage complex science missions, work through the missions stepwise to build up resources – and to benefit from the inserted learning on demand time-outs, allowing them further progression in the missions
5 The student teams are able to communicate their mission experience in creative ways and to share their story-telling in constructive ways with the other teams in the project, and to benefit from this interaction

Eco-systems collaborators parameter
This parameter covers the extent to which the schools' and the student teams' capacity to establish basic as well as further collaboration with science resources in the community allow them to accomplish the science missions.
The parameter covers the basic collaboration and establishment of eco-systems (school-driven) as well as the specific collaboration linked to the implementation of each of the science missions (student-driven).
The parameter includes the extent to which the community science collaborators are able to support the students' science learning through the emerging eco-systems.

In the project "community" is used in the broadest sense of the word: local community, region, but also scientific community and virtual community.

Student mission will address different kinds of communities in different phases.

Quality focuses:
1 The school teams are able to establish, maintain and further develop the basic eco-systems of collaboration with key science resources
2 The school is able to include the most important local resources in the eco-system and to maintain their engagement
3 The student teams are able to identify and engage key science resources important to their missions
4 The community collaborators develop, along the progression of the missions, increasing understanding of the student missions and how they learn through the emerging eco-systems of open science schooling
5 The community collaborators are able and willing to contribute with valuable input to the project's knowledge creation and final outcomes

The interplay towards the project results
This is a higher order parameter covering the interplay between the three parameters described above.
The fourth parameter and its interplay are about the project's knowledge creation towards its final outcomes.
The project can only produce useful outcomes to the extent that it is able to produce knowledge from the practical experimentations and the project's capacity building of participants.
Quality knowledge creation is precisely a result of the interplay of the three structural parameters: the three parameters are expected to be mutually reinforcing, leading to a sound basis for knowledge creation.

IF THE SCHOOL HAS BUILT CAPACITY, IF THE STUDENT TEAMS ARE ABLE TO DESIGN AND WORK WELL IN THEIR SCIENCE MISSIONS – AND IF THE SCIENCE COLLABORATORS ARE SUFFICIENTLY DEDICATED TO SUPPORT THE STUDENTS' SCIENCE LEARNING AND CONTRIBUTE TO THE WELL-FUNCTIONING OF THE ECO-SYSTEM, THEN STRONG AND USEFUL KNOWLEDGE ELEMENTS CAN BE PRODUCED AND LEAD TOWARDS ATTRACTIVE OUTCOMES FOR THE KEY TARGET GROUPS.

The innovation methodology will be operationalized into useful partner guidance at the different stages of the project.

Quality focuses:
1 The project can evidence that the three basic parameters demonstrate project practices that make them mutually reinforcing
2 The three key player groups, the school team, the student teams and the community science resources, are able to deliver valuable raw material to the project's knowledge production
3 The project's knowledge resources are able to capture the project practice and elaborate it into useful knowledge elements
4 The knowledge production is relevant to the creation of the final outcomes, but it also provides still more qualified guidance to the school teams and the student teams along the project.
5 The project's final outcomes appear relevant, authentic and attractive to science teachers and schools from across Europe

IMPLEMENTATION METHODOLOGY

The implementation methodology answers the question:
"How will the project ensure the progression towards quality outcomes?"

The short and precise answer is:
- the project outcomes will result from qualified knowledge creation along the project; this knowledge creation is based on the transformation of documentation of the project practice and experimentation; the project will ensure proper documentation of practice and proper transformation of documentation to knowledge on which the outcomes can be based

Further detailed:
Unlike the innovation methodology, covering the most important structural quality parameters in the project, the implementation parameter is about the quality of the project progression – as a project.
It is concerned with the question: *to what extent is the project able to progress well towards its final outcomes?*
This means that qualified implementation of the project phases (the "scenarios") is crucial, that the transition between the phases is crucial – and that the phases progressively build up to the final outcomes.

The project's IMPLEMENTATION METHODOLOGY includes the following principles:

Progression, not addition of activities
The implementation methodology is created to ensure a strong progression in the project towards its results, and to avoid the project implementation ending up as an addition of isolated activities, or losing its coherence.
The progression curve is created through each scene taking the project practice and its knowledge creation to a higher level.
Therefore considerable attention will be paid to the transition between scenarios, ensuring that the knowledge creation and the project practice from one scenario leads to enhanced quality in the following scenarios.
This might sound banal, but most Erasmus+ projects have considerable problems with ensuring such progression.

Quality focuses:
1 Are the results of one scenario sufficiently elaborated to take the following scenario to a higher quality level?
2 Does the project's practice and knowledge creation interplay support the overall progression towards the expected results, or does it merely repeat itself at the same level?
3 Are the partner meetings and mobilities clearly serving as drivers of the project progression, offering considerable resources to drive the interplay between project practice and knowledge creation?
4 Are the transnational activities (partner meetings and mobilities) designed to give the student teams a leading role in the progression towards the project results?
5 Is the project progression able to continuously share material from the project through the website, the handouts and other tools and make this material attractive to science teachers and schools outside the project?

The results are based on considerable practical experience
The final guidelines for teachers and schools will be based on 2 x 4-6 months of intensive practice in 5 different schools from 5 different countries and involving more than 50 secondary school students between 14 and 16 of age.

Each student team will work through several science missions, increasing in complexity along the project progression, which will help the project build a large bank of practical experience.
This experience and its documentation are crucial to the testing of the eco-systems of open science schooling.

Quality focuses:
1 Are the initial guidelines, from which the project experimentation sets out, qualified to guide the student teams?
2 Are the student teams and their supporters able to communicate the wide range of experience from the missions in a way useful to the project?
3 Are the stepwise produced knowledge elements on open science schooling emerging from practice or do they remain reflections of a priori theoretical constructions?
4 Is the students' practical experience made visible to others for inspiration on the project web during the project?
5 Are the lessons learned from the testing of the eco-systems clearly visible in the project's final outcomes?

The young students' is at the centre of the project and will co-create its results
Any successful learning innovation must build on the uncompromised participation of the young students themselves.
Innovation is not something you do TO people, but WITH people, as the European Commission states.
The project will place the student teams at the centre of the project, in close interaction with the school teams and the science collaborators; they will co-create process as well as final outcomes and their interests and needs will penetrate all project results.
The student teams or the team captains will therefore participate in all project activities, including partner meetings, local planning and sharing of the project results – and including participating at the same level as the other school team participants.
In particular the student teams will be deeply engaged in the eco-systems of open science schooling.

Quality focuses:
1 Are the student teams and the student team captains truly engaged in the project activities from the beginning of the project, and are they co-driving the school teams and the emerging eco-systems?
2 Are the project activities truly impacted by the participation of the student teams?
3 Are the project and the practice partners able to build capacity in the student teams to be at the centre of and co-drive the project?
4 Are the science missions based on the students as science detectives and really defined by and carried out by the student teams?
5 Are the process outcomes, the raw material and the final outcomes clearly impacted by the student teams' eco-system and science learning experience?

The project's accomplishments are based on a powerful interplay between knowledge creation and practical experience
The interplay along the project between knowledge creation and practical experience is a unique methodology recently applied in such successful Erasmus+ projects as ScienceGirls, iYouth and Open Science Schooling:
The first project practice is based on initial guidance from the project (preliminary knowledge).
The initial schools as drivers of eco-systems of science learning guidance is based on Erasmus+ experimentation and solid recommendations from state of the art research and leading learning visionaries, and the OECD and the European Commission.

The lessons learned from the 30 months Erasmus+ Open Science Schooling is of special importance to the creation of initial guidance.
The 2 x 4-6 months test scenarios will feed into an increasing knowledge bank giving rise to still more qualified guidance along the project.
The final knowledge creation will, then, ensure the quality of the final outcome guidance for science teachers and secondary schools from across Europe.

Quality focuses:
1 Is the initial guidance provided by the project able to build sufficient consensus and implementation capacity among the practice partners, the schools, the student teams/teachers and the science collaborators?
2 Are the student teams producing valuable raw material for knowledge creation from the science missions and the interaction with the eco-systems?
3 Are the project's knowledge resources able to direct and guide the schools' and students' practice towards producing additional experience in the eco-systems, if needed?
4 Is the guidance provided by the project for the second round test practice clearly more qualified, useful and relevant than the initial guidance?
5 Are the knowledge partners able to elaborate the produced raw material from the missions into qualified project results, attractive and relevant to science teachers and schools from across Europe?

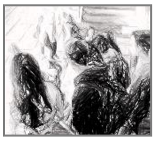
[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)

[Kindly refer to Attachment 3 – ECO-SYSTEM ILLUSTRATION: THE ECO-SYSTEM AT WORK]

APPLICATION ATTACHMENT 5

QUOTATIONS IN SUPPORT OF THE PROJECT

- Quotations from leading global players, such as the OECD and the European Commission, and from leading learning pioneers in support of the relevance of the project



GENERAL APPLICATION QUOTATIONS

Future-ready students need to exercise **agency**, in their own education and throughout life. Agency implies a sense of responsibility to participate in the world and, in so doing, to influence people, events and circumstances for the better. Agency requires the ability to frame a guiding purpose and **identify actions to achieve a goal**.
OECD, "Education 2030", 2018

Students who are best prepared for the future are **change agents**.
OECD, "Education 2030", 2018

Millennials worldwide are more similar to one another then to older generations within their nations.
Time Magazine, 2014

Because the capabilities of our present and future kids are now so different, the education that we have been universally offering them throughout the world is no longer appropriate for the times in which they and their posterity will live. To succeed in the future, today's and tomorrow's young people require a different kind of start in the world – a different kind primary and secondary education than the world now offers them.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Most important, it's an education that creates adults – future citizens – who already have experience, from their education, in finding and implementing real solutions to real problems. This is something that our current education not only does not do, but doesn't even try to do.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

School then becomes about finding and implementing solution to those real-world problems in ways that fully apply the strengths and passions of each kid – with the "content" being whatever in a wide variety of realms, is needed along the way.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

It is no exaggeration to say that the world's kids today, aged roughly 6-18, are the most disrespected, underappreciated, and underestimated, and yet – potentially – the most powerful group in the world for our future.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Today, most of the projects that kids do in class – even those that are called "real" – do not affect the world outside the classroom at all. Almost all of them are made up, mostly by teachers, to achieve learning goals and meet learning standards. Calling the projects "authentic" doesn't help at all, because authentic means only "real-like".
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

The primary goal of education should be real, world-improving accomplishments, with learning as an enabling skill.
That, I believe, is the new model of education that is emerging.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Education throughout the world is stuck in an academic mindset of "learn first, act in the world later". This academic mentality has completely taken over education in the past several hundred years.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Our current education asks of our newly empowered kids pretty much the same things we have been asking kids for the last hundred years: to learn content and skills in a narrow, prescribed range of subjects, to achieve academically, to get good grades, to succeed in the system…
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

The students need an education that moves from the academic model of "learn now so you can accomplish later" to a new model of "accomplish now and learn as you do".
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Teachers [should be] "empowerers" and coaches, whose job is to guide students to get better and better at applying their unique personal passions and interests to effective, real-world accomplishment and, in the process, acquire a wide variety of essential thinking, action and relationship skills.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

This new education will not come into all our schools immediately – it will be a gradual, though accelerating process. But any school or class that currently offers *only* academic education is failing its students, no matter how many bells and whistles – from iPads, to critical thinking seminar, to Mandarin – it may be adding to its programs.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Or, perhaps it is because for so long we have kept our young people from accomplishing anything we have forgotten whey are capable of. But now, a great deal has changed. Half of the people on the planet are under the age of 25, and they are increasingly, individually and as a group, hugely capable and powerful, - and linked to each other in ways that never existed before.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Almost all of our school problems and activities are "made up", designed to include the maximum number of learnings or standards. They are *not* designed to accomplish anything useful in the world.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

When [students] focus on tasks they are truly interested in and passionate about, the amount of enthusiasm, energy, and intellect that they put forth is prodigious.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

What is meant by real, world-improving projects are projects that students select themselves, and do typically in teams, that produce actual changes in their local and global communities – changes that they can point to and say: "I, with my team, did that!"
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

But far more importantly, most of the technology used in schools today is about nothing more than doing "old things in new ways".
But, educationally, we are not doing anything new or different at all. Introducing technology very often masks our lack of any real educational progress.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Pretty much all the ed tech products created around the world today are designed to support academic education in some way.
From a long-term perspective, the approach of creating new and expensive technology just do the same old education in different ways, perhaps, the most wasteful used of our resources for educating our kids there is. Using technology in this way both trivializes technology's real potential and fails to empower our kids further to do anything new that they need.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

But if you believe that education is evolving to a new paradigm, then ed tech is masking what is going on – making it look as if we are making progress while actually preventing us from moving forward.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Rather than telling students how to do things and then making sure they did them right, the future teacher provides guidance to kids on how to choose projects that will help them acquire needed skills, and then assists him in getting their projects accomplished effectively.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

The irony behind the struggle is that just as more and more teachers begin to realize that the academic education from the past is no longer appropriate for our young people's future, many of them are being pushed, by administrators as well as parents, to get better at traditional academic teaching.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

…it is enormously frustrating for those teachers who see their kids needing something different and feel prevented, by "the system" from giving it to them.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

The teachers' job in empowering is to give students "agency", that is, to empower students to apply their passions to doing something that the students

already wants to do, and to direct their students' efforts to improve their local and/or global world.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

In the new role the teacher throws the doors to the world wide open to students, to the world's problems, its knowledge, its resources, and its avenues to change.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

One interesting thing about this kind of teaching is that the teacher need not necessarily know very much about the "content" of the students' projects at all.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

[The new role] includes helping kids find and do projects that fit their strengths and interests and allow them to deeply apply their passions. It includes coaching their student to follow through to the end and complete their projects, to get the help and feedback they need along the way, and to understand what they have gained from doing them.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Coaching kids to accomplish projects that the kids themselves have initiated, and to which they are fully applying their passions, is far more interesting, exciting, rewarding and enjoyable than struggling to get kids to embrace a subject they may not care about.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

It is crucial that these new paradigms and ideas be introduced at the start of *teachers' education and professional development* – we can no longer let our teachers base their future work on the kind of teaching they received as students.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Today, more and more kids feel trapped – impaled, in many cases – between what their parents' generation insists they need as an education, and what they feel strongly is right for them in these times in which they now find themselves.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Today, we far too often treat our kids as if they were trains on a track to the future, when actually today's kids are really rockets.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Although parents and educators struggle with getting kids to learn in the old sense, what they offer the kids is often *way behind* what the kids need. "Age appropriate" has totally outrun us.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

With the arrival of widely distributed and easy-to-use digital tools, our kids already accomplish on a daily basis things that still seem, for many of us, far-off science fiction. They communicate instantaneously with, and learn from, other kids around the globe. They regularly make videos and post them for the world to see and comment on. They organise themselves socially and politically across and throughout the planet.
Marc Prensky, "Education to Better their World – Unleashing the power of 21st century kids", 2016

Companies are rethinking their innovation processes and focusing more on the role of the user. Innovation is no longer only taking place in traditional R&D departments, where the main focus is developing the latest technology. Innovation processes are starting with the user – understanding what problems users face and need solved – and understanding users' behaviour which then gives clues about what products or services to develop. Users are being involved in earlier phases of the innovation process - already when companies are identifying opportunity areas.
The innovation process is becoming user-driven.
OECD, "New Nature of Innovation"

Teachers should have access to authentic tasks, by creating links to the local community (business, local authorities, third sector) to identify and get access to real life tasks that the teachers can use.
Budapest Agenda, "Enabling Teachers for Entrepreneurship Education"

Schools should develop sustainable and systematic partnerships with businesses, social enterprises and NGOs rather than ad hoc links.
Create 'open door' policies in schools to make them accessible to their local communities; and enabling them to draw on the skills and talents of local people.
Budapest Agenda, "Enabling Teachers for Entrepreneurship Education"

Education should be brought to life through practical experiential learning models.
European Commission, "Entrepreneurship 2020 Action plan"

Education institutions should be encouraged to become more entrepreneurial in their wider approach, to ensure that they develop and live a culture of entrepreneurship and innovation through their missions, leadership, stakeholder engagement, curricula and learning outcomes.
European Commission, "Entrepreneurship 2020 Action plan"

It requires nothing less than a sea change in the approach to education, emphasizing active learning and the provision of new experiences for students outside of the classroom.
For many education systems this represents a *fundamental* shift away from traditional approaches.
European Commission, "*Entrepreneurship Education, 2011"*

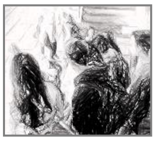
Entrepreneurship in this sense refers to an individual's ability to turn ideas into action. It includes creativity, innovation, showing initiative and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives.
European Commission, "*Entrepreneurship Education, 2011"*

Thus teachers need the professional competencies to be able to guide students through the learning process rather than, as in traditional methods, communicating knowledge and information mainly through 'chalk and talk'.
European Commission, "*Entrepreneurship Education, 2011"*

Students need authentic, practical experiences and realistic learning environments as essential parts of active learning. Teachers need to have access to a varied new range of resources in order to build activities for students that are as true to life as possible, bringing the outside world into the school.
European Commission, "*Entrepreneurship Education, 2011"*

This challenges both schools to become more open to their local communities and, in equal measure, businesses and the wider community in general to be willing to play an active and committed role in supporting teachers and schools in their endeavours.
European Commission, "*Entrepreneurship Education, 2011"*

Foster entrepreneurial skills through new and creative ways of teaching and learning from primary school onwards.
Real world experience, through problem-based learning and enterprise links, should be embedded across all disciplines.
European Commission, “*Entrepreneurship Education: A Guide for Educators, 2013*”



SPECIFIC SCIENCE LEARNING QUOTATIONS

Encourage “open schooling” where schools, in cooperation with other stakeholders, become an agent of community well-being; families are encouraged to become real partners in school life and activities; professionals from enterprise, civil and wider society are actively involved in bringing real-life projects into the classroom.
Commission 2015, Science Education for Responsible Citizenship

Promote partnerships between teachers, students, researchers, innovators, professionals in enterprise and other stakeholders in science-related fields, in order to work on real-life challenges and innovations, including associated ethical and social and economic issues.
Commission 2015, Science Education for Responsible Citizenship

Citizens should be actively and directly involved in science research and innovation projects.
Commission 2015, Science Education for Responsible Citizenship

The point that choices are made over time and involve construction of narratives draws attention to the need for students to be able to continue to construct a viable, recognizable, and convincing narrative through upper-secondary school and beyond. Further, it opens an opportunity to offer students who may not have had access to narratives containing STEM as a possible path of study and career an opportunity to construct such a narrative during upper-secondary school. This, however, presupposes that students’ experiences with STEM subjects during upper-secondary school in fact provide the student with material for such a narrative – both in terms of present interest, future perspectives, and the reconstruction of past experiences.
Understanding Student Participation and Choice in Science and Technology Education, 2015

There are shortcomings in curriculum, pedagogy and assessment, but the deeper problem is one of fundamental purpose. School science education, the authors argue, has never provided a satisfactory education for the majority. Now the evidence is that it is failing in its original purpose, to provide a route into science for future scientists. The challenge therefore, is to re-imagine science education: to consider how it can be made fit for the modern world and how it can meet the needs of all students; those who will go on to work in scientific and technical subjects, and those who will not.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

…Transforming young people’s attitudes to science is a long-term project.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

A growing body of recent research has shown that most students develop their interest in and attitudes towards school science before the age of 14. Therefore,

much greater effort should be invested in ensuring that the quality of science education before this age is of the highest standard and that the opportunities to engage with science, both in and out of school, are varied and stimulating.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

If it is to meet the needs of the future, school science has to develop opportunities for students to explore what it is that scientists do and why that contribution is both enduring and meaningful. In addition, it needs to show that those who study science do not simply spend their lives working in one narrow domain. Rather, that the contrary is true – the study of science opens doors to a multitude of possibilities for self-realization.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

Recent research would suggest that, for the majority of students, interest in pursuing further study of science has largely been formed by the time children are 14.
Osborne and Dillon, *Science education in Europe – Critical reflections* (2008)

Taken together, these data strongly suggest that efforts should be expended to ensure that children's early encounters with science before the age of 14 should be as stimulating and engaging as possible. Some messages from the research for policy-makers and educators are relatively clear – the experience should:
- be rich in opportunities to manipulate and explore the material world;
- use a pedagogy that is varied and not dependent on transmission;
- offer some vision, however simplified, of what science offers both personally in satisfying material needs and as a means of realising an individual's creative potential;
- be provided in both formal and informal contexts for learning.

A single encounter with a science based activity post-14 is unlikely to have a significant impact. What is required is a continuum of educational experiences of science from an early age.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

The irony of the current situation is that somehow we have managed to transform a school subject which engages nearly all young people in primary schools, and which many would argue is the crowning intellectual achievement of European society, into one which the majority find alienating by the time they leave school. In such a context, to do nothing is not an option.
Osborne and Dillon, Science education in Europe – Critical reflections (2008)

In modern societies, neither scientists nor engineers are heroes or attractive role models for the young generation.
Sjöberg and Schreiner, Science education and youth's identity construction - two incompatible projects? (2004)

Meyer (2008) used storytelling as a way into the students' personal experiences with particular phenomena and the sharing of stories as a way to "trespass within science discourse", and which was effective in engaging female students.
Osborne, The Role of Narrative in Communicating Science (2008)

Current science curricula, also in the early ages, are to a large extent based on the assumption that school science is the first step in the process to educate the future scientist. Curricula follow the logic and the structure of well-established academic science. Although "logical" from a scientific point of view, this is not likely to be engaging for the great majority of children. These ideas are well developed in the recent Nuffield report (Osborne and Dillon, 2007) and are not further elaborated here.
Sjöberg and Schreiner, ROSE project Key findings (2010)

But young people do not choose their studies or careers because it is good for the domestic economy. Instead, they base their choices (when they have such choices) on their own interests, values and priorities.

Sjöberg and Schreiner, How do students perceive science and technology? (2006)

Despite children's natural curiosity for science and technology in primary school, many of their teachers are uncomfortable with science subjects and with hands-on demonstrations. Later on, pupils need to feel the relevance of the subject to society and to their own world. Unfortunately, what is taught is often disconnected from cutting-edge science and from today's applications of S&T, and tends to dampen the interest acquired at a younger age.
Interest in S&T is observed to decline most sharply around age 15. This is also when gender differentiation starts to translate into choices, and when key future orientations are set. Regrettably, curricula are often too rigid to allow those pupils that do not choose to follow S&T fields as their primary subjects to come back to science at a later stage. Over-specialization and the lack of social dimensions in the curriculum can also deter students from pursuing tertiary S&T studies.
OECD 2008, Increasing students' interest

According to Seymour, students imagined that, in order to pursue SME careers, they would have to embrace a persona which was alien to their own personality. They portrayed engineers, especially, as dull, unsociable (often materialistic) people who lacked a personal or social life and were unable to relate comfortably to non-engineers. They were also portrayed as uncreative people, who avoided or decried the idea of a broader education.
Some thought that science tended to attract people who already had these personality traits.
OECD 2008, Increasing students' interest

If (to caricature) S&T are perceived as difficult, boring and irrelevant to most students, even those studying them, then the job of careers advisors and others involved in orienting young people's choices is extremely difficult..
OECD 2008, Increasing students' interest

Many of those who had made a decision in favour of or against a career in science and engineering had done so before age 14…
OECD 2008, Increasing students' interest

One danger with trying to make science interesting to children of whatever age is that it merely becomes entertaining, and that at best they remember an amusing trick, but forgets, or never learns, the science it was supposed to illustrate. This may be the case with one-off visits to science museums or exhibitions, where the novelty and excitement of the day out are what make the biggest impression. The most successful efforts therefore will seek to integrate the fun into an overall strategy based on generating and sustaining interest in the scientific process and practices. This can take place inside and outside the classroom.
OECD 2008, Increasing students' interest

Addressing all these demands requires an integrated approach, not only in the sense of integrating the various aspects and contents of science teaching into a coherent whole, but integrating science into the general culture of students.
OECD 2008, Increasing students' interest

Success in the 21st century depends upon acquiring key competences rather than simply learning facts. Being able to collaborate, listen to the ideas of others, think critically, be creative and take initiative, solve problems and assess risk and take decisions and constructively manage emotions are interdependent.
Commission 2015, Science Education for Responsible Citizenship

Conventional modes in teaching and learning contribute little to developing innovation competencies. Research shows that graduates are more likely to participate in innovation processes if their studies involve working with practical knowledge and authentic problems.
Commission 2015, Science Education for Responsible Citizenship

Important results can derive from applying learning to real-world problems, focusing on the relevance and meaning of the ideas and topics discussed and improving the over-all quality of teaching and learning.
Commission 2015, Science Education for Responsible Citizenship

Involving students as researchers and participants in the design, development and evaluation of innovation…
Commission 2015, Science Education for Responsible Citizenship

Above all there is a need to involve citizens, young and old, as active agents at the heart of inquiry-oriented science learning – in identifying and framing the research problems and leading to the discovery of solutions and innovations which help situate science in every-day life. In this way, we involve a richer pool of talent in framing a more responsible and ethical approach to research and innovation.
Commission 2015, Science Education for Responsible Citizenship

Collaboration between formal, non-formal and informal educational providers, enterprise and civil society should be enhanced to ensure relevant and meaningful engagement of all societal actors with science and increase uptake of science studies and science-based careers and employability and competitiveness.
Encourage "open schooling" where:
- Schools, in cooperation with other stakeholders, become agents of community well-being;
- Families are encouraged to become real partners in school life and activities;
- Professionals from enterprise, civil and wider society are actively involved in bringing real-life projects into the classroom;

Promote partnerships between teachers, students, innovators, researchers and stakeholders in science-related fields, in order to work on real-life challenges and innovations, including associated ethical and social issues;
Commission 2015, Science Education for Responsible Citizenship

APPLICATION ATTACHMENT 6

FULL QUALITY ASSURANCE PLATFORM

Encourage "open schooling" where schools, in cooperation with other stakeholders, become an agent of community well-being; families are encouraged to become real partners in school life and activities; professionals from enterprise, civil and wider society are actively involved in bringing real-life projects into the classroom.
Commission 2015, Science Education for Responsible Citizenship

Promote partnerships between teachers, students, researchers, innovators, professionals in enterprise and other stakeholders in science-related fields, in order to work on real-life challenges and innovations, including associated ethical and social and economic issues.
Commission 2015, Science Education for Responsible Citizenship

The project partnership includes a dedicated quality assurance partner with more than 15 years' experience in quality assurance and evaluation in Lifelong Learning and Erasmus+ projects.
The reason is that highly innovative projects need careful and constant quality assurance and evaluation to progress well.
The quality assurance partner has recently carried out complex quality assurance and evaluation in pioneer Erasmus+ projects such as iYouth, iCAP, ScienceGirls and Open Science Schooling.
Besides carrying out quality assurance and evaluation tasks, the quality partner will provide strong support and guidance to the project coordinator.
The participation of the quality assurance partner is known to considerably increase the implementation and final results of the projects.

INNOVATION METHODOLOGY QUALITY ASSURANCE

School as driver capacity parameter

Quality focuses:
1 The schools are able to create the new form of collaboration between the different schools players, from management to student teams
2 The schools are able to build strong consensus in the school team about the methodologies and objectives of schools as drivers of eco-systems of science learning
3 The project is able to support and direct the empowerment of the school teams
4 The school team is able to use the project's long practice experimentation scenes to continuously qualify the school's capacity to facilitate the eco-systems of science learning
5 The school team's eco-system capacity provides the needed science infrastructures to allow the student teams to implement and accomplish their science learning missions

Student teams' science missions parameter

Quality focuses:
1 The project is able to empower the student teams to such an extent that they are able to undertake the science missions and to learn from this activity
2 The student teams are, as science detectives, able to detect and analyse community change needs and opportunities in such a way that it leads to the design of powerful and valuable science missions, providing the project with the needed experimental material for knowledge creation
3 The student teams are able to design valuable community science missions relevant and important to the community or to groups of people in the community, and they are able to describe community actions and science learning challenges linked to the missions
4 The student teams are able to increasingly manage complex science missions, work through the missions stepwise to build up resources – and to benefit from the inserted learning on demand time-outs, allowing them further progression in the missions
5 The student teams are able to communicate their mission experience in creative ways and to share their story-telling in constructive ways with the other teams in the project, and to benefit from this interaction

Eco-systems collaborators parameter

Quality focuses:
1 The school teams are able to establish, maintain and further develop the basic eco-systems of collaboration with key science resources
2 The school is able to include the most important local resources in the eco-system and to maintain their engagement
3 The student teams are able to identify and engage key community resources important to their missions
4 The community collaborators develop, along the progression of the missions, increasing understanding of the student missions and how they learn through the emerging eco-systems of open science schooling
5 The community collaborators are able and willing to contribute with valuable input to the project's knowledge creation and final outcomes

The interplay towards the project results

Quality focuses:
1 The project can evidence that the three basic parameters demonstrate project practices that make them mutually reinforcing
2 The three key player groups, the school team, the student teams and the community science resources, are able to deliver valuable raw material to the project's knowledge production
3 The project's knowledge resources are able to capture the project practice and elaborate it into useful knowledge elements
4 The knowledge production is relevant to the creation of the final outcomes, but it also provides still more qualified guidance to the school teams and the student teams along the project.
5 The project's final outcomes appear relevant, authentic and attractive to science teachers and schools from across Europe

IMPLEMENTATION METHODOLOGY QUALITY ASSURANCE

Progression, not addition of activities

Quality focuses:

1 Are the results of one scenario sufficiently elaborated to take the following scenario to a higher quality level?
2 Does the mission's practice and knowledge creation interplay support the overall progression towards the expected results, or does it merely repeat itself at the same level?
3 Are the partner meetings and mobilities clearly serving as drivers of the project progression, offering considerable resources to drive the interplay between project practice and knowledge creation?
4 Are the transnational activities (partner meetings and mobilities) designed to give the student teams a leading role in the progression towards the project results?
5 Is the project progression able to continuously share material from the project through the website, the handouts and other tools and make this material attractive to science teachers and schools outside the project?

The results are based on considerable practical experience

Quality focuses:
1 Are the initial guidelines, from which the project experimentation sets out, qualified to guide the student teams?
2 Are the student teams and their supporters able to communicate the wide range of experience from the missions in a way useful to the project?
3 Are the stepwise produced knowledge elements on open science schooling emerging from practice or do they remain reflections of a priori theoretical constructions?
4 Is the students' practical experience made visible to others for inspiration on the project web during the project?
5 Are the lessons learned from the testing of the eco-systems clearly visible in the project's final outcomes?

The young students' is at the centre of the project and will co-create its results

Quality focuses:
1 Are the student teams and the student team captains truly engaged in the project activities from the beginning of the project, and are they co-driving the school teams and the emerging eco-systems?
2 Are the project activities truly impacted by the participation of the student teams?
3 Are the project and the practice partners able to build capacity in the student teams to be at the centre of and co-drive the project?
4 Are the science missions based on the students as science detectives and really defined by and carried out by the student teams?
5 Are the process outcomes, the raw material and the final outcomes clearly impacted by the student teams' eco-system and science learning experience?

The project's accomplishments are based on a powerful interplay between knowledge creation and practical experience

Quality focuses:
1 Is the initial guidance provided by the project able to build sufficient consensus and implementation capacity among the practice partners, the schools, the student teams/teachers and the community collaborators?
2 Are the student teams producing valuable raw material for knowledge creation from the science missions and the interaction with the eco-systems?
3 Are the project's knowledge resources able to direct and guide the schools' and students' practice towards producing additional experience in the eco-systems, if needed?

4 Is the guidance provided by the project for the second round test practice clearly more qualified, useful and relevant than the initial guidance?
5 Are the knowledge partners able to elaborate the produced raw material from the missions into qualified project results, attractive and relevant to science teachers and schools from across Europe?

PRODUCT OUTCOMES QUALITY ASSURANCE

Eco-systems of open science schooling – The Guidance Pack

Quality criteria are:
01
The material is highly impacted by practical experience
02
The material appears easy to use for schools and science teachers and is designed in an attractive way
03
The guidance includes specific guidance from the 3 perspectives: schools, students/teachers and community collaborators (eco-system resources)
04
The material uses different media to transmit different content
05
The guidance is realistic to average European secondary schools and offers experimentation at different levels

How we learned science through the eco-systems – The student video

Quality criteria are:
01
The video movie appears to be created by students and offers insight in their science learning experience
02
The video movie includes students' experience with working with the eco-systems and with other science resources
03
The video movie helps science teachers organise relevant and attractive open science schooling for students, including with support from eco-systems of open science schooling
04
The video movie demonstrates how students have created new images of what science learning is
05
The video movie tells stories about positive as well as negative student experience with the science missions and working with the eco-systems

Policy paper: what (more) does it take to make open science schooling a reality?

Quality criteria are:
01
The paper is able to describe what lessons learned were created in the project and how this add to the European science learning innovation agenda
02
The paper is able to point to and identify serious problems with open science schooling and eco-systems supporting such open science schooling
03

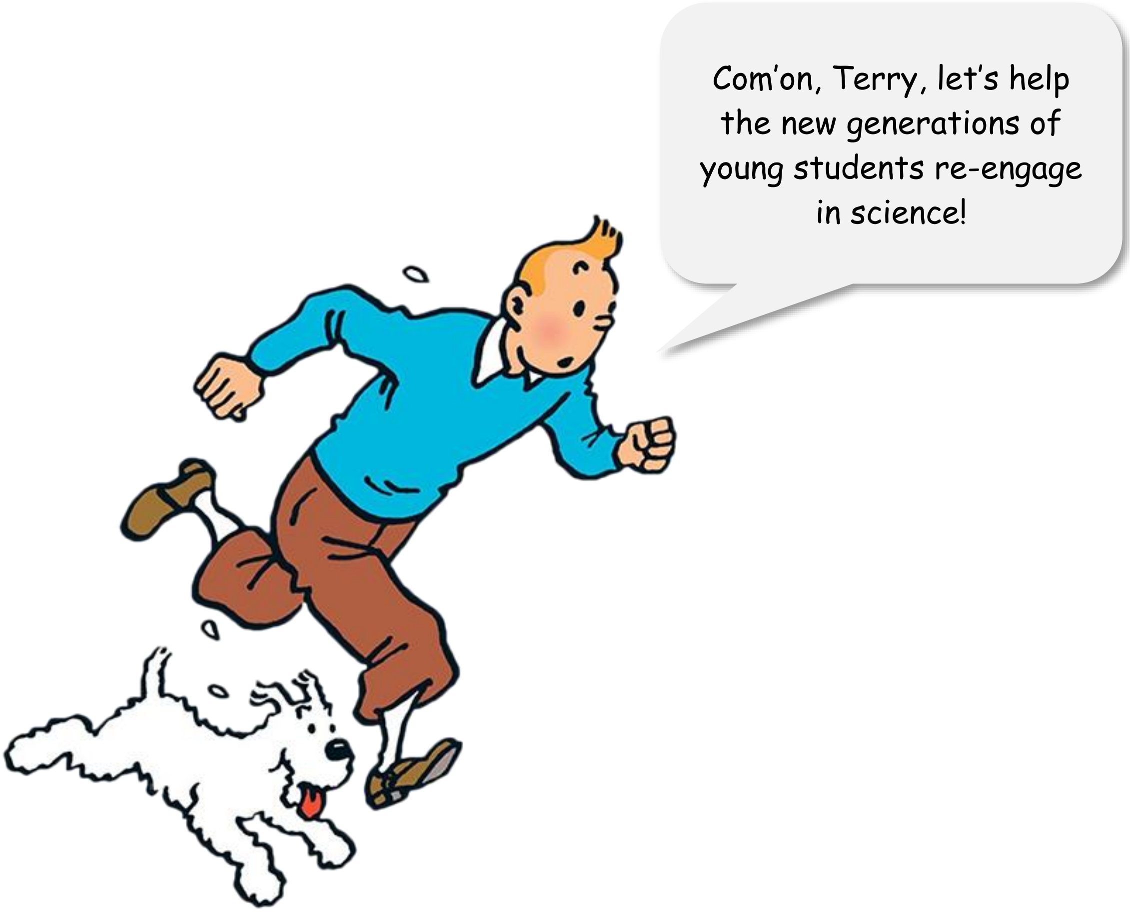
The paper is able to provide relatively precise recommendations on how to create further experimentation with problematic aspects of open science schooling and the supporting eco-systems

Research paper: what (more) needs research and experimentation to make open science schooling a reality?

Quality criteria are:
01
The research paper is able to describe weaknesses in recent science learning innovation research that should be addressed
02
The paper is able to describe how the project has contributed to the European science learning innovation knowledge bank
03
The paper is able to indicated what directions further research in the field of open science schooling and eco-systems of open science schooling should take, including how this research could be supported by European funding

The projects quality assurance platform thus includes a total of **56 quality questions**.
This system will be operationalized into and will direct the project's evaluation activity along the project

[Kindly refer to Attachment 2 – INNOVATION VOCABULARY)


Com'on, Terry, let's help the new generations of young students re-engage in science!