CONNECT - science to students' lives

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Policy Report on Open Schooling

CONNECT

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CONNECT

Inclusive open schooling with engaging and future-oriented science

Table of Content

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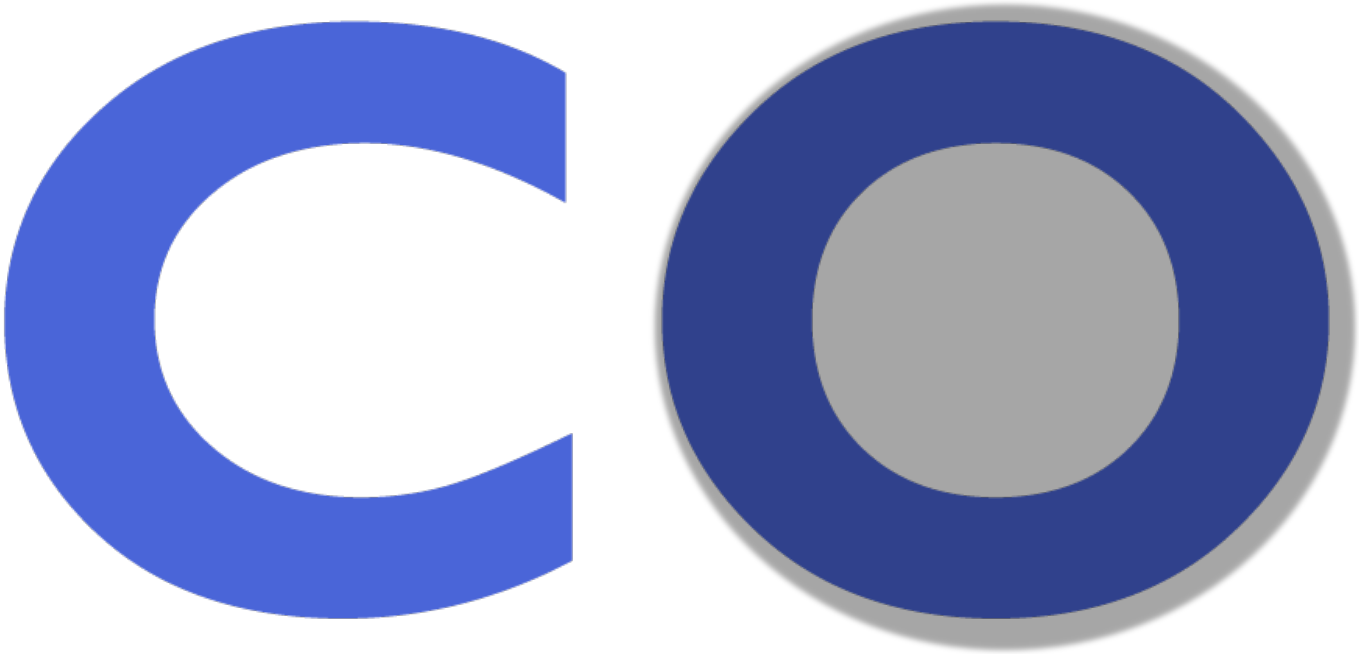


Collaborative Policy Report

This policy report discusses opportunities to enhance open schooling and make it sustainable, based on evidence from the CONNECT project.

Open schooling means "*schools, in cooperation with other stakeholders, becoming agents of community; wellbeing shall be promoted; families should be encouraged to become real partners in school life and activities; professionals from enterprises and civil and wider society should actively be involved in bringing real life projects to the classroom*." (EU, 2018)

Our assumption is that the longstanding promotion of open schooling, by the European Union and its related projects in this area, has been vindicated, both as a result of the current pandemic and the need to address climate change.

In respect of climate change, there is clearly a need to prioritise behaviour change. This includes socially responsible action and a shift away from technology as a driver of change to change as a driver of technology.

The world needs young people to become socially and environmentally responsible citizens, but the current education system is simply repeating the messages of the past and preparing for business as usual.

The imagination of young people in education needs, therefore, to be fed by relevant and responsible scenarios, as a basis for action in climate change, biodiversity, and other relevant fields, rather than simply teaching them abstract science concepts without real world contexts.

Educational Needs

Due to the Covid pandemic, educators have been forced to share responsibility for delivery with parents, careers and others, usually via digital channels. In turn, this has brought into question the structure and content of the formal curriculum.

In addition, there needs to be a shift from treating STEM subjects (Science, Technology, Engineering, Mathematics) in isolation from other branches of education. This has been recognised in European Union's calls and elsewhere as a shift to STEAM, with Arts and Humanities added. We could also envisage the 'A' as representing Actions, which are at the centre of CONNECT.

This shift is timely and appropriate, since:
STEM subjects cannot legitimately be divorced from societal and ethical considerations.

The notion that science can be value free is increasingly challenged, not least by scientists themselves.
Arts and humanities subjects are inextricably connected with science and technology, as mediators of our relationship with the world.

Over emphasising STEM at the expense of arts and humanities has unbalanced our education system and has largely been for the benefit of big business rather than society. Unlimited economic growth is no longer sustainable, and we need to prioritise personal, social and environmental justice and wellbeing.

This is not to say that we should stop teaching science and other STEM subjects. Rather, these subjects need to be contextualised and challenged, in order to drive desirable outcomes.

CONNECT
Inclusive Open Schooling through Engaging and Future oriented Science

is a sustainable model for enabling more secondary schools to adopt open schooling

Our assumptions

The policy background for CONNECT is generated by assumptions built into European Commission thinking, combined with high level political direction from the Council of Ministers.

The three main assumptions are that:

1. Science, or more broadly, STEM (Science, Technology, Engineering, Mathematics) underpins economic growth, but should be more closely related to the needs of society through Responsible Research and Innovation.

2. STEM subjects are less popular with young people than other subjects due to the use of outdated teaching and learning methods.

3. STEM careers are less favoured by young people, leading to shortages of qualified STEM workers and lack of capacity to deal with societal challenges.

Nevertheless, CONNECT also provides a vehicle for working to enhance the policy background, based on its extensive field evaluation. CONNECT research instruments and findings are the basis for our informed practices and policy recommendations.

CONNECT teams in five countries created multilingual resources, materials, methods, tools, and events, and implemented open schooling with their local networks of schools, supported by coaches and scientists from their respective organisations.

Some policymakers and educational influencers may find it difficult to accept that EU policy should be the basis of national reforms or alterations in practice. However, we ask that readers should take seriously the possibilities offered by the work of CONNECT.

CONNECT
Inclusive Open Schooling through Engaging and Future oriented Science

embeds science action driven by youth
in the core curriculum, through
fun participatory approaches.

CONNECT research network

Despite the efforts of previous projects, we know little about drivers for, and barriers to, open schooling in relation to teaching and learning.

This study examined teachers' and students' challenges, and catalysts related to science learning with open schooling.

The open schooling research network CONNECT was established by four universities, two national research centres, three enterprises and a national educational association.

These partners engaged a total of 40 schools, including public schools run by states or municipalities: three in the UK, six in Spain, seven in Brazil, ten in Romania, and fourteen in Greece, to implement open schooling.

A representative sample in terms of gender, nationality, and age was generated, involving students from 11 to 17 whose parents do not use science in their jobs.

Phase one "piloting adoption" evaluation included an average of 10 teachers, 300 students and three STEM professionals in each country: Romania, Greece, Catalunya, UK and Brazil. There were in total 91 teachers, 1,389 students and 36 scientists, who provided qualitative and quantitative data during open schooling adoption.

The results drew upon this quantitative and qualitative data, and provide a significant overview of students' mindsets, interpreted through the lenses of students' science capital and aspirations (Archer et al, 2015), epistemic beliefs and fun in learning (Okada & Sheehy, 2020) and science identity with recognition (Carlone & Johnson, 2007).

Participants

There were 66% women and 34% men.; 70% in secondary schools; 53% integrated sciences, 18% biology, 12% chemistry and 7% physics (See Figure 1).

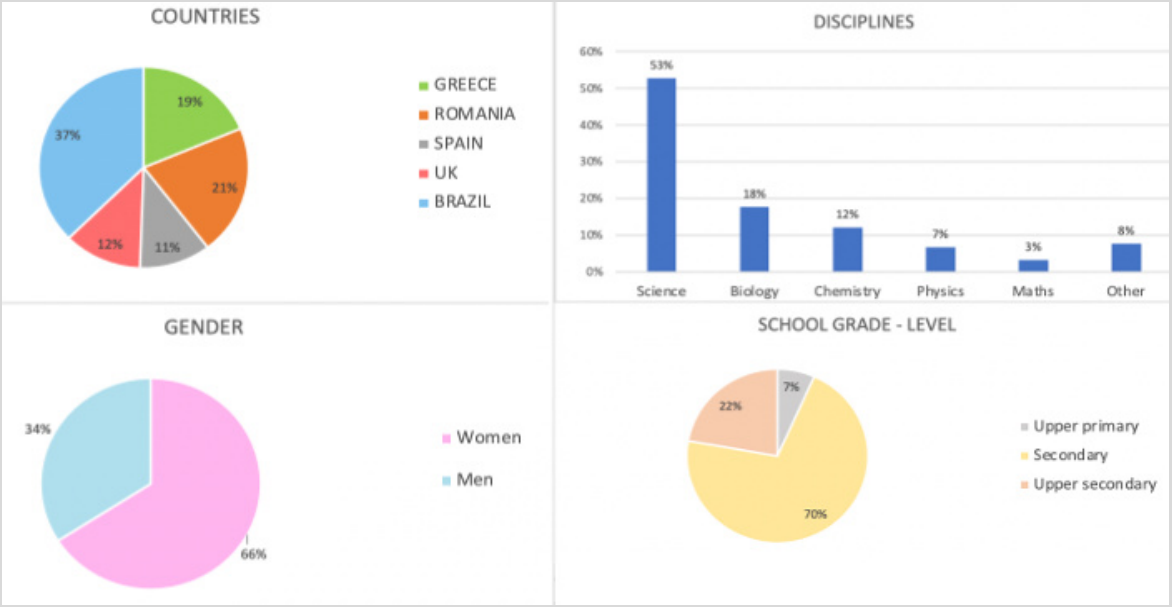


Figure 1 – CONNECT participants who completed evaluation

A representative sample was generated in terms of gender, nationality, and age, mostly from 11 to 17 (See Figure 2).

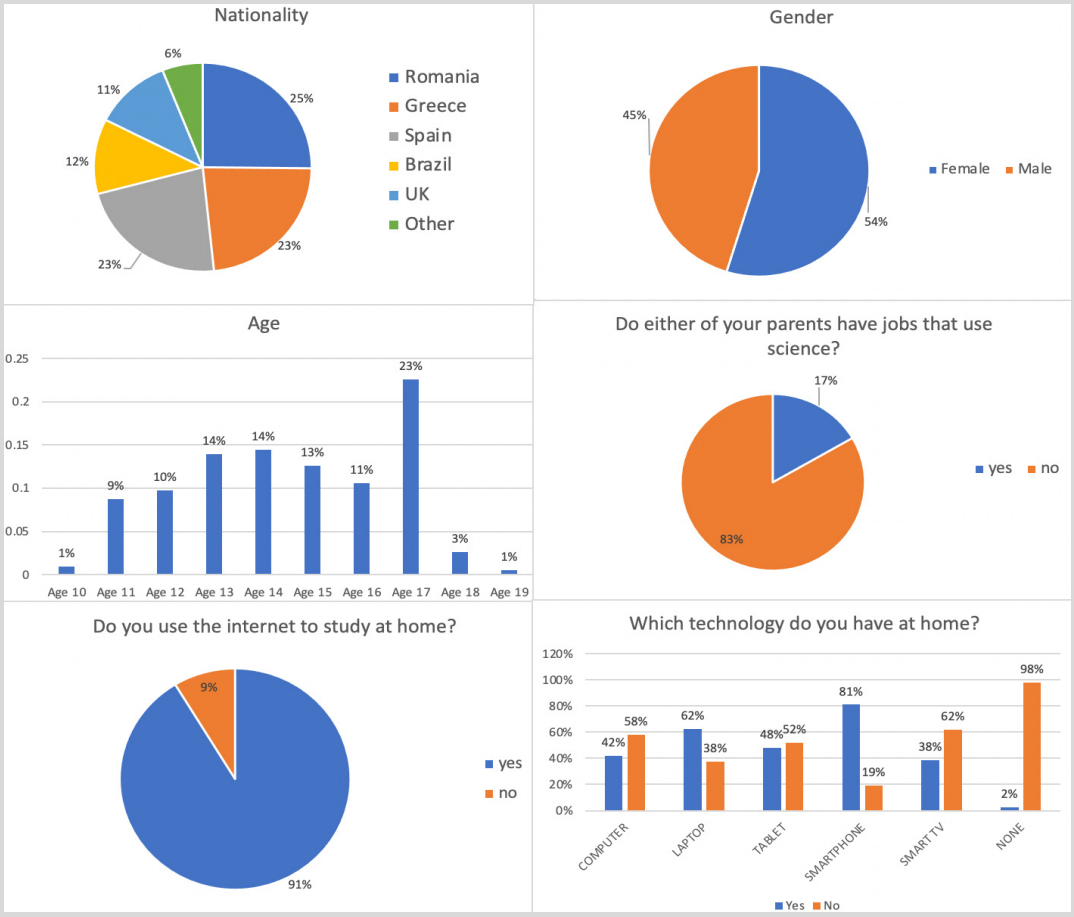


Figure 2 – CONNECT students with significant participation of disadvantaged learners


CONNECT
Students and Scientists
solving real problems

Key Findings related to teachers

Drivers

Many teachers felt confident with pedagogical practices relevant for implementing open schooling.

For example:

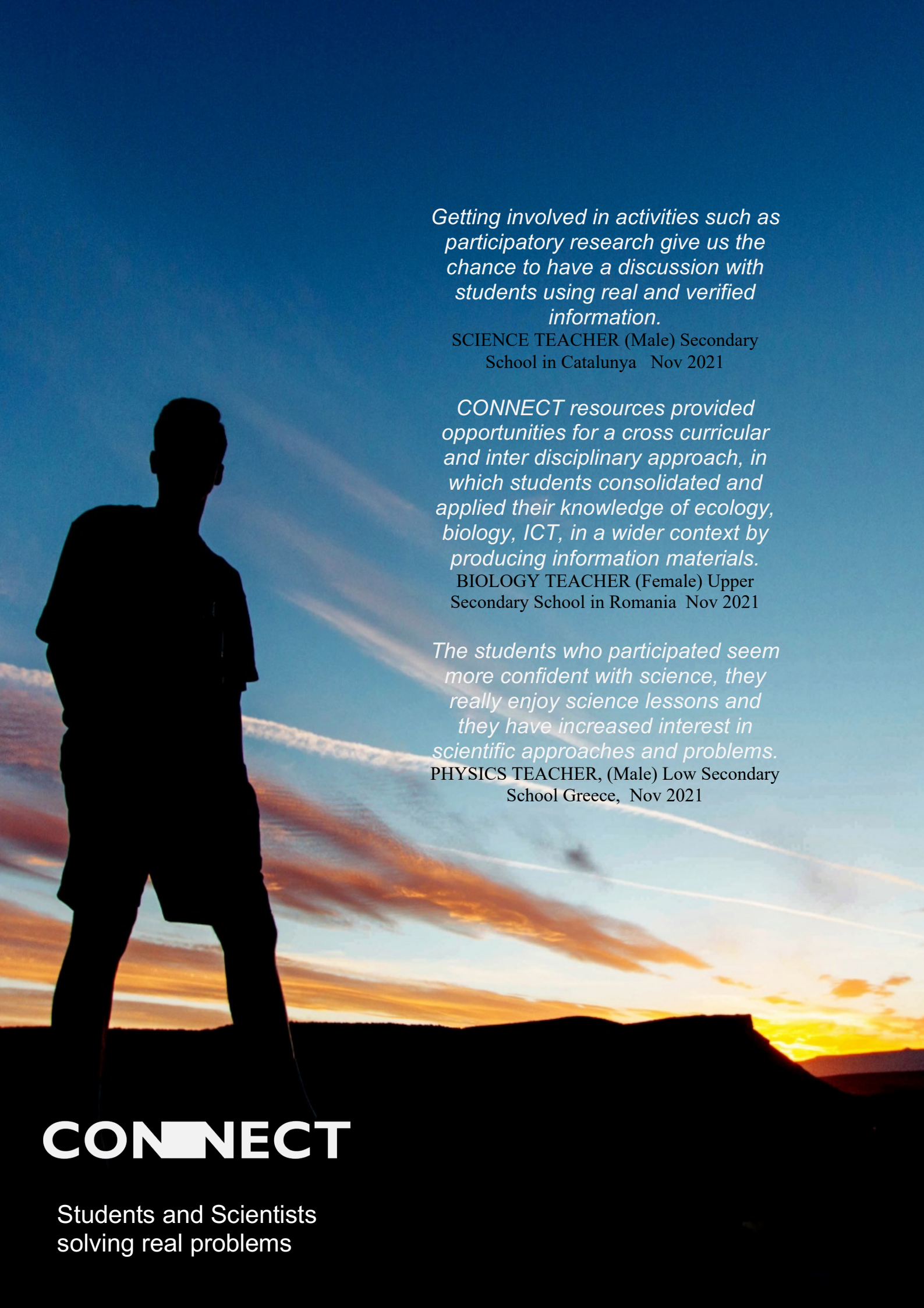
- 90% of teachers felt confident with arousing students' curiosity to undertake problem solving,
- 87% felt confident in guiding students to select reliable sources of information,
- 89% felt confident in helping students to air their views
- 88% felt confident in listening carefully to others during group discussions.

Barriers

Most of the teachers focused on traditional teaching methods, explaining ideas using textbooks and worksheets, whilst students take notes.

Some teachers did not feel confident in

- Discussing (with students) learning goals that included scientists (23%);
- Using questions to trigger divergent modes of argumentation (21%);
- Teaching scientific inquiry with real life problems (19%)
- Promoting discussions with family members (18%).
- A significant number of teachers indicated that they:
  - Rarely use collaborative games and role play (53%),
  - Rarely invite students to raise issues for discussion (39%),
  - Rarely invite students to create their own collaborative inquiry projects (36%)
  - Rarely ask them to talk about topical scientific issues (35%)



Getting involved in activities such as participatory research give us the chance to have a discussion with students using real and verified information.

SCIENCE TEACHER (Male) Secondary School in Catalunya Nov 2021

CONNECT resources provided opportunities for a cross curricular and inter disciplinary approach, in which students consolidated and applied their knowledge of ecology, biology, ICT, in a wider context by producing information materials.

BIOLOGY TEACHER (Female) Upper Secondary School in Romania Nov 2021

The students who participated seem more confident with science, they really enjoy science lessons and they have increased interest in scientific approaches and problems.

PHYSICS TEACHER, (Male) Low Secondary School Greece, Nov 2021

CONNECT

Students and Scientists solving real problems

Key Findings related to students

Drivers

Many students have positive views of the value of science in their lives and society. 75% think that Science, Technology, and Maths are important for solving world problems.

Science for them is related to knowledge, intelligence, innovation, discovery, curiosity, experimentation, research, evolution, development, technology, the Earth and the universe

They identified various world issues that could at least partly be solved through science, such as environmental degradation, climate change, health inequalities, food security, poverty, and the economy.

Barriers

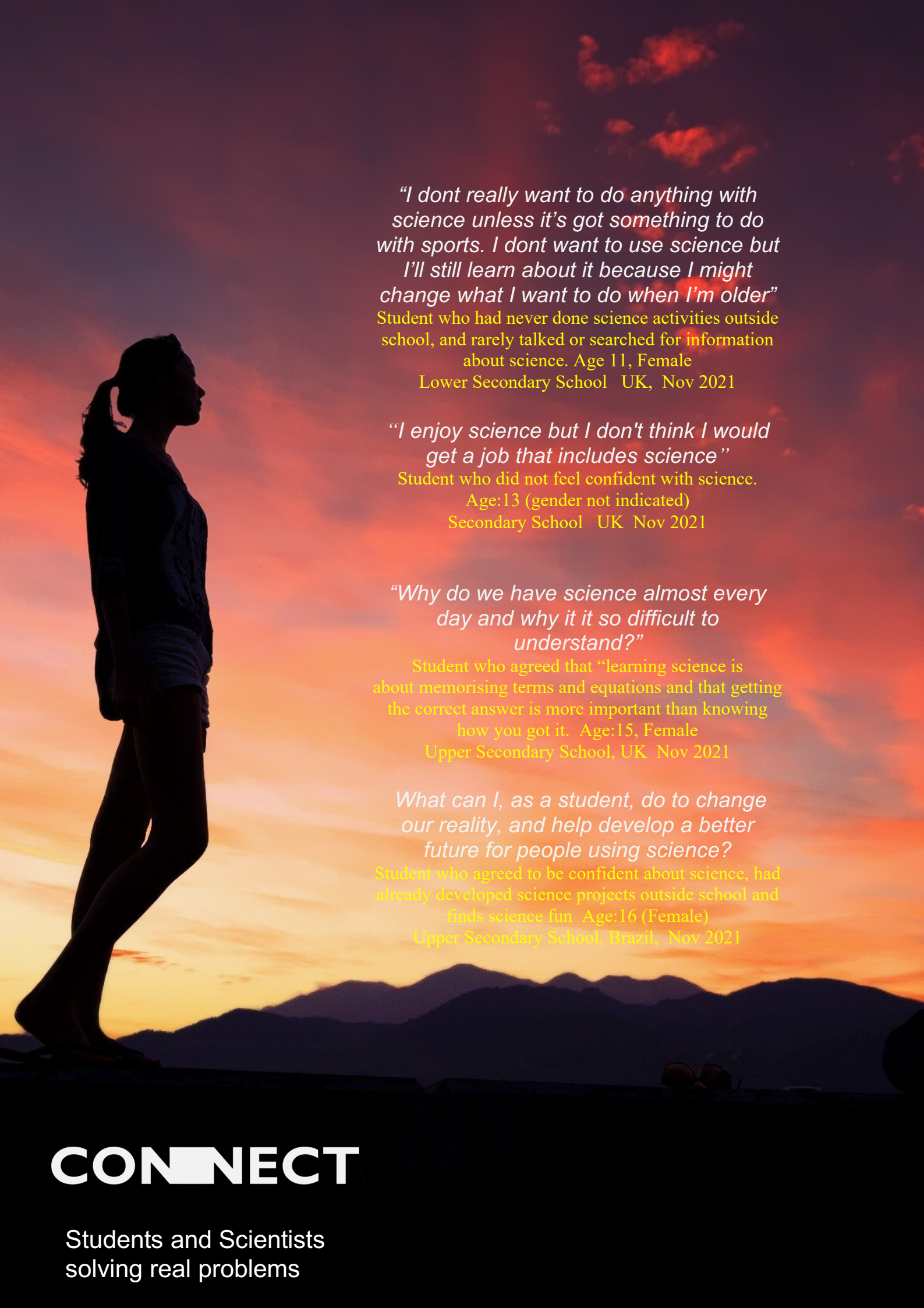
Half of the students had low science capital in all dimensions, primarily related to 'what they do' and 'what they know'.

Half had never done science projects outside school (e.g. at home, in the neighbourhood). Many (60%) were uncertain of their knowledge in science, with low confidence in talking about science, using maths to solve problems in science and selecting information, questions and ideas.

In terms of epistemic beliefs about how they learn:

- 41% of students agreed with the statement that learning science is about memorising terms and equations and that knowing the correct answer is more important that knowing how they reached it.

- In terms of science identity, although 60% considered science enjoyable and 57% considered it fun, there were 32% who would not like to be seen as an expert in science nor to have a job that uses science



"I dont really want to do anything with science unless it's got something to do with sports. I dont want to use science but I'll still learn about it because I might change what I want to do when I'm older"

Student who had never done science activities outside school, and rarely talked or searched for information about science. Age 11, Female
Lower Secondary School UK, Nov 2021

"I enjoy science but I don't think I would get a job that includes science"

Student who did not feel confident with science.
Age:13 (gender not indicated)
Secondary School UK Nov 2021

"Why do we have science almost every day and why it it so difficult to understand?"

Student who agreed that "learning science is about memorising terms and equations and that getting the correct answer is more important than knowing how you got it. Age:15, Female
Upper Secondary School, UK Nov 2021

What can I, as a student, do to change our reality, and help develop a better future for people using science?

Student who agreed to be confident about science, had already developed science projects outside school and finds science fun Age:16 (Female)
Upper Secondary School, Brazil, Nov 2021

CONNECT

Students and Scientists
solving real problems

Families' and scientists' role

Findings from best practices indicated that scientists contributed with 3 different roles.

- Firstly, introducing real world problems and/or engaging students to select relevant issues related to real world problems that they CARE about for science actions.
- Secondly, some partners invited scientists into the process to provide information and answer questions during KNOW, when students work with teachers to apply curriculum content to their science actions.
- Thirdly, scientists were involved in final events to share students' science actions with families and the local community. The following examples illustrate some open schooling activities in 2021.

The key role of family members was identification of obstacles, discussion of opportunities and contributing to decision-making.

The first example (Fig. 3) shows Open Schooling in a Romanian school: a Teacher, a Scientist and two classes with more than 50 students in total. The science action was about Rewilding – protecting nature by introducing species back to their natural environment

The second example (Fig. 4) shows Open Schooling in Brazil, in a semi-arid area, led by the NGO *Anjos Digitais*, with 3 professionals in Education, Social Care and Health, 3 teachers and 141 students in total. The theme was gender equity, puberty and violence against young girls, which increased during the pandemic.

The third example (Fig. 5) shows an Open Schooling exhibition, part of the European Erasmus Programme Fair in Greece, with the participation of 31 schools and educational institutions and more than 500 visitors including teachers, students, and citizens. It was a great opportunity to present CONNECT activities for policymakers, including practitioners involved in other EU funded projects.

Figure 3 Open Schooling Romania

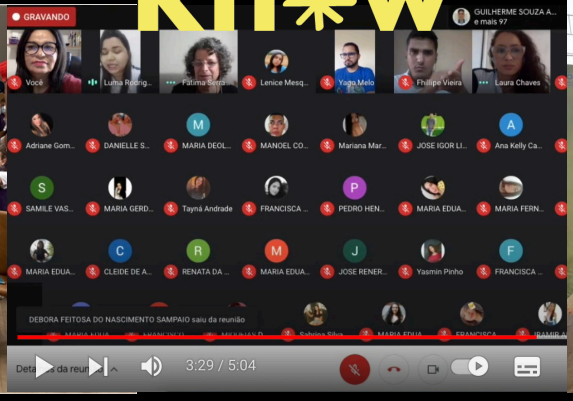


Figure 4. Open Schooling Brazil

Figure 5. Open Schooling Greece

"It is an opportunity for developing our professional skills through direct interaction with school communities, to learn how to get feedback about our work"
Professional student in Medicine (Female) Brazil

" My daughter showed me what she was learning using Augmented Reality and we talked about unhealthy food, smoking and heart diseases "
Family member (Female) Brazil

All of the class came back with parental involvement. I saw students' progress towards using evidence from a range of sources when making claims. Having a scientist Zooming in gave the project some credibility and they were engaged by this.
Biology Educator (Female) UK

CONNECT

Students and Scientists
solving real problems

CONNECT

Students & scientists solving real-problems

Open Schooling adoption

We are especially concerned to address the issues around disadvantaged students and STEM action. Research indicates that insufficient attention is given to the potential of practical activities for engaging disadvantaged students (including girls) in STEM.

CONNECT has provided opportunities for disadvantaged students to work with STEM professionals and their own communities on socially useful projects. It is important to recognise that disadvantaged students should not be stereotyped or seen as less able to learn than their peers from other socio economic backgrounds.

The motivation for such students lies in their being included in activities, being given roles and responsibilities, and in participating as equals.

Previous projects in STEM have frequently reported that their activities, whilst designed to be inclusive, have generally attracted 'middle class' students with engaged parents.

This applies especially to elective activities such as science fairs, museum visits, extracurricular science clubs and children's universities.

By placing its activities in the widest possible range of locations, including deprived areas in rural Brazil, CONNECT has brought STEM actions and scenarios to where they are most needed and where they can add the maximum value to the education of disadvantaged youth.

The impact assessment and evaluation of CONNECT was underpinned by a novel combined approach RRI RMA which integrated RRI – Responsible Research and Innovation (Von Schonberg et. al, 2015) with RMA Reflexive Monitoring in Action (van Mierlo et. al., 2010). RRI principles of public engagement ensured that five representative groups were involved in the process, and with RMA ensures that the needs of educational communities during the pandemic are considered.
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Methodology

Figure 4 presents a summary of our main achievements in phase1, which supported the development of this policy brief and 5 key recommendations. Figure 4 presents the methodological approach adopted, which supports Responsible Research and Innovation (RRI) and used Reflexive Monitoring in Action (RMA).

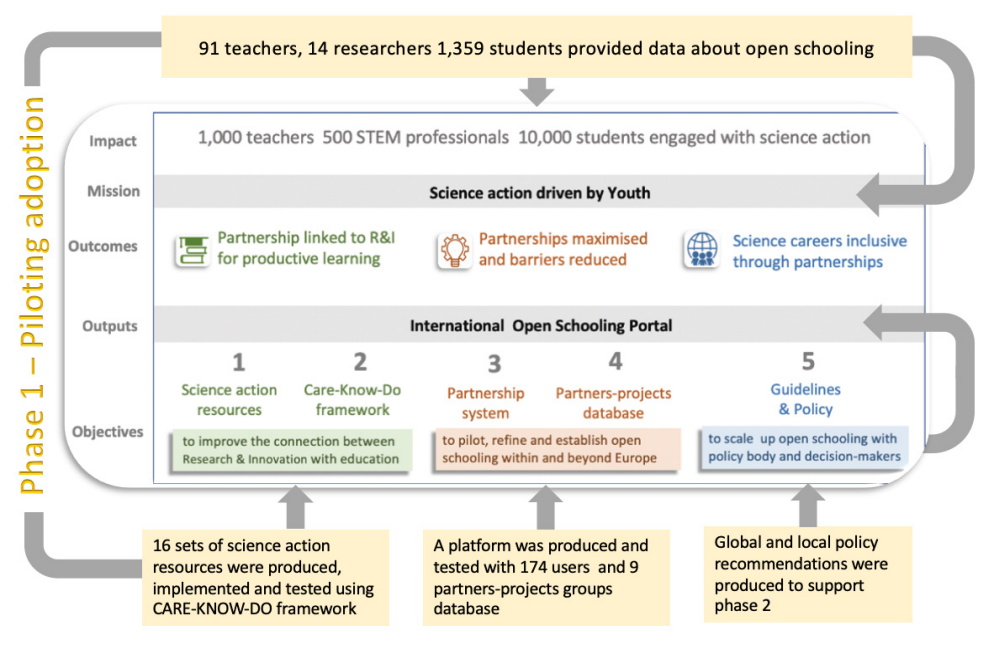

Figure 5 – CONNECT progress towards its objectives supported by phase 1

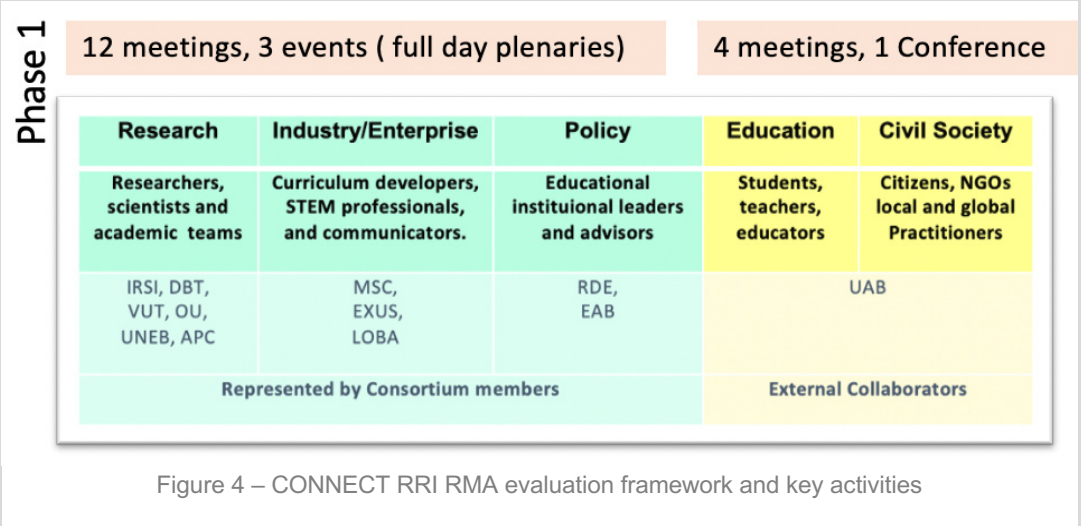

Figure 4 – CONNECT RRI RMA evaluation framework and key activities

Our recommendations

CONNECT is part of the OS Together movement – a network of more than 10 international open schooling projects, partly inspired by EU strategies and policies, to achieve lasting change in education.

This document makes recommendations as to how policymakers can become change agents in this process, rather than focusing on targets and micro managing existing educational processes.

Some recommendations for teacher educators, curriculum and resource designers and policy makers are provided to support Phase 2 of CONNECT: Transformation and Phase 3: Sustainability.

These recommendations were developed in a workshop with partners and the expert advisory board to explore the following questions:

How can open schooling help students increase their confidence in science by enhancing what they know and what they do, supported by families and expert professionals, as well as providing enjoyment and purpose?

How can teachers move from transmissive teaching focused on delivering content to more learner centred approaches, centred on students' interactions, to increase their understanding of science and career aspirations?

Recommendations for WP leaders were developed based on the following five outputs:

The CARE KNOW DO framework for embedding science action resources within science topics.

Twelve sets of science action resources using future orientated scenarios integrated into curricula, with open approaches.

A multilingual platform with structured partnership system that provides a step-by-step induction process for open schooling, with coaching.

Database of 57 partner projects to provide participants with information and best practice guidance about partnership options.

Partnership policies with evidence based recommendations for sustaining open schooling through partnerships involving schools, families, communities, universities and enterprises.


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Global Policy Considerations

Firstly, examining the beliefs, thoughts, and feelings of young people regarding their education is complicated by several factors. They are not usually experienced in this kind of meta-level discussion about education, and do not naturally use the language deployed by academics, with words such as ‘engagement’ and ‘aspiration’. This does not mean, however, that they are incapable of thinking and talking about their education in a serious way, if given the opportunity. CONNECT intends to pursue such opportunities in its next phase of evaluation.

Secondly, the scope of the word ‘science’ in this context has become so wide as to be unhelpful. In the school context, science is defined by policy documents and curricular guidelines as a body of knowledge and a set of methods, but this kind of generalised science does not reflect the full range of specialised science-based activities found across industry and academia. Teaching about the nature and history of science (NHOS) helps to broaden perspectives, but there is still a danger that young people think in terms of stereotypes, typically a middle aged man in a white lab coat. Therefore, although it is necessary to use the term ‘science’ in our evaluation instruments, we cannot know exactly how it is interpreted by young people, in relation to specific contexts.

Thirdly, there is a problem with the relationship between maths and science, which is picked up in questions such as “I feel confident in using maths to solve problems in science”. Although 42% of students across the project felt confident in doing this, a sizeable percentage (29%) definitely did not. This is a blind spot for EU open schooling projects, where the ‘science with and for society’ concept, and the desire for universal scientific literacy, has obscured the need for rigorous maths learning in order to equip students for STEM careers.

Fourthly, the majority (75%) of the young people surveyed believe that science has a major role in solving world problems. This is indicative of a rather naive worldview, but it is a worldview that is shared, to some extent, by policymakers. Scientists, historically, have avoided engagement with policy issues unless specifically invited to do so. In the case of the Covid 19 pandemic, in which scientists were seen regularly in the media, science and society have come together, if somewhat problematically. Young people need to learn not only about science as a systematic way of gathering knowledge, but also as a belief system. They need to be actively involved in changing that belief system, not just joining a value free STEM workforce but participating in society as change agents, whether in STEM based careers or otherwise.

Recommendation 1 – increase the opportunities for students to interact with professionals and family in the community through science actions

EVIDENCE: The roles of parents and carers are especially important within Open Schooling, but there is a lack of support measures to help families and communities take a more active role in education. This is also a factor in career choice, where parental and professional support could increase young people's aspirations. In particular, the use of retired or other professionals to support mathematics learning would greatly increase the life chances of disadvantaged students.

In the CONNECT schools' network, only half of the student respondents agree that "their families think science is interesting and important for their futures." However, this is a finding that can be interpreted widely and may or may not influence career choice.

ACTION: Educational providers should actively focus on parental and family support as well as interactions with scientists and professionals, with training opportunities and face-to-face or online events.

Recommendation 2 – use phenomenon-based learning to build stronger scientific foundations and promote innovation

EVIDENCE: Within the Open Schooling concept, science education has been foregrounded due to long-standing concerns about the STEM workforce. Science teachers are receptive to messages about open teaching and learning but are held back by existing curricula and traditional practices. In addition, a more values based approach is required to address future challenges, in line with the principles of RRI. In schools, this means enlisting a wider range of subjects and addressing phenomena holistically, rather than traditional disciplinary curricula. This does not mean a loss of rigour when it comes to science but acknowledges the wide range of topics that embody real life issues whilst having scientific implications.

Teachers' most commonly used strategies revolved around transmissive teaching, rather than learning centred approaches. This has been noticed by many students, who feel that science learning consists of memorising facts and giving correct answers, rather than developing their understanding of topics.

ACTION: Educational providers should promote curricular innovation and school level actions to encourage creativity, critical thinking and innovative practices amongst students.

Recommendation 3 – Identify good practices that enable students to increase their confidence, enjoyment, and wellbeing.

EVIDENCE: Open schooling can have an impact on young people's emotional wellbeing in the current circumstances. Many actions under the Open Schooling 'umbrella' have helped in this regard, for example, by enabling young people to take part in debates, create media products and generally build their soft skills. Schools, however, are under pressure to meet targets within standardised testing and inspection regimes, and this sometimes conflicts with the aims of Open Schooling.

In CONNECT, many students lack confidence, knowledge and skills in science and maths, especially disadvantaged learners and girls. They find learning science difficult. Although some of them enjoy learning science and find activities fun, many of them do not want to be seen as experts in science nor do they want jobs that use science. 'Science is not for them yet'. However, this is a snapshot of their beliefs based on a necessarily vague impression of what a science career might entail. An issue in STEM education is, therefore, how to convey the overall value of scientific knowledge rather than promoting stereotypical science careers.

Confidence is generated through success in personal interactions, the positive responses of others and through experience in action. All these are promoted within CONNECT.

ACTION: Educational providers should recognise the need for cognitive and emotional development within education and should prioritise this over standardised testing.

Recommendation 4– recognize and widely disseminate good practices in various networks beyond the project.

EVIDENCE: The open schooling concept is broadly welcomed by participants in CONNECT activities as shown in our evaluation, and is especially relevant and challenging during times of crisis, such as the COVID-19 pandemic, as it reflects the expanded role of families, communities, and external professionals in education. However, increasing pressure to deliver the curriculum, brought about by COVID-19, has made widespread engagement in open schooling difficult. There should be recognition of past efforts in this direction, either by schools acting alone, or via EU projects.

In CONNECT, qualitative data shows that the recognition of teachers' and students' good practices and their reflection about positive and negative issues will be important for refining open schooling experiences, aligned with the needs of teachers and students in each country. A number of related projects have collaborated under the banner of *OSTogether*, which could function as an umbrella organisation to promote an Open Schools Charter.

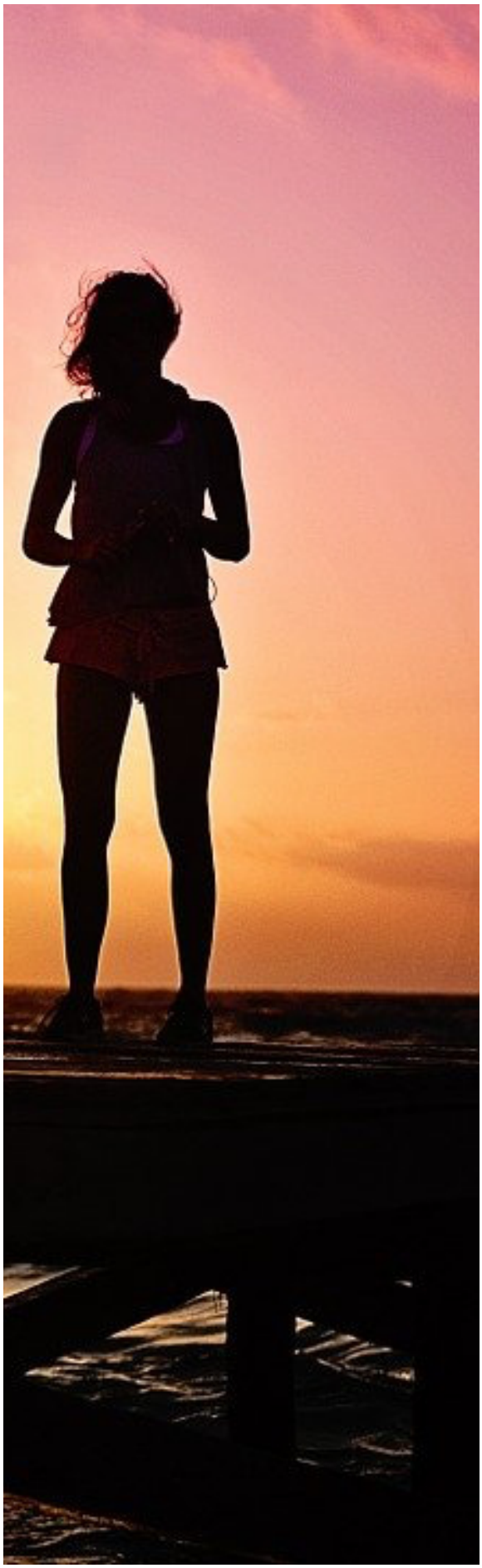
ACTION: Create an Open Schools Charter, supported by an existing pan-European platform such as School Education Gateway, with a sustainable business model. The Charter should reflect the level of defined open schooling activities at the respective institution. There should be an ongoing monitoring and evaluation process to ensure that Charter standards are upheld. Value for schools derives from international recognition of their work in open schooling and the sharing of good practice across the supporting website and social networks.

Recommendation 5 – Establish partnerships with local, regional state, and national policymakers

EVIDENCE: Some drivers were identified for the way that students value science in the world and making their engagement/enjoyment in learning science more active and meaningful. However, various barriers were described, primarily, the lack of disadvantaged students' confidence and opportunities to develop skills which were limited during long periods of isolation during the pandemic, and more generally, and rapidly increasing levels of poverty.

In CONNECT, partnerships with policymakers will be relevant to reaching and supporting significant numbers of students and teachers through the open schooling approach.

ACTION: To maximise impact, CONNECT must establish partnerships with policy makers to make the school curriculum more flexible and to exploit the possibilities of intergenerational and cross professional collaboration. Opening up opportunities for open schooling at local, regional and national levels is vital to scaling up CONNECT's outputs. However, it is important to identify the structures and processes that result in a particular curriculum being delivered through a specific set of teaching and learning methods. This is discussed further in the 'Implications' section below.



CONNECT offers educational providers:

1. Learning and formative assessment materials
2. Best Practices
3. Training events, workshops and coaches
4. Participatory methods and engagement tools
5. Reflective evaluation instruments with feedback
6. Multi-lingual partnership platform
7. Evidence regarding students' engagement, science capital and growth mindsets
8. Scientific Publications

Access: http://connect science.net

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Next Steps

it is important to identify the structures and processes that result in a particular STEM curriculum being delivered through a specific set of teaching and learning methods.

The term ‘policymakers’ covers a range of actors including, but not limited to:

1. Politicians
2. STEM lobby groups, e.g. learned societies, professional associations
3. Academics
4. Civil servants, including professional curriculum designers
5. Private educational providers and consultants
6. Projects such as CONNECT
7. School leaders
8. Teachers, especially those seconded to curriculum design committees or similar
9. Parents, especially in terms of controversial issues
10. Student ambassadors and apprentices

Many of these are not merely stakeholders but have active roles in shaping curricula, whether in the form of lesson plans, online resources or the CONNECT science actions.

However, some actors have more power than others. This is noticeable in the negotiating process. Disciplines such as Chemistry[1] have struggled to maintain their place in the list of taught subjects at school, just as Latin and Greek have largely vanished.

Scientists either have to know a lot of things outside their own field or know someone else who does. The nature of science itself is changing and the idea that students can learn to be ‘scientists’ needs to be made more relevant to current or future STEM workplaces.

The curriculum often functions as a menu or aide memoire for teachers rather than as a definitive guide to essential knowledge. Meanwhile, science processes have become more important than science content.

[1] https://blogs.ch.cam.ac.uk/pmr/2006/10/07/departmental anything not just chemistry may be dying/

The Covid pandemic has illustrated that agility, creativity and speed are essential attributes of researchers, and that traditional processes of peer review and publication are in need of updating.

The scenarios and collaborative science actions promoted by CONNECT and related projects have the power to realign STEM education with the current and future needs of the STEM labour market, providing the policy actors concerned can open up the curriculum to a different way of doing things.

In terms of CONNECT recommendations, therefore, we see the process of open schooling as much more than a fun packed supplement to dull science lessons.

In fact, the term "fun" is used in the project as shorthand for "effective levels of enjoyable challenge in learning".
Fun education connected with life is NOT frivolity.

Enjoyable science actions are those **that make students feel good** and keep them looking toward the future because they want to keep doing those open schooling things that are fun.

Open schooling is about making much more direct connections between:

- **The world of theory and the world of practical action**
- **The world of education and the world of work**
- **The always connected generation and the generation with useful life experience**
- **Disadvantaged students and previously hidden opportunities for them to shine**
- **The applications of science and the alleviation of poverty**

By drawing on community and professional resources to supplement school education, CONNECT is changing lives, not just improving exam results.

Policy communities should carefully consider:

- **how they can contribute to the momentum of open schooling,**
- **what changes are needed in how the curriculum is created, and**
- **what external resources can be brought into the system.**

in order to radically improve the life chances of all students, especially those in disadvantaged situations.


WE
care
WE
know
WE
do
CONNECT
Students and Scientists
solving real problems

Peer Reviewed Publication

Fernandez, J.; Malagrida, R . Okada, A. (2021) How can teachers, students and families collaborate with scientists act as co-researchers to improve Covid-19 preventions? Proceedings of the 8th LSME conference

Mantescu G, Gorghiu G., Bizoi,M. (2021) Open-Schooling on Solar Energy and Green Mobility - Action Targeting on Increasing the Students' Interest in Science and their Confidence in a Sustainable Future. Conference Proceedings of the 38th European Photovoltaic Solar Energy Conference p. 1694 – 1697

Meister I.; Okada A. (2021) The knowledge in virtual networks with social media to promote open education: habitat of collective intelligences EnRede Journal

Neuhaus S (2021) Aligning Science Education with Societal Needs and Values: Intriguing. Proceedings of the 8th LSME conference

Okada A.; DaMatta C. (2021) Teacher training for professional education through a course of extension on emerging technologies with open schooling. Dialogos Educacional Journal 21(71) pp. 1794-1819

Okada A.; Struchiner M; Rabello C; Pinheiro, K. Moura,R.; Quadros, L. ; Castro T. (2021) Innovative ecosystems with open schooling to support less well-represented actors and territories. Proceedings of the 8th LSME conference

Okada, A., Tishler, C, Dworsky, C. Vicente, M. Koulouris, P. , Gray P. (2021) Open schooling for sustainable development to enhance innovation ecosystems. Proceedings of the 8th LSME conference

Panselinas, G et al. (2021). Science teachers and researchers as a community for adapting, designing and implementing open schooling for sustainable development. Proceedings of the 8th LSME conference.

Ribeiro, S. et al. (2021) Open schooling with Collaborative Scientific Action for Environmental Protection of Wild Animals in the Semi-Arid Northeast. Proceedings of the 8th LSME conference

Rosa, L; Souza, M. and Okada, A. (2020). Open schooling with RRI for a significant participation of indigenous communities in network education. The Brazilian Journal of Education Policy and Administration, 36(3) pp. 1046–1067.

Rosa, L. , Souza, M., Okada, A. (2020) Open schooling with RRI for a significant participation of indigenous communities in network education. The Brazilian Journal of Education Policy and Administration, 36(3) pp. 1046–1067.

Sachinski G.; Torres, P; Kowalski R; Cristine, D; Grunewalder, B. (2021) RRI in an interdisciplinary Approach: Developing High School students' multi-Literacies. Proceedings of the 8th LSME conference

Other References

Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. Journal of research in science teaching, 52(7), 922-948

Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 44(8), 1187-1218.

Okada, A., & Sheehy, K. (2020). Factors and recommendations to support students' enjoyment of online learning with fun: A mixed method study during COVID-19. In Frontiers in Education (p. 225). Frontiers.

Von Schomberg, R., & Hankins, J. (Eds.). (2019). International handbook on responsible innovation: A global resource. Edward Elgar Publishing.

Van Mierlo, B. C., Regeer, B., van Amstel, M., Arkesteijn, M. C. M., Beekman, V., Bunders, J. F. G., ... & Leeuwis, C. (2010). Reflexive monitoring in action. A guide for monitoring system innovation projects. Communication and Innovation Studies, WUR; Athena Institute, VU.

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