Dear PARRISE colleagues and friends,

It is with great joy that we welcome you to the fourth edition of the PARRISE newsletter. The PARRISE project is now concluding its second year, which signaled the beginning of the first round of its Teacher Professional Development Programmes (TPDs). With the first iteration of the theoretical framework in place, PARRISE TPDs seeks to operationalize the framework and use it to engage pre- and in-service teachers, and science centers’ educators, in the 11 countries represented in this project. At the same time, this effort will contribute to the refinement of the underlying framework, which will be further tested during the second round of TPDs.

The PARRISE project espouses the Rome declaration of Responsible Research and Innovation (RRI) and aims to provide exemplars of teacher professional development practices that can support the RRI dimension in science education. The latter is one of the “keys” of the European framework for Responsible Research and Innovation; its importance and proposed emphases for the European Union is highlighted in the 2015 report prepared by the Expert Group on Science Education for the European Commission and titled “Science Education for Responsible Citizenship”, which we encourage all science teachers, teacher trainers and science education researchers to read.

The socio-scientific inquiry-based learning pedagogical framework represents one of the first efforts at European level to coherently describe how responsible research and innovation can be instantiated in the science classroom. Moreover, PARRISE is one of the few, EU-funded projects focusing primarily on teacher education and teacher professional development around RRI issues. The SSIBL framework helps provide a common perspective unifying all of the partner’s TPD efforts. Even though each PARRISE partner has the flexibility to develop their own TPD to address cultural and local differences, frequent online conferences between partners working with the same age groups, supports collaboration and sharing across partners. This fourth issue of the PARRISE newsletter illustrates the exciting activities currently under way in PARRISE. Reports from Porto (Portugal), Limassol (Cyprus), London and Southampton (UK) describe the first TPD efforts at these locations.

One main PARRISE goal is to support students in understanding global challenges by connecting them to the students’ personal decision making. As a consequence, the learning scenarios are strongly tainted by the necessity for personal action and critical citizenship. At a recent presentation at the ESERA 2015 symposium, five PARRISE partners demonstrated that RRI issues are under-represented in their national curricula. It is no surprise, then, that many PARRISE teachers engage in adopting or designing units that incorporate the SSIBL approach. The “cartography of the controversy” has been proposed as a useful approach to visualize and conceptualize the complex socio-scientific issues which are evident in the controversies that the PARRISE project seeks to engage students in. This approach, which has been adopted by several PARRISE partners, is described in this edition of the newsletter and can be seen as a strategy for empowering science teachers to select, analyze and integrate complex socio-scientific issues in their lessons.

In addition, this issue of the newsletter describes some of the PARRISE partners efforts for disseminating the PARRISE project ideas to different stakeholders around Europe.

We send you all warm wishes for a new year full of peace, joy and happiness...and, of course, for a year in which we all work together to tackle the global challenges that concern and excite our society.
Employing exemplary SSIBL materials as part of the PARRISE TPD courses

A well-known quote states “Tell me and I forget, teach me and I may remember, involve me and I learn”. Re-contextualizing this quote in the context of the PARRISE TPD efforts, one can see that PARRISE partners have employed a variety of experiential TPD activities, structured around exemplary SSIBL materials.

In this section we present a glimpse from the TPD courses provided by four of the PARRISE partners, who integrate such experiential, SSIBL-based approaches, which allow science teachers to interact with the SSIBL pedagogical framework as learners, as teachers and as reflective practitioners.

Teacher Professional Development (TPD) courses in Portugal

by Christina Dias & Maria João Fonseca
University of Porto, Portugal

Our first TPD course began on September 9th, 2015 with a group of 11 in-service biology/geology teachers (see Figure 1). This training course was designed for a total of 25 hours, distributed as follows: 15 hours corresponding to a set of five (face-to-face) classroom sessions and 10 hours of individual, distance learning.

In the first sessions, the participants were acquainted with the PARRISE project and the main features of the SSIBL framework. In the practical component of these face-to-face sessions, the participants worked in groups to develop or adapt activities and resources of their choice based on a SSIBL approach. Subsequently, they had the opportunity to test and improve their laboratory skills through the implementation of two practical activities: “Natural antibiotics: a hands-on activity on garlic’s antibiotic properties” (Fonseca & Tavares, 2011a) and “The bactericidal effect of sunlight” (Fonseca & Tavares, 2011b).

Putting it into simple terms, each of these activities has been tailored to encompass, as much as possible, the four components comprised within the SSIBL framework - Responsible Research and Innovation (RRI), Citizenship Education (CE), Socio-Scientific Issues (SSI) and Inquiry Based Science Education (IBSE). The use of practical work was one of the strategies used in Portugal with the purpose of empowering the participants to take hold of the educational opportunities and enabled them to feel comfortable to efficiently guide student learning through this innovative approach. All the materials were developed having in mind the central role of students, exploiting every opportunity to discuss the key procedures, potential and limitations of scientific research, and encouraging them to take action while exercising their democratic rights. In spring 2016, all the participants will meet again for a wrap-up session that shall follow the trial and testing of the activities and resources in the classroom.

Figure 1. In-service biology/geology teachers participating in the Teacher Professional Development (TPD) courses in Portugal

Teacher Professional Development (TPD) courses in London, UK

by Ruth Amos & Ralph Levinson  
UCL Institute of Education, UK

During the autumn semester at UCL Institute of Education, London we have once again run socio-scientific inquiry-based learning (SSIBL) training sessions with our new cohort of 104 pre-service science teachers (PSTs). This year, we included a scenario on under-age smoking. We linked to issues associated with the use of ‘new technology’ afforded by e-cigarettes (see Figure 2). This was both thought-provoking and touched naturally on personal issues such as relatives trying to give up smoking, as well as the lack of existing evidence on the risks associated with e-smoking. They really appreciated how powerful SSIBL activities can be in terms of asking contemporary, meaningful questions and thinking about ethically-sensitive research. We worked on creating learning activities to promote researching answers in different ways, for example, using questionnaire surveys, interviews and discussions. The PSTs are going back into their training schools in January 2016 to find appropriate topics and scenarios for promoting curiosity questions, which can be then be shaped into investigable inquiry questions. The goal is to empower students to carry out responsible research, which helps students to think about possible personal actions.

On Friday, January 8, 2016, PARRISE partners from UCL IOE and the University of Southampton are teaming up to give a workshop at the Association for Science Education’s (ASE) Annual Conference at the University of Birmingham. The theme is socio-scientific inquiry within the English science National Curriculum strand of “Working Scientifically”. A report on this will appear in the next PARRISE newsletter.

Figure 2. SSIBL sessions - Questions and issues board

Teacher Professional Development (TPD) courses at Nijmegen (Netherlands)

by Sanne Dekker & Inge van der Aa, Radbout University  
The Netherlands

The Science Education Hub in Nijmegen has undergone large changes in the team coordinating the PARRISE project as the former project leader Roald Verhoeff moved to the PARRISE team at Utrecht University. We thank Roald for all the work he did for the project and we are happy that he will still be part of the PARRISE family.

The new team of the SKUN (Radboud University) consists of Sanne Dekker (project leader), Inge van der Aa and Jan van Baren-Nawrocka. We are all new to PARRISE and started our activities in this team in November 2015. Together we developed a Teacher Professional Development (TPD) program for primary school teachers that will be implemented in the spring of 2016 (February-April). To recruit additional teachers for this program, we have made a video clip about PARRISE and have posted it on our website. Via an e-mail to more than two hundred primary schools, several posts on Twitter, LinkedIn and via our local newsletter, we have spread information about the project and possibilities to sign up for our TPD program. We have also updated our local website, www.wkru.nl, to ensure that primary school teachers can easily apply for the course in Spring 2016 or Fall 2016. Besides approaching primary school teachers, we are in contact with pre-service training programs to explore possibilities to implement parts of the TPD program in the curriculum.

Furthermore, we are busy collecting information and developing course materials for the TPD program. The Science Education Hub at the Radboud University in Nijmegen has a lot of expertise in inquiry-based learning. We can use some of the materials and develop new activities as well to enhance teachers’ skills to promote citizenship of their students. Our TPD course consists of five 2,5 hour meetings. All TPD activities will be centered around the theme “Thinking about DNA”.

The first meeting of PARRISE Nijmegen Teacher Professional Development will be on February 3rd, 2016. We will present the results of the first round in May 2016.
Our "Science with and for Society" themed workshops at Southampton Education School have continued this year with a number of sessions and activities taking place during the first semester of 2015-16. In October, we had the opportunity to inform about 15 of our teacher mentors about the PARRISE project and its aims, and have had a discussion with them about how they could support the pre-service teachers they will be working with during the year. During November, approximately 50 of our pre-service teachers (PSTs) at Southampton Education School took part in two “Science with and for Society” workshops (see Figure 3).

During these workshops, we aimed at introducing our PSTs to the main principles and ideas behind the SSIBL framework and allow them to identify ways in which they could incorporate inquiry-based learning and the use of ethical and societal issues into their planning and teaching of science. We discussed the meaning and importance of inquiry-based learning; drawing from personal experiences during their first school placement, pre-service teachers worked in small groups brainstorming on how to ask questions and develop activities that promote inquiry-based thinking and learning. We, then, used these ideas and considered how ethical and societal issues related to science could be incorporated into inquiry-based thinking and learning. Authenticity, and how this can be made part of the PSTs’ classroom practice, was discussed extensively as it was identified as a challenge for them at this stage in their training.

Finally, our PSTs had the opportunity to engage in activities on three SSIBL scenarios, each exemplifying different aspects of the SSIBL framework. The first scenario on climate change allowed PSTs to consider how they can present and discuss the quality of scientific evidence about a controversial issue, and suggested ideas about “taking action” and making the topic relevant to their pupils. The second scenario posed the question: “Would you sign a petition for a ban on using animals to test new drugs?” and aimed at engaging PSTs in decision-making around the issue of using nuclear power plants. Our PSTs are now working on independent study tasks on issues of teaching and learning science, one of which is socio-scientific inquiry-based learning, and this work will be further developed and discussed in the new year.
Teacher Professional Development (TPD) courses in Cyprus

by Eleni Kyza, Yiannis Georgiou, Andreas Hadjichambis, & Andria Agesilaou
Cyprus University of Technology

Our first TPD program began on October 24, 2015 with a group of 48 in-service science teachers (biologists, chemists, primary education science teachers) and will run until May 2016. The TPD adopts a model of teachers as learners, designers and reflective practitioners. Teachers work in eight different design groups, organized according to discipline and level of teaching (primary, lower secondary or upper secondary education). The TPD is composed of five face-to-face meetings, each one lasting six hours, and bi-weekly video-conferences of each design team to coordinate the design of the SSIBL modules.

The main goal of the face-to-face meetings is to familiarize science teachers with the underlying philosophy and the operationalization of the SSIBL framework. Each f2f meeting consists of several experiential activities. For instance, during the first and second face-to-face meeting, our science teachers took on the role of students and investigated the controversial topic of antibiotics in meat, using an online learning environment designed by the local PARRISE team. The “Meat safety” learning environment (see Figure 4) encompassed all four aspects of the SSIBL framework (scientific inquiry, socio-scientific issues, active citizenship leading to responsible research and innovation). The science teachers, working in groups, were assigned one of the stakeholder roles involved in this controversy (e.g. concerned scientists, farmers, medical industry, government agencies, public interest organizations against antibiotics). They were then asked to develop an argument that would answer the driving question (“Should antibiotics in livestock be banned?”) according to the stakeholder’s role they had adopted. Arguments were captured in google docs, to facilitate group work and sharing. At the end of this activity teachers reconvened as a plenary and each group participated in a public debate around the topic (see Figure 5). Following this activity, in which teachers became the learners, the teachers were asked to work as reflective practitioners, and analyze the learning module and its potential to promote the four dimensions of the SSIBL pedagogy.

The next face-to-face meetings included brief introductions of each of the SSIBL dimension, along with experiential activities to foster a grounded understanding of the SSIBL framework. Each meeting also included time for teachers to work in their design teams. This type of TPD experiences, structured around exemplary SSIBL material, and including a variety of presentations, discussions, experiential activities and design time allows teachers to conceptualize the SSIBL pedagogical framework, while also affording opportunities to elaborate and operationalize its main dimensions. In this context, the face-to-face meetings are purported to function as a mechanism for our web-based meetings during which the PARRISE teachers work collaboratively to design SSIBL-based activities for their science students.
Assessing Cypriot PARRISE teachers’ RRI attitudes and beliefs

As one of the ways to evaluate the effectiveness of its teacher professional development approach, the PARRISE Cyprus team assessed the participating teachers’ beliefs and attitudes towards Responsible Research and Innovation (RRI) prior to the outset of its TPD programme.

For this purpose we adopted a Eurobarometer questionnaire to examine the participating teachers’ RRI understanding, as these compare to the general public of Cyprus. For the latter, we used the outcomes of the Special Eurobarometer 401 report, which was titled “Responsible Research and Innovation (RRI), Science and Technology”.

The PARRISE Cyprus “Teachers’ RRI attitudes and beliefs” questionnaire consisted of 44 questions and including two open-ended ones on the operationalization of RRI which are currently under analysis. It was administered to 45 in-service science teachers (36 women, 9 men) and included primary education teachers (n=16), lower and upper secondary education teachers (n=15, n=13, n=1), with an average teaching experience of 13 years.

Overview of findings

The questionnaire encompassed seven RRI dimensions as identified in European Commission RRI reports. We present an overview of our findings for each of these seven dimensions for the Cyprus PARRISE teacher cohort.

1. Engagement with science and technology: The PARRISE Cyprus teachers are interested in developments about science and technology; they are informed about these developments mainly from websites (89%), social networks sites or blogs (56%), and television (62%). The general public in Cyprus, according to the Eurobarometer results, is primarily informed from television (66%), websites (38%) and newspapers (25%). In Europe, participants are primarily informed from television (65%) and newspapers (33%). PARRISE Cyprus teachers (36%) believe that decisions about science and technology should be made by scientists, engineers and politicians, and the public should be informed about these. According to the Eurobarometer report, more than half of Europeans believe that when it comes to decisions made about science and technology, public dialogue is required (55%) whereas less than four in ten respondents believe that it is not (37%). 57% of the general public of Cyprus also thinks that public dialogue is required.

2. The impact of science and technology on society: Results indicated that the PARRISE Cyprus teachers have an overall positive attitude towards science and technology. Most (47%) believe that scientists working at a university, or government laboratories, try to behave more responsibly towards society by paying attention to the impact of their science and technology related activities, as compared to scientists working in private company laboratories (24%). The general public of Cyprus (85%) and most European respondents (82%) think that scientists working at a university or government laboratories try to behave more responsibly towards society. It is also important to mention that a considerable part of the general public of Cyprus (83%) believes scientists working in private company laboratories behave responsibly.

3. Attitudes towards science and technology: Despite their positive attitude towards science and technology, PARRISE Cyprus teachers recognize that there is also a negative impact on human life, health and the environment. Most teachers (93%) believe that science and technology make our lives more comfortable, while 82% of them believe that scientific and technological developments can have unforeseen side-effects that are harmful to human health and the environment. This finding concurs with the Eurobarometer result about the general public of Cyprus (90% think this way); the respective percentage at European level, based on the Eurobarometer survey was 74%.

4. Ethics and science: Most PARRISE Cyprus teachers (44%) believe that scientific and technological applications can threaten human rights, where as 24% of the respondents disagree with this statement. A rather large percentage of the PARRISE Cyprus teachers (33%) indicate uncertainty. The respective results at European level indicate that 54% of the respondents believe that scientific and technological applications can threaten human rights and 23% are not sure. All PARRISE Cyprus teachers believe that all researchers should receive mandatory training on scientific research ethics (100%) and should be obliged to openly declare possible conflicts of interest, such as their sources of funding, when they are advising public authorities (96%). The general public of Cyprus participating in the Eurobarometer report also thinks the same way.

5. Young people and science: Some teachers believe that young people trained in science will have better chances of getting a job (49%). The Eurobarometer results show that European participants believe that, too (59%). PARRISE Cyprus teachers also believe that young people can improve their culture through science and technology (78%) and that science and technology will increase opportunities for future generations (78%). Only 9% of the PARRISE Cyprus teachers believe that young people involved with science will not have better chances of getting a job; the respective percentage at European level is 18%.

6. Gender issues and science: Teachers in PARRISE Cyprus believe that it is important that scientific research equally takes into account women’s and men’s needs (96%). Cypriot participants in the Eurobarometer report also agreed with this statement (93%); the respective percentage at European level was 86%.

7. Open access to research results: Most PARRISE teachers in Cyprus (49%) think that the results of publicly funded research should be made available online free of charge to the general public, an opinion also shared by most Eurobarometer respondents (62%). The general public in Cyprus also agreed with these results, but at a greater scale (80%).

Overall, PARRISE teachers in Cyprus hold positive attitudes towards science and technology and share similar opinions and attitudes as compared to the general population in Cyprus. As a next step we are analyzing the open-ended questions that asked teachers to define RRI to identify the specific beliefs that exist in our PARRISE Cyprus 2015-16 teacher cohort. Even though the sample is small and non-representative, this analysis will support our localized efforts to provide targeted support to the participating teachers and understand the kinds of challenges that are present when trying to conceptualize Responsible Research and Innovation.
Mapping controversial, socio-scientific issues

According to the SSIBL framework “Socio-Scientific Issues (SSI) are controversies, or ‘wicked’ problems with no straightforward solutions, occurring both at the societal and the scientific level. Controversies comprise a plurality of values and representations justifying different opinions.”

In order for the SSIBL pedagogical approach to be successful this must be grounded in a well-chosen, socio-scientific debate that is appropriate for the target age group. At the same time, the success of the SSIBL pedagogical approach is dependent upon whether the science teacher and their students are able to consider the different and contradictory aspects involved in a given SSI debate.

"Mapping the controversy" is a strategy, which can empower science teachers to select, deconstruct and integrate complex socio-scientific issues in their practice. The next contributions briefly outline the value of this approach and provide some examples from the perspective of the PARRISE TPD courses.

Cartography of controversies and Actor-Network theory

by Laurence Simmoneaux & Jean Simmoneaux
 solonic Nationale de Fromation Agronomique, France

The cartography of controversy approach is linked to the Actor-Network Theory (ANT) and is currently employed in the context of Science and Technology Studies (STS). The aim of STS education is to help students develop their understanding of how society and science are mutually dependent. Encouraging individuals to take a personal position is considered as a major challenge for STS education: “In traditional science instruction personal opinion is not involved and may be actively avoided. STS instruction, on the other hand, seeks out exchanges between students to help them arrive at personal positions that combine scientific knowledge with moral responsibility” (Solomon, 1981, p. 78 quoted by Ratcliffe, 2001).

French sociologists Michel Callon (1986; 1990) and Bruno Latour (1989; 2007) have developed the Actor-Network Theory (ANT) in Science and Technology Studies, as this theory is able to accommodate not just the technical and scientific aspects of an issue, but also allows space to explore the effect of the political, legal, moral, ethical and other issues that need to be considered (Latour, 2007).

In the Actor-Network Theory (ANT), the aim is to characterize the interactions between society and (techno) sciences and more specifically how “actants” (human and non-human actors in a network) interact in a given network to contribute to the success of an idea or an artifact. Furthermore, an actant is identified by its performative actions, - what it says, its influence or how it relates to other actants. Latour describes performative actions as both talk and action and because these relationships are both material and semiotic.

Venturini (2010) has used these ideas to propose a “Cartography of Controversy” approach, that is accompanied by didactic techniques that enable one to explore issues and visualize the role of actants in a techno-socioscientific debate. Cartography of controversy has become a research method thanks to the contributions of a large research and teaching community. A cartography of controversy can give pictorial representation to Socio-Scientific Issues / Socially Acute Questions (SI/SAQ) with the identification of the range of participants (human and non-human "actants") and their roles in the controversies. According to Venturini, “The economic inequties, the environmental crises, the bioethical conundrums and all the issues troubling modern societies are imbrigos of politics, ethics and technologies impossible to disentangle. In these hybrid situations, public participation becomes more and more difficult. To navigate in a world of uncertainties, future citizens need to be equipped with tools to explore and visualize the complexity of public debate. The purpose of mapping controversy is to contribute to the development of these tools through the creative use of digital technologies.”

[Controversy Mapping]

Building these cartographies of controversies can help students and teachers to unravel the issue, to understand its complexity, to identify the nodes of controversy, interests, alliances and oppositions between actants. This method has been used in France in teacher training as well as at the secondary and tertiary level.

Mapping the controversy activity in Israel

by Anat Yarden, Rachel Cohen & Eran Zafrani
Weizmann Institute, Israel

Teachers in Israel participated in a Professional Development (PD) course which was conducted in the framework of the PARRISE project. The teachers, working in groups of 5-8, were involved in a “mapping the controversy” activity at one of their December 2015 sessions. Each group was asked to prepare a controversy map around a topic of their choice, according to instructions prepared using the information received from two PARRISE WP4 (Upper Secondary Education Teacher Professional Development in SSIBL) team partners: Gregoire Molinatti (France) and Christine Heidinger (Austria).

The teachers were briefly introduced to several worldwide challenges, such as hunger in the third world and the possibility to spread the idea of using Spirulina as a solution, a project that is running for several years in the Gimazia Herzelia high school in Tel-Aviv. One of the activities that took place in the PD asked teachers to reason about how Social Science Issues can be characterized and how the controversies involved can be mapped. In the course of the activity teachers were asked to choose a controversial topic, identify the social public agenda actors and their interrelationships.

The controversy map was prepared by five high school biology and environmental sciences teachers from different schools in Israel. The teachers spontaneously raised social issues and analyzed them. One of the groups raised the issue of immunization, which is on a public debate in Israel in the recent years. This teachers’ map, shown in its original form in Hebrew and also translated in English, addresses the problem of vaccination (or unwillingness of certain parts of the population to get vaccinated) and its impact on the population.

For instance, in the case of PARRISE TPD courses at the Weizmann Institute, the group of teachers who participated in the TPD courses was divided to four sub-groups and each sub-group was asked to prepare a controversy map around a topic of their choice. This TPD activity was organized and conducted according to instructions and information we received from two WP4 team partners: Gregoire Molinatti and Christine Heidinger, who have also employed the same cartography process as part of their TPD courses. An exemplary concept map derived from a subgroup of teachers, who participated at the PARRISE TPD courses at the Weizmann Institute appears in Figure 6.

Figure 6. Controversy map developed by a group of teachers participating in the PARRISE TPD courses at the Weizmann Institute of Science (first image: controversy map translated in English, second image: Hebrew version)
The 11th Conference of the European Science Education Research Association (ESERA2015) took place in Helsinki, Finland between August 31 to September 4, 2015. The ESERA bi-annual conference serves as an important milestone in the European science education community, providing science educators and science education researchers with the opportunity to present their work and learn from science education efforts around Europe.

PARRISE had a strong presence at the conference, as the partners had organized two symposia. Moreover, it was represented in the European projects poster session, which was intended to serve as a communication platform for information exchange and networking.

The first symposium entitled “Towards socio-scientific inquiry-based learning in teacher education - Experiences from across Europe” was organized and chaired by the coordinator of the PARRISE project, Dr. Christine Knippels (Utrecht University). The discussant of the symposium was Dr. Isabel Martins from the Federal University of Rio de Janeiro, who is a member of the PARRISE external advisory board. The symposium focused on the experiences of four PARRISE partners (UCL Institute of Education, Radboud University, University of Montpellier, University of Porto) with the SSIBL pedagogical framework (see Figures 7-8).

The second symposium was titled “Citizenship, Inquiry and Responsibility in socio-scientific issues: An analysis of national curricula” and was organized and chaired by Dr. Eleni A. Kyza. Dr. Maria Evagorou (University of Nicosia), who is participating in the ENGAGE project, another EU-funded RRI effort, was the discussant of the session. The symposium focused on a cross-cultural analysis of national curricula in five of the PARRISE countries (Cyprus, Israel, Portugal, Spain, Sweden) in terms of the four SSIBL aspects (socio-scientific issues, scientific inquiry, active citizenship, responsible research and innovation) (see Figures 9-10). One important finding of this cross-cultural comparison is the lack of sufficient educational activities promoting active citizenship as well as responsible research and innovation in all of the countries involved. This finding highlights the importance of the PARRISE project and the necessity to introduce SSIBL-based educational activities to promote the goals of responsible research and innovation in Europe.
PARRISE presented at the Eminent conference

by Christine Knippels & Frans van Dam
Utrecht University, The Netherlands

The PARRISE project was presented in a plenary session and a stand at the recent Eminent conference in Barcelona, 19-20 November 2015 (see Figure 11). This Experts Meeting on “Science, Technology, Engineering and Mathematics in Education and Life” is organised annually by the European Schoolnet (EUN). Over 250 European experts in science education discussed the status of the Scientix project, EU policy-makers shared their plans and delegates could network at the exhibition stands.

Especially relevant from the perspective of PARRISE is the recent advisory report “Science Education for Responsible Citizenship”. This report to the European Commission was presented in Barcelona by one of its authors, Yves Beernaert. The advisory panel recommends that science is taught from primary school on and that science should also be linked to subjects and disciplines other than STEM. The report promotes to link science with arts and humanities into the dialogue. In addition, involving the social sciences “helps us understand what works, what doesn’t work and how to improve the quality of life for everyone.”

Furthermore, the advisory panel wants to enhance collaboration “between formal, non-formal and informal educational providers, enterprise, industry and civil society.” This is “to ensure relevant and meaningful engagement of all societal actors with science and increase uptake of science studies and science-based careers to improve employability and competitiveness.”

The authors point out “that greater attention should be given to promoting Responsible Research and Innovation; and to enhance the quality of teaching, from induction through pre-service preparation and in-service professional development”, the core approach integrated in the PARRISE project.

Presentation of PARRISE in Austria

by Franz Rauch & Diana Radmann
Klagenfurt University, Austria

The Austrian PARRISE group has devoted much time and effort for disseminating the PARRISE project in Austria. What follows below is a short list of the last Austrian dissemination actions:

♦ PARRISE was presented with an article in the newsletter of the IFF-Faculty (Faculty for Interdisciplinary Studies of the Alpen-Adria-Universität Klagenfurt) published in June 2015.
♦ At the INSTEM “Conference on innovation and dissemination in math / science education” on 17-18 June, 2015 in Freiburg, Mira Dulle from our institute promoted the PARRISE project. About 70 people representing different EU, IBSE projects attended the conference.
♦ On 18 July, 2015 a press release about PARRISE was published in the Carinthian daily newspaper “Kleine Zeitung”.
♦ The forum “Environmental Education” organized a seminar titled “Building the environment together—Together for the world of tomorrow!” (see Figure 12). Project teams from various European countries presented their activities and results. Participants were in- and preservice teachers as well as other stakeholders in environmental education for sustainability.
♦ PARRISE was presented by Franz Rauch at the conference of the “Koordination Nordverbund” organized by the Centre of Teacher Training and Interdisciplinary Education Research (Zentrum für LehrerInnenbildung und interdisziplinäre Bildungsforschung) of the University of Augsburg, which took part between 1-2 October 2015 in Halle an der Saale (Germany).
♦ Franz Rauch presented the progress of the PARRISE-project at the IMST-Networking Meeting, which took part from 22-23 October 2015 in Leibnitz. About 30 participants of regional IMST-networks and regional Didactic Centres attended the event.
♦ Franz Rauch was invited as a keynote speaker at the Conference on “Science Education and Green Chemistry for a Sustainable Future” at the Academic Arab College for Education in Israel, Haifa from 1-4 December, 2015. His presentation covered also the PARRISE project.
A workshop entitled “Paint lights and shadows on science”, was recently conducted by partners of the PARRISE project, from the University of Jaén in Spain. The workshop and a stand were part of the pan-European “Researcher’s night”, in a big open area in Jaén in September 2015.

The main goal of the workshop was to raise public awareness about the benefits and risks of scientific development, and the need to promote Responsible Research and Innovation. For this purpose, children aged 4-16 were invited to reflect on good and not so good things derived from science and its applications (see Figures 13-14). They were, then, encouraged to make drawings expressing their views and to participate in the competition “Paint lights and shadows on science”.

Most children came to the workshop with their parents, who thus became a target group for the dissemination of those ideas. Parents, grandparents and other relatives visiting the stand had the chance to have a look at the posters and brochures of the PARRISE project. Along with flyers and posters, provoking questions aimed at raising awareness about the benefits and risks of scientific development were also printed in big letters on the walls of the stand. These prompts encouraged visitors to raise further questions about the objectives of the PARRISE project. Generally, visitors did not seem to be very familiar with the term “Responsible Research and Innovation” (RRI) and often asked for further clarification about the term. This fact stimulated conversations about who should make decisions on research, as well as the need to better align the products and processes of science with the needs, values and expectations of society. As a result, the concepts of “science for” and “science with” society were coupled with research and innovation with responsibility.

The event provided opportunities to discuss how to enable people to make informed decisions on socio-scientific issues and how to prepare them to actively contribute to RRI. In this respect, the role of science education became evident to properly equip future citizens to face current scientific and societal challenges.

Along with the opportunity to disseminate the PARRISE project and to raise general awareness of the need to ensure RRI, the drawing activity offered an interesting insight into the views of children and youth on these issues. Environmental problems such as air and water pollution, energy sources, the decrease of green areas and the over-exploitation of natural resources were the most popular topics present in the children’s drawings. Other drawings showed concerns about drug consumption, weapons and the distribution and use of some scientific applications, such as those derived from medicine and technology.

Although most of the children’s contributions seemed to be straightforward and very easy to interpret, the PARRISE partners sometimes felt the need to ask children for further explanations about their drawings. This was the case with an eight-year old girl, who placed mobile phones and tablets in the “dark side” of science. When she was asked to explain why, she argued that these devices prevent children from playing with each other. The children’s drawing revealed the complex interplay of social, scientific and ethical aspects, offering a meaningful and illustrative view into children’s thinking.

In summary, more than 150 people visited the stand and over 80 children took part in the drawing competition entitled “Paint lights and shadows on science”. The analysis of the drawings made by children, as well as conversations with parents and other relatives, indicated that this activity can be a powerful way to raise awareness about the role of science education to prepare future citizens for RRI.  

**Figure 13.** Children taking part in the workshop entitled “Paint lights and shadows on science” at the Researchers’ Night in Spain

**Figure 14.** Some of the participants (children with their parents) at the workshop entitled “Paint lights and shadows on science” at the Researchers’ Night stand by the University of Jaén (Spain)
Teaching physics innovately

by Mártá Jávor & Andrea Kárpáti
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An international conference was organized at the end of the summer in Budapest about how to teach physics innovatively in secondary education. Nowadays physics is not the most popular subject in high school—a fact that makes discussions about how to best teach physics more important. At the conference, teachers from several countries shared their ideas about the modernization of physics education.

The highlight of this conference was the presentation of environmental and socially sensitive issues, and innovative teaching methods using the most recent IT technology in formal and informal learning environment, such as science centres, museums and research sites. Contributions were organized around themes with direct relevance to socially sensitive issues in science education and recent findings from physics education research. The SSIBL Framework was introduced in a plenary presentation and discussed in paper sessions. A roundtable discussion on socially sensitive issues, e.g. on nuclear energy, and a visit to the Paks Nuclear Power Plant was also used to highlight the importance of a SSIBL approach to science education.

The exchange of ideas during the conference by 101 participants from 18 countries was inspired by invited speakers, who included well-known researchers. Marisa Michelini, President of GIREP (International Research Group on Physics Teaching) was the first speaker about how to develop modern physics’ thinking in secondary schools. Hannu Salmi, from the University of Helsinki, a member of the PARRISE External Advisory Board, presented relationships between formal education and informal learning via science centres. Ulrike Feudel, professor of theoretical physics of the Institute for Chemistry and Biology of the Marine Environment in Oldenburg gave insights into introducing students to complex systems in nature and their socio-environmental consequences.

Witty experiments by Miha Kos, the founder director of House of Experiments in Ljubljana, Slovenia showed how “doubtology” helps you avoid misconceptions when illusions trick you common sense. David Featonby from the UK, physics teacher and ambassador of “Science on Stage Europe”, presented the Science on Stage international network of innovative and socially targeted science education and its biennial festival, which will next take place in Debrecen, Hungary in 2017. Zoltán Néda, a Hungarian professor of the University of Cluj-Napoca, and external member of the Hungarian Academy of Sciences, demonstrated how light and kinematics experiments lead students to a deeper understanding of the basics of the theory of relativity, as part of the celebrations of the “International Year of Light” in 2015.

Participants enjoyed an exciting lecture by György Szabó, researcher of the Wigner Research Centre for Physics in Budapest, about game theory and its applications to the understanding of social and scientific phenomena. Miklós Vince, a member of the von Karman Laboratory of Environmental Flows at Eötvös University, demonstrated that fluid dynamical experiments can faithfully model phenomena, even phenomena related to climate change. The researchers of the Institute for Nuclear Research at Debrecen developed an entertaining adventure game which can help students to understand nuclear systems and processes. Zsolt Fülöp, the director of the Institute, showed participating teachers how to use this game for developing a firm knowledge base as well as sensitizing students about social issues around the use of nuclear energy. In connection with this crucially important issue for the Hungarian society, Attila Aszódi, professor at the University of Technology and Economics in Budapest, discussed the scientific, economic and social issues of the enlargement of the Nuclear Power Plant in the town of Paks, also explaining the problems regarding its public acceptance.

In the conference sessions, speakers presented their favourite educational project in nine areas. There were several content areas that have not yet been included in the actual curriculum of physics, however their social and scientific relevance would make an inclusion justifiable. We had 60 contributing speakers, and most of them were high school teachers of physics. Many of the Hungarians among them have learnt about the SSIBL Framework during a course offered by the doctoral programme on Physics Education at Eötvös University.

The conference reached its pinnacle at the round-table discussion about nuclear energy use, a socially sensitive issue in Hungary that has to be reflected in science education (see Figure 15). An excursion to the town of Paks, where participants visited the Training Centre of the Nuclear Power Plant, completed this debate and showed how teaching Physics is relevant for shaping public opinion through providing authentic scientific information.

Figure 15. Round-table discussion, participants (from left to right): Hannu Salmi (University of Helsinki, Finland), Zsolt Fülöp (Institute for Nuclear Research, Debrecen, Hungary), Attila Aszódi (University of Technology and Economics, Budapest), David Featonby (Science on Stage Europe, United Kingdom), László Egyed (moderator of the discussion)
New local websites

Do you know that some PARRISE partners have launched a local PARRISE website for announcements regarding their own TPD community?

Cyprus University of Technology, Cyprus

University of Jaén, Spain

Figure 16. You can now visit the local website (in Greek) to find out more!

Figure 17. You can now visit the Spanish local website to find out more!
PARRISE NEWSLETTER

PARRISE - Promoting Attainment of Responsible Research & Innovation in Science Education

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