JUNIOR SCIENCE CAFE (JSC) "Learning Science through Social Events" - Guidelines

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This document is a revised edition of the JSC-Guidelines adaptation document by P. S. which was based upon the fundamental aspects of the Sci-Café project (http://scicafe.eu/). The present revision compiles the description of the Junior Science Café Guidelines according to the project's Pedagogical Framework and the "Inquiry Based Science Education" structure which was introduced in D2.3. The development of this attempt, in terms of phase-structured steps that comply with the IBSE model, was finalized at the 2nd Creat-IT Consortium meeting in Serbia.

These Guidelines are combined with the Implementation scenarios for the Junior Science Café case study that are already available through the project portal (please consult chapter 6 of this document).

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1. Introduction to the Junior Science Café practice

In this section the Science Café concept is been described as a Junior Science Café case study complying with the Creat-IT pedagogical framework.

1.1 What is a Science Café

Running through the history of the exploration of science, one can easily notice that forming reasonable questions and the effort to answer them was from antiquity quite a popular method of exploring philosophical and scientific issues. The communication of this productive process was either real, by existent live individuals, or fictional, by imaginary heroes. Conversations in dialogical format help participants, or readers, to identify themselves with the characters that make answers or with the ones who make the questions, thus accelerating the process of disseminating knowledge to a personal level. Two typical examples of this approach are the works of Plato, in dialogical form, reflecting the debate as a means of teaching in the ancient schools of Athens, and the dialogues of Galileo.

In modern times, as science increasingly specializes in various fields, the need for further dissemination and popularization of scientific ideas is imperative. The contribution of several names in the course of organizing public debates was varied. Public gatherings in places where everyone could exchange ideas, took the character of special events. Such an urban space in Europe, until the romantic times, was the 'thematic' café. In the modern form of the so called "science café", began to acquire structure and features given by people who had the initiative to organize public events with widespread social impact.

In terms of Science Cafes per se, there are many different practices. When project Scicafe started, in 2011, many different practices named "Science Cafe" existed. To say who invented the Science Café format is very difficult. It seems that fist science cafes in its temporary form appeared in France and in the United Kingdom around the1990's.

We can not forget the contribution of Duncan Dallas or the earlier "Café Philosophique" of Mark Sautet whose practices remain a model for subsequent efforts.

In its broadest sense, a Science Café is a meeting between scientists and an audience of non-experts, held in a non-academic place in an informal setting (Belmonte & Castellani, 2012). Science Cafés are a model of scientific communication that satisfies a number of requirements delineated in recent years in relation to enhancing the motivation of pupils to study science and to stimulate their participation in scientific debate. It was noted that a crucial requirement for a

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good science education is that science is not presented as knowledge true once and for all, but as a set of alternatives that may be in conflict.

Overall, the Science Café format has spread across the globe in a grassroots way, adapting to different cultures and audiences. One of the goals of the Scicafe project was to create the network of science cafes in the word. This allowed a comparison of the practices.

Despite this diversity, three shared values are reflected in every Science Café:

• it occurs in a meeting place creating a welcoming and comfortable atmosphere,

• it is open to everyone and particularly people who do not usually engage in discussions about sciences,

• it is run on the principles of free speech, listening to and respecting other's opinion. Everyone in the audience who has something to say can contribute to the debate.

As a conclusion a "Science Cafe" is a public debate among experts and public which is conducted by adults. A Science Café is a public event.

1.2 What is a Junior Science Café

A Junior Science Cafe (JSC) is generally a Science Cafe where the public are pupils. It is a social debate prepared organized and conducted entirely by pupils assisted by their teachers. Pupils benefit by taking active participation on the development and creation of a Science Café final event according to its principles presented in this document. A Junior Science Café meeting is a public event related to the named case study itself and normally it can be organized independently as such. A JSC though could also be supported by a small-scale event related to the other two case studies of the Creat-IT project (WASO & Science Theatre TS). As an alternative, a JSC could support the other two case studies as an "after event" discussion/debate (please consult WASO & ST case studies).

Usually the expression "Junior Science Café" means a Science Café dedicated to pupils from 11 to 18, with the older end of the age group felt to benefit the most from the process; where the audience/public are pupils.

The Junior Science Café as a case study within the CREAT-IT project approaches the relation between the practices as described above with the Inquiry Based Science Education model.

2. A Junior Science Café described as a case study within

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the Creat-IT project

JSC is one of the three case studies within the CREAT-IT project. All of the project's case studies comply with the Inquiry Based Science Education (IBSE) model and the Pedagogical Framework as described in D2.1 and D2.3.

The JSC case study within the Creati-IT project is also focused on a number of the Creat-IT pedagogical principles. The Creat-IT pedagogical principles as described by UoE are as follows:

1) Individual, collaborative and communal activities for change ,2) Risk, immersion and play, 3) Interrelationship of different ways of thinking and knowing, 4) Dialogue, 5) Discipline knowledge, 6) Possibilities, 7) Ethics and trusteeship, 8) Empowerment and agency

The IBSE model can be described as a 5-phase implementation model as follows: Phase 1: Question Eliciting, Phase 2: Active Investigation, Phase 3: Creation, Phase 4: Discussion and Phase 5: Reflection.

2.1 Which are the principles that JSC case study is mainly focusing?

When analysed in relation to the CREAT-IT Pedagogical Principles, six of the principles immediately stand out: Empowerment and Agency, Relationship between Bottom Up and Top Down, Risk/Immersion and Play, Discipline Knowledge, and Ethics and Trusteeship.

During the preparation of a Science Café teachers are like pupils because they have to check expert information on the internet. Skillfully evaluating what is reliable information on the internet is an open problem for every citizen. Nobody could say that they have learned once for all, because the information available on the internet is constantly evolving. There is a huge diversity of sources and complexity for relative non-specialists in evaluating the credibility of those sources. In navigating this knowledge teachers therefore constantly have to use their own knowledge and intuition to seek reliable information. Moreover if teachers want to organize a JSC with the pupils, the theme of the Science Café will often be chosen by pupils, so the teachers cannot know in advance what they might need to find on the internet. This also then relates to the CREAT-IT Pedagogical Principle of Empowerment and Agency (8) as decisions are placed in the hands of the young people giving them agency over the content and the direction it might go in. The participants (pupils, teachers and tutors) act in a less hierarchical and more equal environment where re-positioning and listening-actions are possible (linking further to one of the background Exeter theories of Living Dialogic Space, Chappell & Craft, 2011 which emphasizes exactly this re-positioning and listening-actioning). Related to this is the CREAT-IT

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Pedagogical Principle of Relationship between Bottom Up and Top Down (6). The JSC process acknowledges the importance of letting ideas, knowledge and practices that emerge via the pupils questions and ideas from the 'bottom up', lead science education rather than always being dominated by 'top-down' knowledge from scientists. JSC finds a way to balance these by using pupils questions as a starting point and then allowing them to bring in existing relevant scientific knowledge via their internet research and the Science Cafe itself.

The risks (Risk, Immersion and Play – 3) associated with this for both teachers and pupils are clear; it is a real undertaking with a real scientist. A risk for teachers is that the pupils are often more able than them to use social networks but have insufficient knowledge and experience to discriminate between relevant and irrelevant information. This discrimination is related to Professional Wisdom, to the knowledge of the process of science, especially the methods of validation and the peer review system. For example teachers might work with pupils to develop understanding of what makes an article reliable (helping them to ask questions such as, 'Is there a description of the experiments?' 'Is the statistics base referred to?' 'Is there a bibliography? What kind of references are used [articles from specialized peer-reviewed journals or simply scientists' opinions]?).

The connection to the CREAT-IT Pedagogical Principle of Discipline Knowledge (8) then becomes apparent. Not only are pupils dealing with the discipline knowledge of scientific facts – the 'what' of science - but they are also coming to understand experimental reliability and validity criteria; something of the 'how' of science. While a connection can also be made to the CREAT-IT Pedagogical Principle of Different Ways of Knowing (3) here, in that the JSC process includes both 'knowledge that' and 'knowledge how', it is less apparent that the process includes the more aesthetically focused 'knowing this' (Reid, 1981), as the arts are not so strongly fore-grounded in this case study as they are in the other two. Nevertheless it could be argued that the interaction with the scientist brings an element of the embodied notion of 'knowing this'.

The interaction with public debate and more culturally-based questions does however fully bring in the principle of Ethics and Trusteeship (7) as it engages adults and pupils alike in considering the ethics of science regarding what matters to them as a community.

The presence of other CREAT-IT Pedagogical Principles becomes apparent within JSC as the deeper process of the JSC Science Café is explained below:

Firstly, young people must choose a scientific topic, starting from their interests (Empowerment and Agency – 8). They decide what are the interesting questions and possible subtopics to be developed in particular. At this stage, they have the opportunity to study and deepen the topic

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chosen, calling into question their more or less naive ideas. This connects especially to the CREAT-IT Pedagogical Principle of Possibilities (6) which emphasizes the importance of space for multiple possibilities within science education and knowing when it is appropriate to broaden these ie within the main topic area or narrow them within sub-topic areas (also connecting to the background Exeter theory of Possibility Thinking, REF, which emphasizes the importance of being able to shift from 'what is' to 'what might be').

Viewing 'materials' here in its broadest possible sense in that one of the core 'materials' for JSC is the virtual environment and knowledge manifestation on the web. This lends the project a very particular character in terms of its form and content, in the same way that a different 'material' for knowledge exploration (e.g. dancing bodies) would lend different nuances to that knowledge exploration. How the internet is used as part of junior science café is key. The pupils have to organize a Science Cafè, so they have to develop interesting question around the chosen theme and to find the expert to answer their question in the public event, which is the final real Science Café.

During the training pupils develop the ability to find and check technical information on the internet. They learn to read scientific material via the web and gain the tools to discriminate material and scientific information and so they become more critical users of the internet. They ask and respond to questions such as 'Who is an expert on this particular scientific theme? In the experience of those facilitating JSC's, in the mind of the pupils, before the JSC training, teacher, journalist, researcher often seem indistinguishable. During the JSC they will discuss the differences and will decide that the most expert in relation to science knowledge is the researcher because he/she builds the scientific knowledge by him/her-self and so knows the results but also understands the procedures and limits of these results.

Then the pupils have to find an expert to invite. They have to visit University and Research Centre websites. In this way they learn where and how scientific knowledge is built. They have to discriminate who is really expert on the theme. In this way they develop the skill of discriminating who is reliable on the particular topic.

The pupils' selection of the expert relates to the above-detailed CREAT-IT Pedagogical Principles of Discipline Knowledge (5) and the Relationship between bottom up and top down production of knowledge.

After the identification of the speakers, the pupils organize a meeting with them in order to discuss how the Science Café will proceed. Before and after the meeting, the young people deepen the topic of the Science Café. In order to collect and share information and materials

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they choose and use digital tools (facebook group, blog, etc.). They also look for pieces of literature or film clips related to the theme to present during the final Science Café event. The group finalizes the organization of the Science Café; they choose the order of the questions and the connected materials. Then the group works on logistics and on promotion of the final Science Café event. They usually design and print promotional posters and cards. In the final event the speakers meet the public. The public is composed mainly of the pupils' peers, other teachers and parents but also the general public. The debate is coordinated by a facilitator, who is also a student (Empowerment and Agency – 8).

In every step the difference of opinion and the debate are crucial to developing knowledge and to driving the project. This resonates strongly with the CREAT-IT Pedagogical Principle of Dialogue (4). This principle emphasizes the importance of allowing for dialogues between people, disciplines, creativity and identity, and ideas. This dialogue allows for conflict and irreconcilable difference as well as negotiation and agreement. These facets of dialogue are alive and well within the JSC format which has debate at its heart and which allows conflict to take a prominent role where appropriate. The digital tools (facebook group, blog, etc) that support the debate are chosen by pupils to encourage and further these debates.

The participative context of organizing a science café has some powerful advantages. It allows pupils to:

- learn to share a collective project in an atmosphere of cooperation and collaboration,
- be aware of where and how scientific knowledge is produced
- learn to search for scientific information and connect different topics
- and also highlight the individuality and specific skills of everyone

Pupils are also invited to develop citizenship competences as they:

- find contacts with experts
- benefit from an interdisciplinary approach to a scientific subject
- make information useful and expendable inside and outside school
- contribute to an image of science as part of general culture
- understand the scientific stakes of today and tomorrow.

These shared values and advantages relate closely to the CREAT-IT Pedagogical Principles of Empowerment and Agency (8), Ethics and Trusteeship (7) and Individual, collaborative and

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communal activities for change (1). The latter has not yet been discussed but it seems very apparent in the JSC method as that approach allows for individual, collaborative and communal activities which can feed each other, especially with a student group forming around the creation of the Science Cafe. This offers a shared identity to that group within which participants can work, allowing for difference but with a shared creative process and purpose.

2.2 The Creat-IT planning templates

The framework for teaching Science using creative approaches has been described thoroughly in D2.3. The CREAT-IT planning template based on this framework consists of two parts in which a teacher may fill in details of his/her scenario. In the first part of the template, requirements and general details are given while in the second a detailed description of the procedure is described according to both the Inquiry Based Science Education model and the project's pedagogical framework.

Session 1 Planning: *Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.*				
IBSE Activity	**Potential arts activity**	**Student**	**Teacher**	**12 CREAT-IT Pedagogical Principles**
Phase 1: Question Eliciting	*Hot seating (Drama): pupils ask their questions to a designated "expert" in the field of every day materials. Pupils take it in turns to be the expert*	*Pupils think about questions they have regarding the properties of everyday materials*	*Provide pupils with the everyday objects to sort and classify*	*Highlight the relevant principles* *1. Professional wisdom* *2. Individual, collaborative and communal activities for change* *3. Risk, immersion and play* *4. Different ways of knowing* *5. Dialogue* *6. Relationship between 'bottom up' and 'top down'* *7. Interrelationship of different ways of thinking around a shared 'thread' or 'throughline'* *8. Discipline knowledge* *9. Possibilities* *10. Ethics and trusteeship* *11. Importance of materials* *12. Empowerment and agency*
Phase 2: Active Investigation		*Pupils plan how they will test the properties of the everyday materials*	*Support pupils by asking further questions to prompt thinking*	
Phase 3: Creation	*Pupils record their process using photographs, video, audio recordings. This material can then be used to enhance a dramatic scene*	*Pupils conduct an investigation to test the properties of everyday materials*	*Support pupils through questions, guidance and provision of resources*	
Phase 4: Discussion	*Prepare a drama that explains and interprets their results.* *Create dramatic scenarios that illustrate how reversible or non-reversible changes affect our lives and the environment.*	*Using the arts pupils prepare and present their results for discussion*	*Assess pupil's knowledge*	
Phase 5: Reflection	*Pupils evaluate their project and consider "how well did the drama process support their learning?"*	*How successful was their investigation. What would they change to improve the reliability of their results?*	*Assess pupils' understanding*	

Fig. 1 First part of the CREAT-IT planning template as described in D2.3

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Key role in the final structure of a CREAT-IT scenario are the IBSE phases as described above: Phase 1: Question Eliciting Activities/Exhibiting Curiosity, Phase 2: Active Investigation, Phase 3: Creation, Phase 4: Discussion, Phase 5: Reflection

The five phases of the IBSE model allow pupils and teachers to establish an engaging role with knowledge which in the case of CREAT-IT project, encourages a more energetic and performative action of both.

2.3 The Creat-IT IBSE concept and its relation to the JSC

Junior Science Café as an activity gives pupils the ability of understanding that the adventure of knowledge becomes a quest through a sequence of questions and answers, of gathering information and presenting the outcomes. Scientific knowledge becomes a valuable achievement when individuals are contributing to a task using communication, discussion and evaluation processes. Society embraces people in their tasks for acquiring knowledge and recognizes their achievement as a social acquis. By definition a JSC activity encourages all the above social approaches to their full while assuring that the the whole process keeps a direct reference to the school curriculum defined by the teacher.

In the second part of the template the organization of a Junior Science Café is explained in a more detailed way while a "step-like" procedure help teachers to describe, to be guided through and to communicate the sequence of events that lead to the final challenge.

At the following table, which was finalized at the project's 2nd meeting in Serbia, an eight-step JSC implementation sequence including introduction, organization, management and evaluation is presented as an IBSE activity.

Junior Science Café as an Inquiry Based Science Education activity	
IBSE phase	JSC steps
Question eliciting	**Step 1** Following the choice of curriculum based science education theme by the teacher, the teacher present a content (phenomenon, movie or other) that stimulates pupil-generated questions about the theme which links the interests of the student to the curriculum

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Active Investigation	**Step 2** choice of the experts 1. Teacher inquires about who is an expert. 2. Creation of criteria by the pupils based on ◦ curriculum thematic investigation related to the specific research interests. ◦ scientific excellence related to peer review system and the workings of scientific community 3. Internet based search of the experts' profiles 4. Discussion of the experts' profiles in light of the previous curriculum and scientific excellence criteria. **5.** Democratic choice (vote) of the experts' best-equipped to lead further investigation in the curriculum specific theme **Step 3** The pupils refine their questions according to the specific specialization of the experts to prepare an interview with the experts. **Step 4** The pupils meet with the experts, pose the refined questions. The experts help pupils bring their question into focus and help them to develop their questions further.
Creation	**Step 5** Preparation of science cafè. The pupils find and define links between the scientific topic at hand, literature, movie, art in general or other related content for introducing their questions during the events. **Step 6** Divide class into groups with various roles (moderator,…) The pupils should involve local community in their event.
Discussion	**Step 7** Science cafè: the event Discussion of the questions with experts and the local community
Reflection	**Step 8** Reflection after, follow-up

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3. How to organize and manage a JSC according to the CREAT-IT concept

This chapter of the Guidelines gives an analysis of the practice needed to be followed in order to produce a successful event. The following aspects are obligatory only in terms of their structure and their final spirit. Details of implementation that derive from the following approach should respect the fundamental characteristics of the case study described above.

An overview of the process for organizing a JSC can be summarized as follows:

Training activity for teachers (provided by CREAT-IT)	Resulting basic school project	Comments
• 1-day Professional Development workshops\seminars • Follow-up through the project's portal *Location of training: Schools/other (e.g. regional Professional Development course organizers)*	• 1-4 week school projects with pupils resulting to a final social event. • (School projects could be longer from several weeks even months[1]) *Location: Schools/Science Museum/Local Art or Public Institution*	• 1-3 teachers per school classroom project • Collaboration of science and art\music\dance\drama teachers is recommended • The CREAT-IT project's JSC Implementation Scenarios exemplify this training structure.

The preparation before the realization of the event is the most valuable part of the process. Pupils are guided to choose a topic from the school curriculum, the appropriate scientist or other guests to support their case and the venue. Pupils are also encouraged to prepare presentable content either of digital resources on the internet, the use of ICT applications, or their own work in the class.

For the final JSC event experts from different disciplines meet the public in an informal place, like a place for social gathering or similar, and discuss a common theme from different points of view. There can be other researchers (in the same or different disciplines), teachers, pupils, but

1 E.g. According to the Italian practice a JSC usually has a duration of 3 months, including 7 - 10 meetings for planning and preparation at school before the final Science Café event.

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also people employed in different areas, mainly (but not only) with degree. Each expert has no more than 15 minutes for introducing the theme from his/her own point of view and then there is a debate between the experts and the public. The public is encouraged to be heterogeneous and participates with questions but also by bringing other points of view. Everyone can participate, and there is no entrance fee. Its composition depends on the place where the event occurs. The event's suggested duration can be 2 hours (30 minutes of introduction by experts, 30 minutes of introduction by the pupils and one hours of debate).

A JSC event as a CREAT-IT activity is described thoroughly through the CREAT-IT Planning templates of D2.3 presented in chapter 2.2 of this document. In the following section 3.1 these templates are explained as a JSC activity. With these documents at hand teachers have two ways to implement a JSC case study activity: 1) by choosing an existing JSC scenario through the project's portal (please consult chapter 3.2) or 2) by making a JSC scenario of their own (please consult chapter 3.3).

3.1 Using CREAT-IT Planning templates for a JSC scenario

The following templates require the data needed to describe a JSC scenario in CREAT-IT. You may read the lines in cyan and follow the instructions. These two templates along with other supporting documents are found on the project's portal.

An explanation of the first part according to the JSC case study is given below:

Case Study Approach: Junior Science Cafe	
Science unit topic *Here you may enter the title of the Science Topic that the JSC is about* **Class information** **Year Group:** *Here you may enter the Grade of your class* **Age range:** *The pupils' age range* **Sex:** *mixed* **Ability:** *mixed*	**Materials and Resources** *What do you need? Selection of everyday objects* *Where will the learning take place? On site or off site? In several spaces? (e.g. science laboratory, drama space etc.), or one? Here you may specify the learning place and the place of the final JSC event.* *Health and Safety implications? Here you may specify any special material that may be needed and any safety implications (e.g. chemical experiment or outdoor activity)* *Technology? Here you may specify any technology needed.* *Teacher support? (e.g. team teaching with arts and science expertise) Here you may specify any human-resources support needed to accomplish the tasks of this scenario.*

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Prior knowledge
Pupils were taught: *Here you may explain details about subjects of the curriculum required to be taught prior to the implementation of this scenario.* *(e.g. To compare and group materials together, according to whether they are solids, liquids or gases/To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius/To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature)*
Individual session project objectives *(What do you want pupils to know and understand by the end of the lesson?)* *Please give an overall description of the steps (sessions) needed to be followed in order for this scenario to be accomplished. You may also give an overall description of the relation between the described steps and the curriculum (please consult the following template).*

Assessment	Differentiation	Key Concepts and Terminolgy
How will you assess the pupils' understanding? *How will you record this?*	*How can the activities be adapted to the needs of individual pupils?*	*Properties Hardness Solubility Transparency Conductivity Dissolve*

An explanation of the second part of the JSC scenario planning template is given below.

IBSE Activity	Potential Arts Activity	Pupils	IBSE Questions for pupils	Possible Use of Social Media	Teacher

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Question Eliciting Activities/ Exhibiting Curiosity (step 1)	Define the JSC Title that derives from the current knowledge about a scientific Question	Pupils think about questions they have regarding the scientific theme	What would you like to know about…? What would you like to find out about…? How do you think this certain kind of phenomena is happening? How do you think this certain topic affects our everyday life?	Pupils use the school's blog to pose questions. Pupils pose questions on Twitter for feedback. https://twitter.com/	Begin cooperation with artists or the music/fine arts/drama/dance teacher at your school in order to generate ideas. Discuss with your pupils the idea of creating a multi-disciplinary performance designed and inspired by a scientific theme.
Active Investigation (steps 2-4)	Pupils are introduced in the idea of searching for an expert. Pupils form a list of questions and finally they meet the experts	Pupils plan how they will negotiate the scientific inquiry theme and its resources. They plan the use of internet resources, the curriculums of scientists, the history of scientists, topics and achievements.	What do you want to find out? Can you invent…? What approach would you use to…? What kind of experiment or observation might work best for your investigation? How does an expert record the results? Can we do the same? What does an expert conduct an experiment? What does he expect? How can we conduct an experiment on our own? What do you observe? What can you see? What do you expect	Pupils split in groups and take assignments Pupils collaborate their planning using Glogster: http://edu.glogster.com/?ref=com Pupils document their investigation with video and photos to share on websites to open up further debate and feedback, they utilize these comments in	Support pupils by asking further questions to prompt thinking. Support pupils by facilitating their investigation by providing access to the world of Science (Science institutes representatives, Scientists in local or National laboratories, distinguished Professors or University teams)

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			to see? Why do you think this is happening…? How would you explain…? How is… related to…? What examples can you find to…? How would you organize… to answer…? What is expected/ unexpected? Can you think of a different /interesting way to answer your question?	their reflection	
Creation (steps 5-6)	Main task for a JSC activity is the preparation of the event. Art can be directly or indirectly related to the topic. Any links between artistic expression and the scientific topic (literature, movie, music, art in general) found by the pupils or the experts, is	Pupils classify their investigation in topics and content. They evaluate its essence for the creation of their final debate. Pupils with the help of their teacher organize rehearsals at the JSC venue.	What is the main scientific question and how can we simplify it in order to make it comprehensible and engaging to someone who doesn't know anything about it? How can we make people interested about the subject? How are we going to present our work? How are we going to conduct the debate? How can you explain and interpret the results?	Pupils keep tracking their work through an online calendar.	Teacher provides the collaboration of other teachers within the school or distant if possible. Other classes may contribute in taking up tasks for the preparation of content or further support. Support and guidance for logistics and venue. Continuous guidance and overview of process

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	encouraged. Rehearsals are encouraged and organized.		What is the relationship between…? Would it be better if…? What information would you use to support your view? What remains unclear?		
Discussion (step 7)	During the actual JSC event pupils present any activity prepared in the previous steps.	Pupils conduct the event prepared according to the rehearsals	How can we collect every possible valuable aspect of the vent? How can we keep track of all opinions? How can we gather all results from the debate?	Share video of discussion on Youtube to open up further discussion within the community. Conduct the discussion with video / audio conferencing . Post images of the work taken on Instagram. Twitter for comment. Present results online using Prezzie or Glogster.	Teachers participate and facilitate the final event. Assess pupil knowledge
Reflection (step 8)	Any artistic engagement during the event may contribute to	Pupils go through the digital content gathered from the event.	How does the result relate to your original idea / prediction?	Pupils write a blog post sharing their reflection with others	Upload results (recordings, assessment) to the CREAT-IT portal

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	the results of the event. Artistic involvement is encouraged also during the presentation of the final results in the web.	Pupils evaluate all data and prepare them to be presented online	Do you agree with the outcome / result…why? How would you adapt… to create a different result? Can you formulate a theory as why this happened? Has your thinking changed? What new question could you ask?	in the community for feedback and further debate. Pupils prepare an online self-refection presentation using Prezzie, Glogster, Scoopit.	(http://portal.creatit-portal.eu)

3.2 Follow an existing JSC scenario

Implementation Scenarios written by members of the CREAT-IT consortium especially for the Junior Science Café case study are now available as a startup. Teachers may use project's platform in order to navigate into the appropriate folder and download the document. An Implementation Scenario written by the consortium consists of an introduction, the rationale of implementation, its relation with the pedagogical framework, the two implementation templates, an evaluation/additional information paragraph and references.

Start-up Implementation scenarios may be found in all languages of the consortium. This may benefit teachers to use this facility in order to develop synergies with classrooms outside their country.

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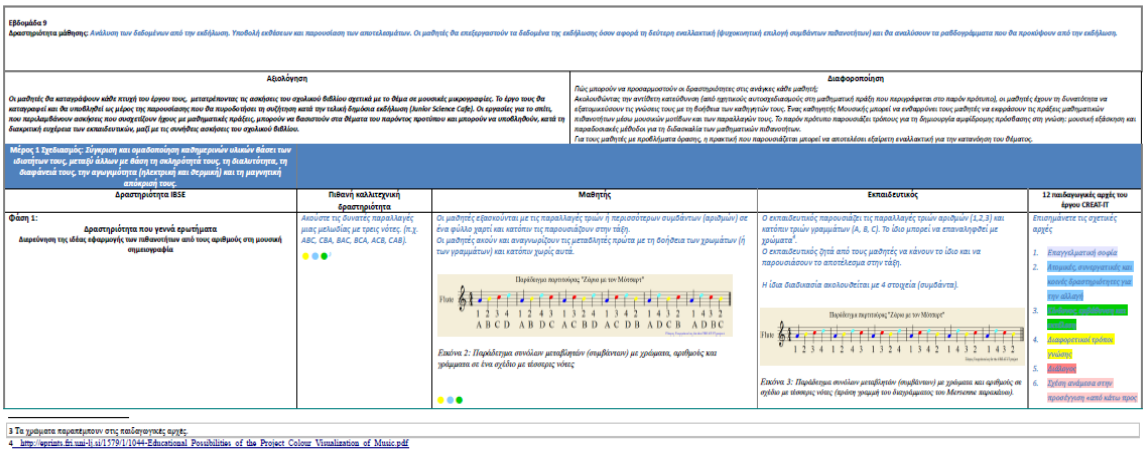
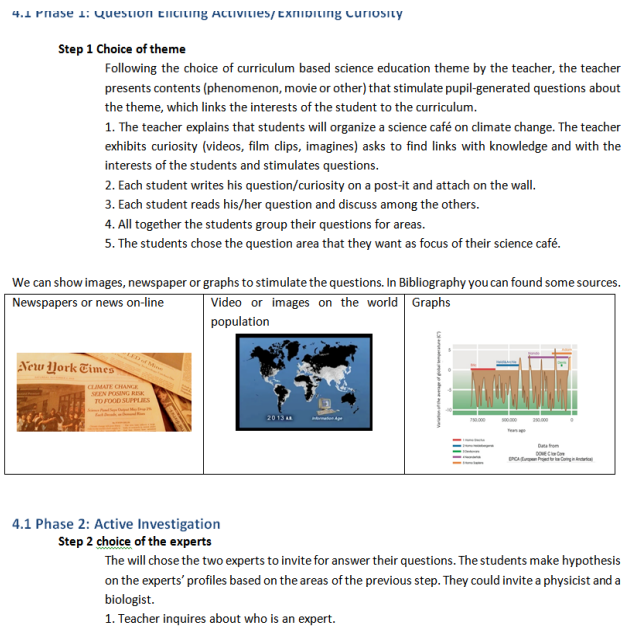


Fig. 2 JSC implementation scenario in Music & Math (Greek version)



4.1 Phase 1: Question Eliciting Activities/Exhibiting Curiosity

Step 1 Choice of theme

Following the choice of curriculum based science education theme by the teacher, the teacher presents contents (phenomenon, movie or other) that stimulate pupil-generated questions about the theme, which links the interests of the student to the curriculum.

1. The teacher explains that students will organize a science café on climate change. The teacher exhibits curiosity (videos, film clips, imagines) asks to find links with knowledge and with the interests of the students and stimulates questions.
2. Each student writes his question/curiosity on a post-it and attach on the wall.
3. Each student reads his/her question and discuss among the others.
4. All together the students group their questions for areas.
5. The students chose the question area that they want as focus of their science café.

We can show images, newspaper or graphs to stimulate the questions. In Bibliography you can found some sources.

Newspapers or news on-line	Video or images on the world population	Graphs

4.1 Phase 2: Active Investigation

Step 2 choice of the experts

The will chose the two experts to invite for answer their questions. The students make hypothesis on the experts' profiles based on the areas of the previous step. They could invite a physicist and a biologist.

1. Teacher inquires about who is an expert.

Fig. 3 JSC Implementation scenario in Climate Change

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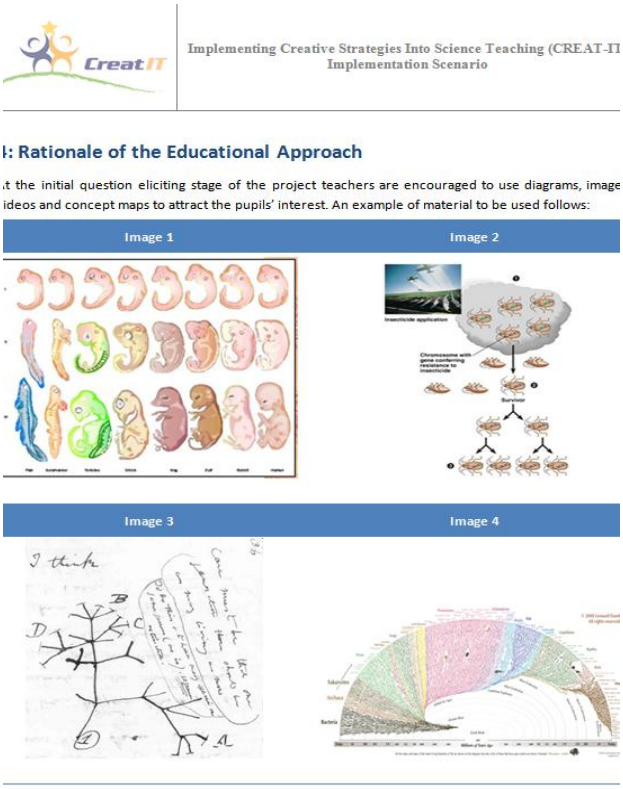

Fig. 4 Implementation scenario in Evolution

3.3 Make a JSC scenario of your own

Fulfilling the final task of the project which is to help teachers adapt the project's goals to their own needs, the CREAT-IT platform offers tools for developing new and innovative scenarios referring to each case study. These tools may help teachers shape up and write down their own vision for creating a JSC scenario that will fully support their needs according to their classroom (please consult section 3.1 of this document). Except from the authoring tool teachers may take in account some fundamental tips for organizing and conducting a successful JSC event.

3.3.1: Inspiring curiosity

Teacher initiates the idea of organizing a JSC taking in account the educational needs of the school curriculum that will define the main steps of the process. Teacher starts to stimulate the

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curiosity of the pupils with questions about physical phenomena, nature, the human body and behavior, or everyday-habits (step 1 of the above table). Pupils deepen further on the subject defining the subtopics with the help of their teacher. Teacher asks questions about the topic and its relation to perceptions in everyday-life.

3.3.2: Presenting the idea of the case study to the pupils

Teacher starts initiating the idea of presenting the opinions gathered in whole class discussion along with the scientific evidence supporting them to the public. Teacher will try to stimulate pupils' interest in presenting their own preparation and work about the subject in a public event, inviting scientists and any other stakeholder to support them. The teacher may present the idea of having groups of pupils divided in order to fulfill diverse tasks according to the "pupils's activity" described in the scenario. The whole class may have the opportunity to take part in the final presentation and no one will be excluded.

3.4 Conducting a JSC scenario

This chapter refers to the actual work needed for managing a JSC scenario.

i. Choice of the theme according to the class curriculum.
ii. Choice of speakers. Pupils choose the panel participants from the field of Science and the Arts.
iii. Preparation of meeting with the panelists. In this step pupils meet with the members of the panel discussing the outline of the final event.
iv. Preparation and scheduling of the science café. Pupils assisted by their teacher prepare logistics and the proceedings of the event.
v. Final organization. The final event takes place in public as planned. The open presentation and discussion is conducted by one student as presenter or a team of pupils having the role of presenters in sequence.

3.4.1: Choosing a Creative Subject: The core of a "Creat-IT JSC"

Respecting the curriculum and through a whole class discussion, teacher will define the theme according to the educational needs. All ideas can be collected by means of various modes of expression (audio recording, photo-montage, writing, drawing...). Then, all subjects are presented, classified and organized into a hierarchy under a synthetic shape. Divide the pupils into groups and invite them to give their main personal representations, reflections and questioning they have about one on many subjects in the list that they find interesting. Invite

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them to collaborate in order to ask the 'deeper' aspects of knowledge defining a subject (e.g. the relation of images with colors and waves, the interaction of humans with the material world, the microkosmos or the universe, the sound as a way of communication, the environment and the use of technology). Pupils may use the internet to collect information, audiovisual media or texts and then discuss with each other about way that all this information can be presented. On a second stage teacher discusses the issues with the groups individually or in whole class seeking for the relation of the subjects with a creative aspect of everyday life. A good idea would be the integration of a small scale live experiment that can be performed during the final event or a live representation of an example that can be reproduced or presented in front of an audience.

3.4.2: Choice of speakers

Depending on each local culture and the reach that the subject might have, organizers usually invite between one and five speakers at the café.

3.4.2.1: According to the subject...

Ask the pupils to search what kind of speakers they should invite to make the café interesting, in order to choose how many of them they want to invite. These guests can be sociological, political, historical, economical, but also psychological or philosophical specialists. One of the guests should also come from the world of creativity that is from the Arts (Visual or Performance). This phase is crucial, and the duration strongly depends on how pupils made their autonomous search. In some groups, more time should be necessary to analyze and discuss the information collected by pupils.

3.4.2.2: According to their expertise…

The choice of the speakers is based on the following criteria:

- Expertise on the chosen theme: the expertise of speakers must match those needed to address the chosen theme,
- Professional excellence: speakers to be invited should be the best in the field in which they operate,
- Experience in communication: they must have some past experience of communication to an audience of non-specialists.

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Concerning the evaluation of the curricula vitae gathered during the preparation, pupils with the help of their teachers should also take in account the following criteria:

- topics of scientific publications,
- number and type of scientific publications,
- relationship between age, number of publications and academic status of the researcher,
- specific skills of the researcher

The procedure is finalized by the pupils vote.

3.4.3: Preliminary meeting with the speakers

A meeting with the guest before the science cafe event is needed in order to fix with them the scheduling of the event. The pupils meet the speakers and realize how they deal with the topic, what are their strengths and weaknesses. All this will take into account when choosing in the preparation of the science cafe. The preliminary meeting with the guests is a very important moment since seeing people at work helps removing typical stereotypes about them. The preliminary meeting with the speakers can take place with every guest, each one separately, in their workplaces or at school. The first solution is preferable because pupils have the opportunity to see them at work. In this case, however, a problem could be the room capacity that does not allow a large group of pupils to participate. To give everyone the opportunity to participate, pupils can be divided into two groups that meet separately the speakers. The second approach has the advantage of giving pupils the opportunity to meet speakers together, without limitations. Specialists should be aware of the representations of the group emitted during the search of the subject and the specific questions, in order to acquire a personal view of the subject. During the meeting, the specialist shares with the group his own vision of the theme bringing elements of answer to the student's questions which will come to confirm or on the contrary to counter their preliminary representations. After a summary of the specialist's main ideas pupils will be asked to compare with their view towards the subject prior to the meeting to see if their ideas are evolved. In order to complete its discoveries student's group may also be invited to widen its field of reflection by an observation on the ground, by visiting a place or an event in connection with the subject: exhibition, festival, site of observation (ex: research laboratory, park). Final step would be to organize a summary suggesting the young people to form crucial conclusions elaborating sensitive productions illustrating their new approach of the subject and the problem.

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3.4.4: Preparing the content of the event

The preparation of the event's content consists of five basic elements: the formation of substantial questions, the live interaction with all panelists, participants and audience, the documentation and finally the online publication of the event.

3.4.4.1: The questions …

By now all pupils might know a little something about the topic. Teacher may invite them to write down many basic questions (ten minimum). Then, all these questions are presented, classified and organized into a hierarchy under a synthetic shape. Divide the pupils into groups, with the task of finding the answer to one of these questions. They can use the Internet and / or books. During this search, new questions will emerge naturally: invite them to note them. Each team will present its answer and new and more specific questions that came out. Then a final list of questions for the speakers is written down. Often basic questions are discarded after the search. In a café on black holes, the basic questions often relate to common stereotypes about this astronomical object as "door to other worlds", etc. After noticing that the scientific issues about the black holes were different from them, pupils produce new questions. The stereotypes are often discussed at the beginning of the science café: pupils in fact realize that this is useful in order to shift audience's attention to scientifically significant themes.

3.4.4.2: Live interaction with the participants

In order to make the Café even more engaging for both the participants and the audience as well, a live experiment, a happening or even a performance could support it. Creat-IT project seeks to build the foundations of building a substantial relation between Creativity and Science-teaching. The organization of a JSC as a social event can directly engage the arts towards this subject giving to teachers and pupils a splendid opportunity to reveal the social aspect of Science within the society. This event can be related -or even linked directly - to the two other case studies of the project (e.g. WASO and Science Theatre).

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3.4.4.3: Documentation

Pictures, short videos (excerpt of a movie, documentary or web) or readings (brief literary, fiction or scientific texts) could make the performance more lively and fun. You can introduce the cafe by using it in order to integrate the scientific debate in a broader cultural context. Don't hesitate to show your basic premises with your own creations: it will help to remove quickly the typical stereotypes and go further. Be aware of presentations which send people to sleep! Prepare slips of paper to promote the cafe and leave them on tables during the event.

3.4.4.4: Create a blog or a social-network page dedicated to the event

Teachers choose the appropriate social-network portal, preferably an official school page, in which the progress of the process is being presented. The purpose of this page will be mainly to encourage a valuable follow-up by future users. The target group maybe teachers or even pupils as well. Digitized material such as videos, presentations, images or texts related to the subject may also be uploaded to the portal. Future visitors may then be updated by the process or may be inspired by it.

An online streaming portal or a teleconference platform can also be used as a tool to organize online JSCs with distant participants or communities.

3.4.5: Finally the event day!

The following aspects are crucial to the success of a JSC event.

3.4.5.1: Logistical aspects

The organization of a science cafe requires some organizational skills in order to carry out the following tasks:

• Setting of the location: it is very important to create an informal atmosphere. Chairs aligned as in a conference, the presence of large tables that separate the speakers from the audience, must be avoided. Often the pupils themselves come up with great solutions!

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• Food and drink: the presence of food and drink is rather crucial to avoid the atmosphere of a "conference" that may discourage questions from the audience.

• Equipment: microphones, projectors, computers, must be found and tested before the event.

• Arrive in the JSC venue well in advance to make everything ready!

The science cafe event is meant to be a public event, not only for pupils (and parents) but for a wider audience. The school may not be the ideal place to carry it out, unless it is already configured as a cultural landmark of the area. Possible locations are public libraries, bookstores, etc.

3.4.5.2: Promote your event

Promote your event via mailing lists including pupils, teachers and parents but don't forget to announce your events by using web portals, periodicals, newspapers, radio, television stations - and of course your blog -. Press release is absolutely vital! Posters and flyers should be distributed to public locations to entice people, at educational institutions for example, but also the broader public at local supermarkets, public libraries, or other public places, simply wherever you think your future visitors may see them.

Your document should be no longer than one page and answer questions such as what, when, where, who, cost – it's free! - and it should give contact-names. Don't hesitate to use a brief and attractive presentation of the subject, with key words, intriguing, funny or quirky introduction, employ eye-catching visuals! Introduce the guest's identities, some information about their career and also a bibliography people can follow to go further.

3.4.5.3: During the event

Here is some advice that can be useful for the conductor or the conducting team:

• Adopt a positive attitude, encourage people to express their opinion without being afraid of being judged. Congratulate them on the quality of the question or of their remark.

• Ask the group to prepare some questions, in order to facilitate the speaking,

• Encourage the most reluctant people to participate and ask them in a individual way to argue their point of view.

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You can present a recent event of your school that was recently related to Science or the Arts. Find all possible relations between the event and the idea of promoting Science out of it and present it. You can show a picture susceptible to activate their reaction: in a junior science cafe recently organized in England on the use of animals in the research, the speaker brought with him images of genetically modified animals, as obese mouse or phosphorescent cows. The interest and the disturbing side of these photos allowed a discussion.

• Don't hesitate to clarify the technical language but do not abuse of it!

• Repeat what have been just expressed either ask people if everything is clear for them,

• Ask the speakers to argue their speech, to illustrate their comments by examples and cite systematically their sources.

• Do not hesitate to refocus the debate if it goes away from the subject!

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4. Reflection and Evaluation of a JSC event

Classroom work after science cafe is crucial: pupils can revise the topics, addressing questions remained open and have time for discussing them. Keep feeding your blog by listing every science cafe you realize, with a summary of discussions, the list of guest speakers, press release, flyers, posters and media articles – when journalists cover events -, relevant web links, audio or video recording, photos, forum… You can also invite public on past events to give their feedback and ask pupils to give their own e-mail or suggestions for future events.

The blog will create a network among the cafe that:

- motivates pupils and teachers: if the cafe is seen by them as part of a larger project and not as an occasional event, they work with much more enthusiasm. Science cafe can be used as an introduction to a theme, to be developed later in classroom by the teachers,
- provides material for the next cafe and encourage the recurrence of the initiative

To join the Creat-IT Scicafe network please consult: http://creatit-project.eu/ science-café case study for more details. Announcements and materials may also be found on this site.

The CREAT-IT project portal (http://portal.creatit-project.eu) is aimed at collecting and sharing both recordings (images, written material, videos, audio files, etc.) and evaluation of the various projects, regardless of a project's length.

Evaluation of the project should be considered in advance, and integrated as part of the project.

In Appendix 1, below, you will find a template which can be used to collect feedback and stimulate pupils discussion following the JSC project. Appendix 2 is aimed at evaluation of the teacher's feedback.

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5. Post-Project (Follow-up, Online Support & Documentation)

A successful Junior Science Café scenario produces further debate among pupils, participants and guests even after the end of the event. The reflection procedure as Phase 5 of the CREAT-IT approaches (please consult section 2.3 of this document) is the trigger-point for producing the necessary steps that will lead to the development of the next JSC project. Questions unanswered, emerging technologies, everyday life, even the investigation of nature itself, all aspects of real life can make use of the outcomes of a successful JSC event.

Pupils and teachers are encouraged to preserve any written, spoken or performed evidence of their work during either the JSC preparation or the final event. Powerpoints, documents, videos, interviews, photographs, live performances, in-classroom-projects, are uploaded and presented by the pupils on the school's platform, or by the teachers, to an educational network community (such as Open Discovery Space).

Pupils are then encouraged to write essays on the evaluation-results of their event considering the data gathered during the event. Teachers on the other hand are encouraged to finalize their JSC scenario and share it online with their educational community. The CREAT-IT project portal (http://portal.creatit-project.eu) is the perfect place to share your results, and get ideas for future projects from teachers in other schools, in other countries.

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6. Referenced & recommended links

-Belmonte C. & Castellani T. (2012). The 'Caffè Scienza Junior' project: Students protagonists of their scientific training. In Koulouris, P. (Ed.), SciCafé 2012 Conference and Events: Europe's Science Cafés Thinking Forward. Book of Proceedings. Epinioa, Athens.

-CREAT-IT literature may also be found on the following website: www.creatit-project.eu, including: The CREAT-IT project's Guidelines for creativity in Science Education; JSC Implementation scenarios; JSC Samples.

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Appendix 1: Evaluation of JSC Activities with Pupils

This is a short guideline that should help you to get valuable feedback from your pupils about their perception of the JSC project they've participated in. We encourage you to ask additional questions if needed.

Before you begin, please consider some general suggestions for gathering feedback from your pupils:

Make sure you tell your pupils that you are not grading their responses, but rather trying to get a feel of their perception

Respond to any feedback, good or bad, with gratitude, and reflect upon it – ask for and/or suggest actions that might result from it

Do not get discouraged by the inevitable few negative comments. Try to see everything as constructive criticism

Take notes– write down your impressions and conclusions made during the evaluation

Print out the following questionnaire and hand it out to the pupils at the end of the class (at the end of the project). Give your pupils about 5 minutes to fill it in – ask them to do it in silence, without commenting out loud. They should not sign the questionnaires. The main purpose of this is to provoke individual reflection among pupils. The written responses could also serve you as additional source of information while summarizing pupils' feedback.

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A1.1: QUESTIONNAIRE FOR THE PUPILS

Note: This questionnaire appears in the CREAT-IT project's Deliverable D6.2 for general cases. In the following version, it has been adapted specifically for JSC projects It is meant for pupils (pupils) who have participated in a JSC project.

What is your strongest impression of the JSC project you participated in?

How difficult was it for you to participate in the JSC project? Would you say it was:

too difficult

challenging

neutral

too easy

Did you feel motivated to participate in the activities of the JSC project?

Not motivated at all

Motivated to some extent

Very motivated

What could be done differently to make the project more motivating for you?

What did you enjoy doing most?

Was there something you did not enjoy doing? What? Why?

What was, for you personally, the most useful part/activity of the JSC project with regard to understanding/learning the lesson?

If you compare it with the usual class in this subject, are there, in your opinion, advantages of JSC? If yes, what are they?

Are there any disadvantages in comparison with the usual class? If yes, what are they?

Anything you would like to ask/ add about the JSC project?

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A1.2: Discussion

Start a group discussion following the questionnaire pupils answered, question by question. While gathering the answers we encourage you to:

1. Ask for a rationale/explanation for each answer by posing the "why?" questions and asking them to compare impressions with the traditional class.

2. Ask for suggestions for improving and try to agree upon the actions that result from it.

3. Summarise at the end.

You do not need to focus much on the quantitative data (e.g."*5 pupils liked it, 6 didn't, 7 were indifferent*") but rather try to gain more in-depth information and to draw conclusions (e.g. "*majority/minority* ***felt****…* ***because…***").

A1.3: Summary

Summarise the findings using mainly the feedback gathered during the group discussion, but also using written pupils' answers, if available.

A1.4: Report

Report on pupils' feedback by answering the following questions:

1.Which activities/aspects of JSC project were, from the pupils' perspective

the most enjoyable?	
the least enjoyable?	
the most difficult?	
the most inspiring?	
the most engaging?	

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2. Based on the feedback you gathered from the pupils, is there anything you would change in the project, or do differently next time? What? Please explain.

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Appendix 2: Demonstration Activities EVALUATION QUESTIONNAIRE FOR TEACHERS

Dear Sir/Madam,

We want to know about your experiences with implementing JSC with your pupils. The questionnaire is short; it takes less than 10 minutes to complete.

It is very important to stress that we need your **honest opinion**. All critics, good or bad, will be understood only as your support to the CREAT-IT project's activities and project outcomes. Please note that the questionnaire should be completed individually.

The survey is anonymous. Data gathered will serve only for the purposes of this project.

Thank you for your time!

Have you encountered any (significant) problems while delivering the lesson using WASO/Science Theatre/Junior Science Café case study? If yes, what were the problems?

(MULTIPLE ANSWER POSSIBLE)

I've encountered no (significant) problems

Lack of financial/technical support

Lack of time for my own preparation before the project

Lacking skills/knowledge I needed to implement JSC

Opposition among pupils

Opposition among colleagues

Opposition among superiors

Opposition among pupils' parents

Something else. What?_____

How did you deal with these difficulties?

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From pupils' perspective, which activities/aspects of JSC project were **the most enjoyable**?

From pupils' perspective, which activities/aspects of JSC project were **the most difficult**?

From pupils' perspective, which activities/aspects of JSC project were **the most engaging**?

What is your assessment of the **level of pupils' engagement** during participating in WASO/Science Theatre/Junior Science Café project, in comparison to their engagement during the traditional class?

They are less engaged than after traditional lesson

They are more engaged than after traditional lesson

I am not sure

Based on the feedback you gathered from the pupils, is there anything you would change in the project, or do differently next time? What? Why?

After your experience with implementing WASO/Science Theatre/Junior Science Café, do you feel confident to independently design and conduct project that foster creative science teaching in the future?

I do not feel confident enough

I feel confident enough

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Do you plan to realise the WASO/Science Theatre/Junior Science Café or a similar, independently design project again in the future?

Definitely not

Probably not

Probably yes

Definitely yes

What would encourage you to realize the WASO/Science Theatre/Junior Science Café or similar project again in the future?

A2.1: Linkcast, Internet-based Collaboration

As a tool for distant collaboration, CREAT-IT provides the opportunity of using "Distance learning Music Agoge" Videoconference platform (Adobe Connect Pro). Distance learning Music Agoge (DMA) is a pilot project attempting to set the foundations for the exploitation of teleconference and live streaming capabilities used as tools for supporting music education as performance praxis. In this direction the capabilities of connections (links) and direct multimedia streaming (live webcasting) are combined and tested in low-infrastructure-conditions that constantly vary according to the actions which the program covers. The term "Linkcast" may describe the above effort.

As a tool for Junior Science Café, Linkcast practice may allow the distant collaboration from more than two remote locations in an advanced non-commercial videoconference environment.

Please contact Mr. Petros Stergiopoulos for this task on plagiavlitis@yahoo.gr .

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