DESIRE

Catalogue of key results - 1st version)

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1. What science education projects' outcomes do project managers disseminate and how do they disseminate them?

In order to answer this general question, a questionnaire about dissemination (Q1) was designed and administered to managers or coordinators of several projects funded by the EC (7th Framework Programme), by the EACEA (Lifelong Learning Programme) or by other institutions, such as ministries of education of different countries, public or private organisms or societies. In particular, 45 science education projects were selected and their managers were contacted to invite them to complete the questionnaire.

19 out of the 45 project managers (42%) who were contacted fulfilled all or almost all the fields of the questionnaire up to the date of the first reporting period of the Desire project (30th November 2012).

Table 1 shows the list of projects to which these managers referred when answering the questionnaire.

Table 1. List of projects about which some data has been collected through Q1

Projects funded by the EC (7th FP)	Projects funded by the EACEA (LLP)	Projects funded by public (national) organisms	Projects funded by other institutions
Engineer Establish Fibonacci Ingenious – ECB Inquire Iris Nanoyou Pathway Sails Sed S-team U4Energy Xplore Health	eTwinning EU Train	Compec (Spain) Epse (UK) Projekt X (Denmark)	Muse (EPS)

1.1.   On the content of dissemination

Which types of outcomes do managers disseminate within the lifetime of funded science education projects?

Figure 1 shows the types of projects' outcomes that the surveyed project managers selected to disseminate to particular target audiences.
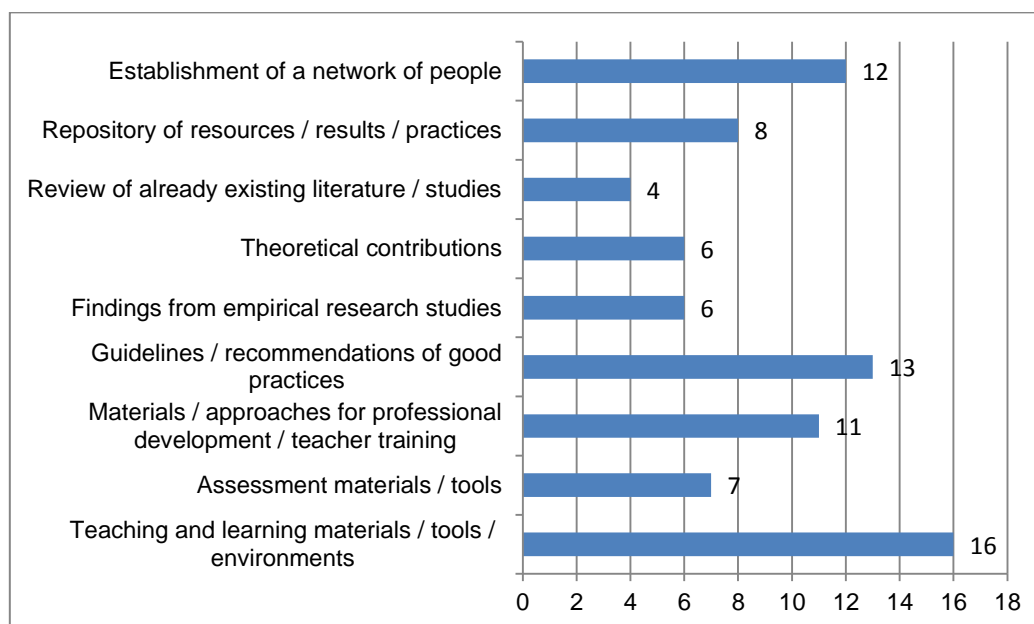
Figure 1. Types of projects' outcomes disseminated by funded projects (n = 19 projects)

As shown in Figure 1, 84% of science education projects produce and disseminate teaching and learning materials, tools or environments. Other types of outcomes that are usually developed by science education projects are guidelines of good practices, networks of people and materials for teacher training. These types of outcomes were developed and intended to be disseminated by more than 50% of the projects listed in Table 1. Finally, the types of outcomes which are not so commonly disseminated by projects are: reviews of already existing literature or studies, theoretical contributions and findings from empirical research studies. In sum, Figure 1 shows that projects' outcomes that are usually disseminated are those products resulting from an innovation or development process. On the other hand, projects' outcomes that are not so frequently disseminated correspond to theoretical or empirical research findings.

1.2. On the target audience of dissemination

What is the profile of the target audience that is intended to be informed of project outcomes?

As shown in Figure 2, all science education projects are intended to reach teachers and professors. This is the common target audience that all science education projects share. About 75% of funded science education projects also intend to reach other target audiences such as teacher trainers, other project managers and policy-makers. Less than a third of the analysed projects intend to reach science events' organisers, science centres' managers, editorials or other society agents like parents or industries.
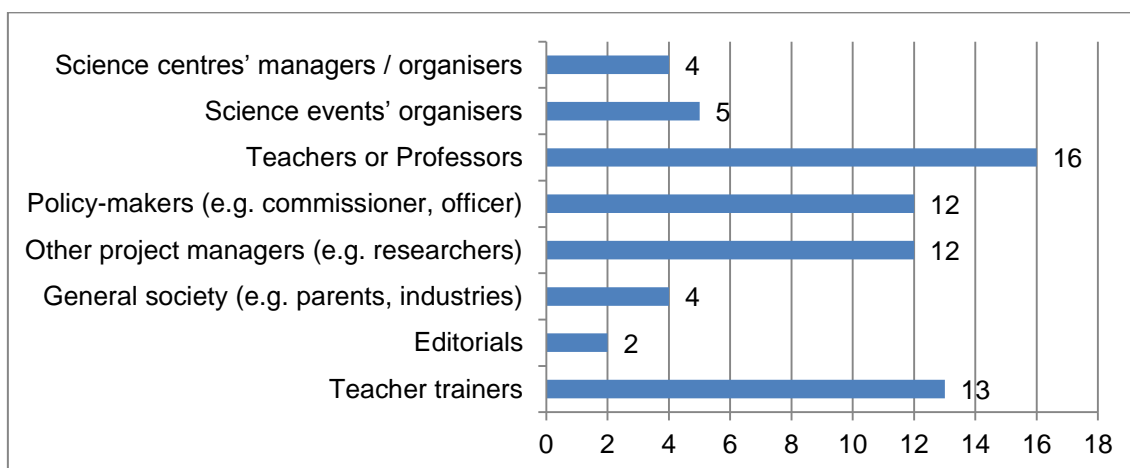
Figure 2. Target audience of science education projects (n = 16 projects)

1.3. On the strategies of dissemination

1.3.1. Which types of strategies are used by project managers to disseminate each type of project outcome?

Table 2 summarizes the types of dissemination strategies that are used in the analyzed funded projects to reach their target audience. It also shows the frequency of use of these strategies in the projects that have been analysed.

Table 2. Strategies used by project managers to disseminate project outcomes

Types of dissemination strategies	Specific dissemination strategies	# of projects (*)	
Text-based strategies	**Public project documents / reports**	**8**	**17**
	Articles in academic, refereed journal	4	
	Articles in professional journal / magazine	2	
	Brief documents (e.g. brochures, leaflets)	5	
	More than one text-based strategy	7	
Media-based strategies	E-mail lists (e.g. newsletters)	4	**17**
	Internet (e.g. portals, websites, videos)	**12**	
	Popularization / Mass media (e.g. TV)	0	
	Online social networking (e.g. blogs, forum)	0	
	More than one media-based strategy	11	
Face-to-face strategies	**Traditional events (e.g. conference, seminar)**	**7**	**16**
	Participatory techniques (e.g. community of practice, workshop)	**6**	
	More than one face-to-face strategy	9	
(*) 17/19 project managers provided this information			

As shown in Table 2, all three types of dissemination strategies (text-based, media-based and face-to-face) are frequently used in funded projects. However, not all specific dissemination strategies are used with the same frequency.

According to the reported results, public project documents or reports seem to be the most common text-based strategy to reach target audiences. Articles in academic journals (e.g. Studies in Science Education) and/or professional journals (e.g. Science in School) are not so widely used to disseminate project outcomes.

Concerning media-based strategies, Internet (e.g. portals, websites) is by far the most common dissemination channel to reach target audiences. In particular, projects' websites and the ones created by the ministries of education are the most common examples of Internet portals through which project outcomes are disseminated. Other dissemination channels such as mass media or social networks do not appear to be used in the analysed projects. One possible reason for the little use of these more recent channels can be found in the first Desire on-line discussion event, where social networks such as Facebook or Twitter were considered little appropriate to disseminate projects' outcomes to teachers due to the low traffic that these social networks seem to bring to project websites. Regarding mass media such as TV documentaries as dissemination channels, they are considered strategies that tend to have a very poor effect on disseminating project results or ideas in depth.

Finally, two main categories were distinguished within face-to-face strategies: traditional events such as conferences or seminars, and participatory techniques such as face-to-face communities of practice or workshops. These two dissemination strategies are used in funded projects with approximately the same high frequency. Some examples of traditional events on science education that projects' managers usually attend are organized by:

- The European Science Education Research Association (ESERA)
- The National Association for Research in Science Teaching (NARST)
- The International Organization for Science and Technology Education (IOSTE)
- The International Network on Public Communication of Science and Technology (PCST)
- The European Conference on Research In Chemical Education (ECRICE)
- The International Research Group on Physics Teaching (GIREP)

As explained by some project managers in the first Desire on-line discussion event, face-to-face events such as conferences and workshops allow them to network and find out about project results and future project developments. Another reason that was argued to opt for face-to-face events is to provide stakeholders all the necessary background to better understand projects' outcomes. Finally, face-to-face events were

also considered key to facilitate keeping up to date around certain strands taking into account the huge amount of information that flows in the digital era.

Although, in general terms, all three types of strategies seem to be used very frequently, specific strategies are used more than others to disseminate certain types of project outcomes.

As shown in Table 3, project outcomes such as teaching and learning materials or teacher training materials are mainly disseminated combining reports, brief documents, websites or participatory techniques. Outcomes like empirical research findings, theoretical contributions or reviews are mainly disseminated using academic or professional journals, websites and face-to-face traditional events such as conferences. Finally, the establishment of networks of people is a project's outcome that is usually disseminated through public reports, brief documents, email lists, websites and participatory techniques.

Table 3. Number of projects that use each specific strategy to disseminate each type of project outcome

Specific dissemination strategies	Teaching and learning materials	Assessment materials	Teacher training materials	Guidelines of good practices	Empirical research findings	Theoretical contributions	Review of literature / studies	Repository of resources practices	Network of people
Public project reports	**5**	1	**3**	**3**	-	1	**2**	1	**2**
Articles in academic refereed journal	1	-	1	1	1	**3**	1	-	-
Articles in professional journal	1	1	-	1	1	1	1	1	-
Brief documents	**5**	1	-	1	-	-	-	**2**	**2**
More than one text-based strategy	2	3	4	4	3	-	-	1	1
E-mail lists	-	-	1	-	-	-	-	1	**2**
Internet	**7**	**4**	**4**	5	3	**2**	**3**	3	3
Popularization / Mass media	-	-	-	-	-	-	-	-	-
Online social networking	-	-	-	-	-	-	-	-	-
More than one media-based strategy	7	2	3	4	2	-	-	2	4
Traditional events	2	1	1	**5**	3	3	3	1	1
Participatory techniques	**4**	1	**2**	-	-	-	1	**2**	**2**
More than one face-to-face strategy	7	3	4	4	2	-	-	2	4

1.3.2. What are the characteristics of the channels of each dissemination strategy used in funded projects?

A. Language of dissemination

Concerning the language of dissemination, project managers usually choose English as a communication language to reach the target audience. Thus, as shown in Table 4, public reports, academic journals, websites and portals and on-line social networks are channels where project managers disseminate project outcomes using English as preferential language. Although that is the case of European funded projects, it does not seem to be the case of projects funded by national institutions. In the latter case, project outcomes are mainly disseminated in the official language(s) of the country or region where the project is funded and developed.

Other channels such as professional journals, brief documents, email lists and face-to-face traditional events tend to use English as well as other languages, depending on the countries that the project involves. Finally, dissemination strategies such as mass media and face-to-face participatory techniques usually choose the native languages of participants or main target audience of the project.

Table 4. Languages used in each specific dissemination strategy of funded projects

Specific dissemination strategies	Native	English	Several languages (English included)
Public project reports	15%	**54%**	31%
Articles in academic refereed journal	-	**75%**	25%
Articles in professional journal	12%	38%	**50%**
Brief documents	17%	33%	**50%**
E-mail lists	27%	27%	**46%**
Internet	23%	**39%**	**39%**
Popularization / Mass media	**60%**	-	40%
Online social networking	29%	**43%**	29%
Traditional events	39%	15%	**46%**
Participatory techniques	**64%**	9%	27%

B. Length of dissemination

According to project managers, most of the dissemination strategies they use in funded projects do not require too much time to make project outcomes known and understood by target audiences, except for project reports and face-to-face strategies,

which require more time to disseminate project outcomes. Table 5 summarizes the aforementioned findings on the dissemination length.

Table 5. Dissemination length of specific strategies

Specific dissemination strategies	Length (*)	
	Short	**Long**
Public project reports	36%	**64%**
Articles in academic refereed journal	**100%**	-
Articles in professional journal	**85%**	14%
Brief documents	**92%**	8%
E-mail lists	**80%**	20%
Internet	**61%**	39%
Popularization / Mass media	**100%**	-
Online social networking	**72%**	28%
Traditional events	25%	**75%**
Participatory techniques	27%	**73%**
(*) Length in number of pages or time one would spent having a look at or participating in a certain dissemination channel Short: Less than 25 pages or less than an hour Long: More than 25 pages or more than an hour or day (e.g. periodic events)		

C. Number of dissemination strategies

Project managers also indicated the number of products with regards to each type of channel that were produced to disseminate project outcomes. As shown in Table 6, most of the analysed projects produced less than 10 reports, articles and websites, whereas most of them produced more than 10 brief documents, newsletters and attended more than 10 face-to-face events. These results can be interpreted taking into account the general organization of European funded projects. These projects usually have a budget per partner for attending or organizing several events and printing brief documents. On the other hand, project reports are usually related to a limited number of deliverables to be submitted in each work package. Funded projects also tend to create one reference website to illustrate their goals, progress and status.

Table 6. Dissemination products developed in funded projects

Specific dissemination strategies	# of products		
	1 - 3	**4 - 9**	**>10**
Public project reports	**22%**	**33%**	45%
Articles in academic refereed journal	**67%**	-	33%
Articles in professional journal	14%	**43%**	43%

Brief documents	40%	-	**60%**
E-mail lists	-	38%	**62%**
Internet	**55%**	9%	36%
Popularization / Mass media	-	33%	**67%**
Online social networking	**50%**	17%	33%
Traditional events	11%	22%	**67%**
Participatory techniques	22%	22%	**56%**

1.3.3. Which strategies are used to disseminate project outcomes to each target audience?

As discussed before, each of the three types of dissemination strategies (text-based, media-based and face-to-face) are used in funded projects with almost the same frequency to reach the target audience.

However, some specific strategies are used more often than others to reach specific audiences, as shown in Table 7. Thus, teachers and teacher trainers, who are the main target audience of science education projects, are contacted through multiple text-based strategies, websites and face-to-face strategies in order to make project outcomes known and understood by these audiences. In fact, they are the only target audiences that are involved in face-to-face participatory techniques, such as workshops and communities of practice. As evidenced in the first Desire on-line discussion event, some project managers have some reservations about using these dissemination strategies since they are considered very demanding and very time-consuming, they require a lot of involvement of all parts, and they do not tend to have impact at a large scale. Given this appraisal, we can interpret that project managers decide to invest time and effort to use participatory techniques in case they intend to reach the main target audiences and potential users: teachers and teacher trainers.

On the other hand, other target audiences that are common to most science education projects, like policy-makers and other projects managers, are usually reached by means of public reports, articles, websites and traditional events (e.g. conferences). This is a contrast to what some policy-makers state when commenting on the gap between research and policy. According to different reports (Anastopoulou, 2010; CIHI, 2004), researchers and policy-makers are driven by different incentives and reward structures, they have different timeframes for action, and different understandings of and standards for evidence. Moreover, policy-makers often do not have the time to pay attention to project results published in the style and media typically used by researchers.

Table 7. Specific dissemination strategies used to reach each target audience

Specific dissemination strategies	Teacher trainers	Editorials	General society	Other project managers	Policy-makers	Teachers / Professors	Science events' organisers	Science centres' managers
Public project reports	2	-	-	2	1	1	-	-
Articles in academic refereed journal	-	-	-	-	-	1	-	-
Articles in professional journal	1	**1**	-	1	1	1	-	-
Brief documents	1	-	1	-	-	1	**2**	**1**
More than one text-based strategy	**5**	-	**2**	**5**	**4**	**7**	1	1
E-mail lists	-	-	-	-	-	-	-	-
Internet	**6**	**2**	1	**5**	**5**	**7**	**2**	**1**
Popularization / Mass media	-	-	-	-	-	-	-	-
Online social networking	-	-	-	-	-	-	-	-
More than one media-based strategy	3	-	**2**	3	2	5	1	1
Traditional events	3	**1**	**2**	**5**	**4**	3	1	**1**
Participatory techniques	2	-	-	1	-	4	-	-
More than one face-to-face strategy	**5**	-	1	3	3	**6**	**2**	1

1.3.4. How many people are projects' outcomes intended to reach through each dissemination strategy?

Project managers who answered the questionnaire also estimated the number of people who were reached through the dissemination strategies of each project. According to these estimations presented in Table 8, most of the dissemination strategies that projects use are intended to reach more than one hundred people from the target audiences. The larger amounts of people are intended to be reached by means of media-based strategies such as portals and websites and mass media, in the case it is used as a dissemination channel.

Table 8. Estimated number of people reached through each specific dissemination strategy

Specific dissemination strategies	# of people			
	<50	50-100	>100	>1000
Public project reports	30%	10%	**50%**	10%
Articles in academic refereed journal	20%	20%	**40%**	20%
Articles in professional journal	-	-	**57%**	43%
Brief documents	-	9%	**55%**	36%
E-mail lists	11%	-	**44%**	**44%**
Internet	-	20%	20%	**60%**
Popularization / Mass media	-	10%	10%	**80%**
Online social networking	33%	-	33%	33%
Traditional events	8%	23%	31%	**38%**
Participatory techniques	27%	9%	**55%**	9%

1.4. On the quality of dissemination actions as perceived by project managers

1.4.1. Planning of dissemination actions in funded projects

Project managers were also asked to qualify their degree of agreement with the following sentences concerning the dissemination plans of each project:

a) *The dissemination strategies were already planned when the project started and this plan was followed without alterations throughout the project*
64% of the project managers agreed with this statement, 21% neither agreed nor disagreed and the remaining 14% disagreed with it. This result evidences that, in general, project managers plan some or most dissemination actions

before starting the project. It is likely that the initial plan cannot be followed without alterations in some cases, as reflected in the 36% of responses which do not agree with this statement.

b) *The dissemination plan of the project prioritized publishing articles in refereed journals since they have greater intellectual credibility*
   Just 23% of the project managers agreed with this statement, whereas 8% neither agreed nor disagreed and the remaining 69% disagreed with it. This result is consistent with the findings related to the dissemination strategies that are more frequently used in funded projects. According to those results, publishing articles in academic refereed journals is not one of the most common dissemination strategies that the analyzed projects use.

c) *The dissemination plan of the project prioritized those strategies that allowed reaching the largest number of people from the target audience*
   86% of the project managers agreed with this statement, whereas the remaining 14% disagreed with it. According to this result, having an impact at a large scale seems to be one of the goals of funded projects on science education.

1.4.2. Actual dissemination actions carried out in funded projects

Project managers were also asked to qualify their degree of agreement with the following sentences concerning the actual dissemination actions carried out in each project:

a) *The dissemination of the project results was mainly carried out after the project finished*
   23% of the project managers agreed with this statement, 23% neither agreed nor disagreed and the remaining 54% disagreed with it. Although most project managers consider that the dissemination actions are carried out within the lifetime of funded projects, there are many other project managers who recognize that most dissemination actions are carried out once the project has finished. We can find one possible interpretation of this result in the first Desire on-line discussion event, where some participants pointed out that it might be risky to try to disseminate project results that are still under development because some stakeholders might lose interest if they do not find these results

useful, applicable or fully understandable. These results suggest rethinking the dissemination plans of funded projects to adapt them to real conditions.

b) *The dissemination strategies implemented in practice differ from those which were planned mainly due to time constraints*
25% of the project managers agreed with this statement, 17% neither agreed nor disagreed and the remaining 58% disagreed with it. This result seems to be in agreement with the fact that most project managers consider that the dissemination actions they carried out in the analyzed projects were followed as planned. The remaining project managers, who recognize that some deviations from the initial dissemination plan were necessary, seem to attribute them to time constraints.

c) *The dissemination strategies implemented in practice differ from those which were planned mainly due to resource constraints (e.g. funding, technology, human)*
100% of the project managers disagreed with this statement. Therefore, they do not consider that the main reason for some deviation from the initial dissemination plan is the lack of resources.

d) *The dissemination strategies used in the project actively involved the target audience*
67% of the project managers agreed with this statement, and the remaining 33% neither agreed nor disagreed with it. These results seem to be in agreement with the fact that almost all the analyzed projects intend to reach target audiences through face-to-face strategies, such as conferences or workshops, where people tend to interact with each other. Some evidence related to this result was also found in the first Desire on-line discussion event, where some project managers agreed on the importance of involving stakeholders during the whole lifetime of the project in order to establish stronger relationships with them, and to enhance the chances of influencing future decisions through research and dissemination.

e) *The dissemination strategies used in the project were based on already existing resources, relationships or networks*
62% of the project managers agreed with this statement, 31% neither agreed nor disagreed and the remaining 8% disagreed with it. This result would mean

that many project managers take into account what have been already done and build on it. In fact, some participants in the first Desire on-line discussion event suggested that a good way to promote further dissemination after a funded project finishes is to use portals centralizing all the project results. In words of one project manager, *"some very good tools and resources available on websites of finished projects are not disseminated anymore as the funding has stopped. One solution is to use portals centralising all these project results like the Scientix portal (www.scientix.eu)"*

f) *The project results were disseminated to less people than was planned / expected*

15% of the project managers agreed with this statement, 31% neither agreed nor disagreed and the remaining 54% disagreed with it. This result seems to be consistent with the fact that the estimated number of reached people using different dissemination strategies is quite high.

1.4.3. Degree of satisfaction with the dissemination actions carried out in funded projects

Project managers were also asked to express the degree of satisfaction with the dissemination plans that has been carried out. 79% of the project managers expressed that they feel satisfied with the dissemination plans that were carried out in practice.

However, some of them also mentioned certain changes that they would perform in case they could. These changes refer to:

- The dissemination strategies used during the lifetime of the project: Some project managers would consider using certain dissemination strategies such as blogging, organizing some conferences or workshops on the topic of the project, or writing academic articles. Other project managers would avoid using social media.
- The project outcomes produced during the project: Some project managers would have liked to produce more teaching materials based on research outcomes.
- The plan and control of the timeline of the project: Some project managers would consider adjustments to the deadlines for ensuring the produced materials are available on time, whereas other project managers request more flexible time structures or periods of dissemination (e.g. longer than 3 years) for funded projects.

1.5.   On the evaluation of the quality of dissemination actions

Apart from analysing project managers' perception of the quality of the dissemination actions carried out, they were asked to elicit the criteria they use to evaluate the quality of the implementation of dissemination actions. As shown in Figure 3, the most common criterion of evaluation (85%) is the number of people who are reached using any of the dissemination strategies implemented in the project. This quantitative indicator seems necessary to evaluate whether dissemination actions make project outcomes available to the target audiences. However, this criterion does not seem sufficient to evaluate dissemination actions in depth considering that dissemination also involves making project outcomes understandable and usable in order to facilitate their use or exploitation. Other qualitative indicator used in 62% of the analysed projects refers to the target audiences' perception of the quality of the project. This criterion might allow evaluating whether target audiences consider that dissemination channels are usable and the outcomes are clear, useful and ready to be used in practice. As elicited by one project manager in the second Desire online discussion event, this criterion seems difficult to use in order to measure the quality of a dissemination plan since it would require surveys or interviews to participants.

54% of project managers also used the number of users as a criterion to evaluate the effectiveness of the dissemination strategies used in the projects. However, as expressed by some project managers in the first Desire on-line discussion event, measuring the number of users is very challenging. In words of one of the participants, "*number of visits on a project website is a very common criterion used to evaluate the results of a dissemination strategy but it is not always representative of the use of your results by teachers. It is often difficult to get information from all the teachers that are involved in a project. It happens very often that teachers have been using the resources for a long time without telling the project manager*"
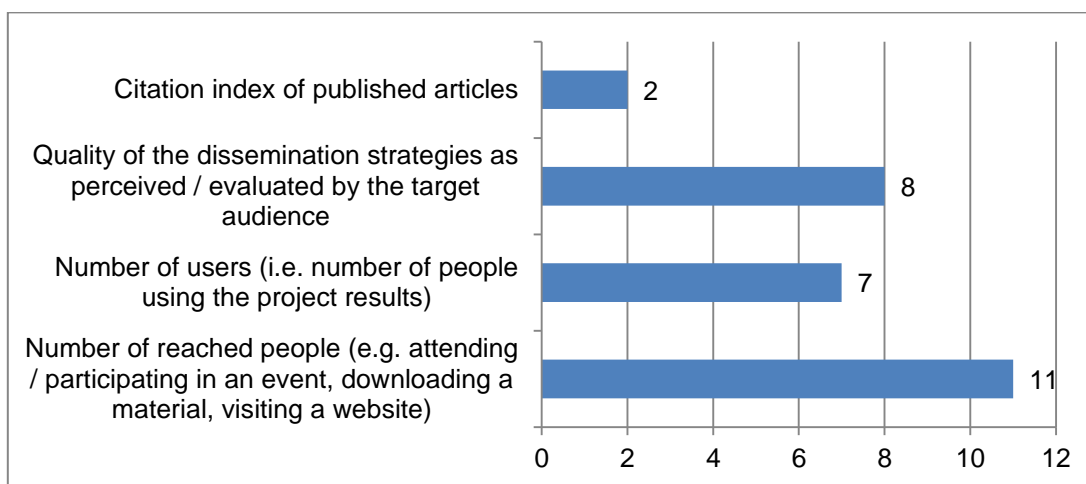
Figure 3. Criteria used in the analyzed projects to evaluate the quality of dissemination actions (n = 13 projects)

1.6. Best experiences at disseminating project outcomes

Some of the best experiences on dissemination that project managers explained during the first and second Desire online discussion events are related to the involvement of stakeholders as intermediate stakeholders, ambassadors or members of the steering committee from the beginning of a funded project. In this way, stakeholders could also spread the word of the project at a regional/national level by organizing information days to explain to other schools the outcomes of the project, or by communicating the activities and outcomes of the project to their colleagues and media in the language of their country, or by sharing their experiences on a blog. Most project managers participating in the event agreed on the importance of the role of this first group of stakeholders to reach the target audience and create a wider network since they would know who to contact and what channels to use to get the message across. They consider that the local knowledge is the key.

Nevertheless, some participants also elicited their doubts concerning the viability of this strategy. Some reservations about the use of this strategy refer to the profile of stakeholders that can actually play this role as ambassador with their peers. The other reservation refers to the number of stakeholders one can reach in this way.

Other good examples of dissemination strategies consist of workshops or seminars for in-service professional development purposes, out of schools or within schools. However, some participants agree that these workshops are time-consuming and might not be a suitable format for any kind of project since outcomes really need to talk to teachers' interests.

One of the participants mentioned that projects should document experiences and present them in a flexible way (e.g. case studies which allows framing the experience carried out with attention to the context and boundary conditions, learning materials for students, scripts for teachers with a detailed description of how the materials were designed and used, movies of educational activities) in order to spread good practice and generate adaptive processes so that stakeholders can learn from past experiences. In this sense, projects' outcomes would be expected to stimulate new initiatives that take account previous research and intend to generate effective learning activities, new ways of interacting with colleagues and researchers, etc.

Project managers also recognize the need for providing different types of incentives (remuneration, recognition, network, training, etc) to teachers or other stakeholders involved in the project.

Finally, one project manager shared another innovative experience consisting of including podcasts in a project website for dissemination purposes.

2. Which project outcomes reach target audiences and how do they reach them?

2.1. Project managers as target audience of dissemination

2.1.1. How do project managers value the amount of information from science education projects that they receive?

As shown in Figure 4, most of project managers (64%) who answered questionnaire Q1 consider that they do not receive too much information about the outcomes from European, international or national projects.
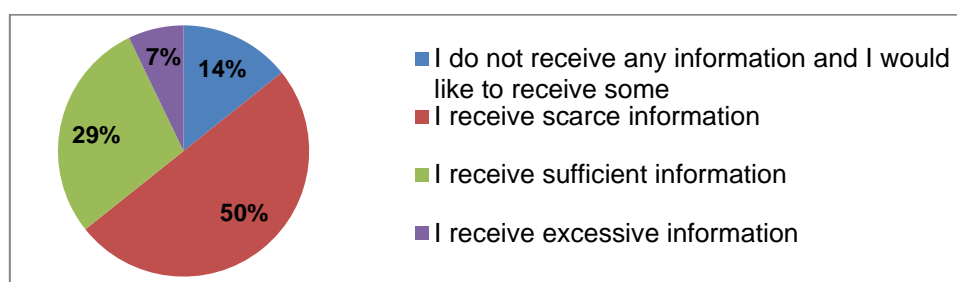

Figure 4. Project managers' appraisal of the amount of information received from funded projects

2.1.2. How are projects managers informed of other science education projects' outcomes?

The most common channels through which project managers are usually informed of other projects' outcomes are shown in Figure 5. These channels coincide with the ones they usually use to disseminate the outcomes of the projects they coordinate, which mainly are: media-based strategies (e.g. websites, portals, newsletters) and traditional face-to-face events (e.g. conferences).
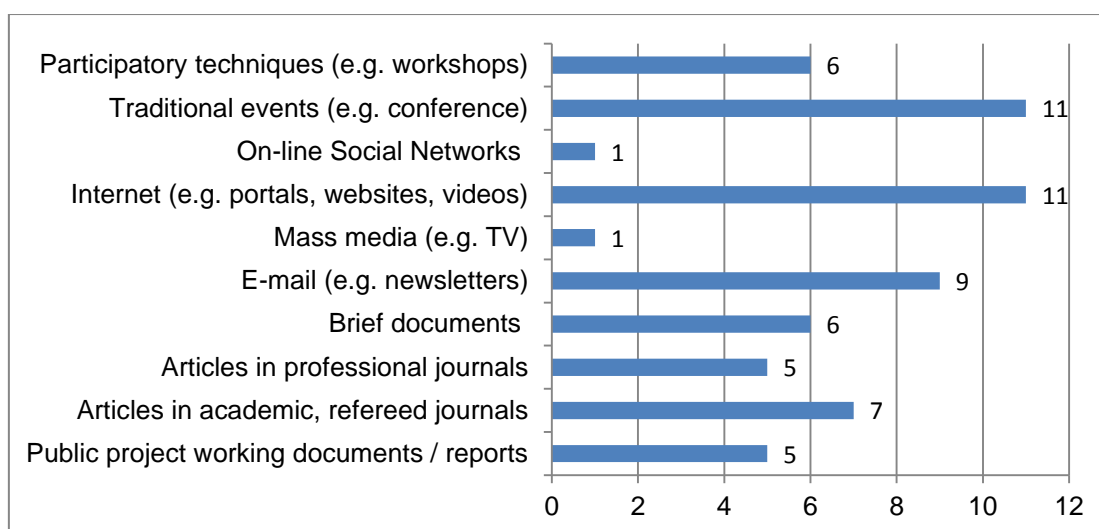

Figure 5. Dissemination channels through which project managers are usually informed (n=14)

As part of the target audience, some project managers explained in the second Desire online discussion event how they got to know some projects' outcomes. One of the most common dissemination strategies simply refers to the traditional word of mouth, which does not necessarily take place in formal events. Project managers recognize that they usually get to know outcomes from projects that are addressed to a topic which is somehow related to the topic addressed in projects in which they have been involved. Therefore, project managers actively or passively get to know projects' outcomes that match their interests as researchers, teacher trainers or teachers.

The project outcomes that are appreciated as the most interesting or useful by project managers are: training packages/materials, immediate and usable classroom materials, and resources on scientific content, which have good quality and are accompanied by some support. As highlighted by one project manager who participated in the second Desire online discussion event, "*there is nothing more immediate and usable than having at your fingertips documents to rely on and good facilitators at an arm (or computer)'s distance*".

2.2. Teachers as target audience of dissemination

A questionnaire about dissemination for teachers (Q2) was also designed and administered to a number of teachers involved in several projects funded by the EC (7th Framework Programme), by the EACEA (Lifelong Learning Programme) or by other institutions, such as ministries of education of different countries, public or private organisms or societies. In particular, 45 science education projects were selected and their managers were contacted to ask them to send questionnaire Q2 to teachers involved in the projects they managed.

Teachers involved in 20 out of the 46 selected projects (42%) fulfilled all or almost all the fields of the questionnaire up to the date of the first reporting period of the Desire project (30th November 2012).

Table 9 shows the list of projects to which these teachers referred when answering the questionnaire.

Table 9. List of projects about which some data has been collected through Q2

Projects funded by the EC (7th FP)	Projects funded by the EACEA (LLP)	Projects funded by public (national) organisms

Engineer Establish Fibonacci Ingenious – ECB Iris Nanochannels Nanoyou Sails Scientix S-team U4Energy Xplore Health	CrossNet eTwinning EU Train Inspire Spice Stella UniSchooLabS	Compec (Spain)

2.2.1. What types of projects' outcomes reach teachers?

Figure 6 shows the types of outcomes that the surveyed teachers get to know from the projects that are included in Table 9.
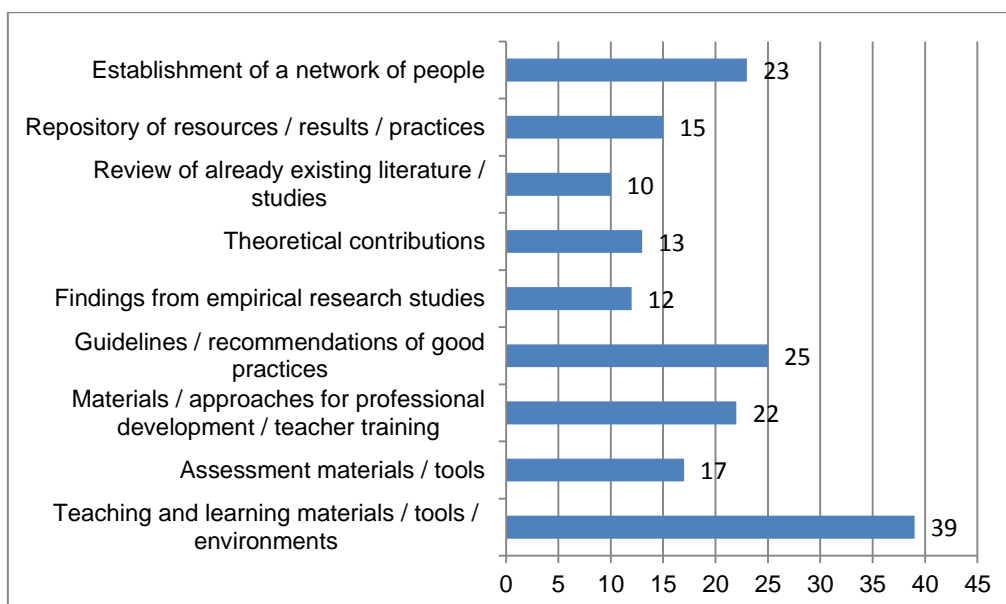

Figure 6. Types of projects' outcomes disseminated by funded projects (n = 19 projects)

As shown in Figure 6, teaching and learning materials, tools or environments are the most common science education projects' outcomes that reach teachers since 85% of them recognize that this is the kind of outcome of which they have been informed from funded projects. Other types of outcomes that usually reach teachers are guidelines of good practices, and networks of people. These types of outcomes reached about 50% of the teachers who answered Q2. Finally, the types of outcomes which have lower impact among teachers (less than one third of teachers) are: reviews of already existing literature or studies, theoretical contributions and findings from empirical research studies. In sum, Figure 6 shows that the outcomes that teachers usually get to know from funded projects on science education are those products resulting from an innovation or development process. However, assessment materials are not usually developed and/or do not frequently reach teachers, which could be

considered problematic taking into account that assessment is a key aspect which should accompany any innovation process intended to change educational practice. On the other hand, projects' outcomes that do not reach teachers so frequently correspond to theoretical or empirical research findings.

2.2.2. By means of which types of dissemination strategies teachers get to know projects' outcomes?

Table 10 summarizes the types of dissemination strategies by means of which teachers get to know funded projects' outcomes. It also shows the frequency of use of these strategies by teachers in the projects that have been analysed.

Table 10. Dissemination strategies by means of which teachers get to know projects' outcomes

Types of dissemination strategies	Specific dissemination strategies	# of projects (*)	
Text-based strategies	**Public project documents / reports**	**28**	
	Articles in academic, refereed journal	15	
	Articles in professional journal / magazine	15	**36**
	Brief documents (e.g. brochures, leaflets)	16	
	More than one text-based strategy	19	
Media-based strategies	E-mail lists (e.g. newsletters)	11	
	Internet (e.g. portals, websites, videos)	**35**	
	Popularization / Mass media (e.g. TV)	5	**38**
	Online social networking (e.g. blogs, forum)	15	
	More than one media-based strategy	19	
Face-to-face strategies	**Traditional events (e.g. conference, seminar)**	**24**	
	Participatory techniques (e.g. community of practice, workshop)	**27**	**37**
	More than one face-to-face strategy	19	
(*) 41/46 teachers provided this information			

As shown in Table 10, teachers usually get to know projects' outcomes by means of all three types of dissemination strategies (text-based, media-based and face-to-face) used in funded projects. However, not all specific dissemination strategies reach teachers with the same frequency.

According to the reported results, public project documents or reports seem to be the most common text-based strategy by means of which projects' outcomes reach teachers. Articles in academic and/or professional journals are not so widely used by teachers to reach project outcomes.

Concerning media-based strategies, Internet (e.g. portals, websites) is by far the most common dissemination channel to reach teachers. In particular, projects' websites are the most common examples of Internet portals through which teachers

get to know projects' outcomes. Other dissemination channels such as newsletters, mass media or social networks do not appear to be so frequently used by teachers to get informed of funded projects. During the first Desire on-line discussion event for teachers, some teachers who were enthusiastic about the use of social networks such as Facebook or Twitter expressed that the fact that they can choose the kind of information they want to receive is a useful feature of a dissemination channel.

Finally, two main categories were distinguished within face-to-face strategies: traditional events such as conferences or seminars, and participatory techniques such as face-to-face communities of practice or workshops. These two dissemination strategies are used by teachers with approximately the same high frequency. Some examples of traditional events on science education that teachers usually attend are organized by the funded projects in which they have been involved, local / national associations of science teaching or international conferences on science education, such as the Science and Mathematics Education Conference (SMEC) series.

Although, in general terms, all three types of strategies seem to be used very frequently, specific strategies are used more than others to disseminate certain types of project outcomes.

As shown in Table 11, project outcomes resulting from an innovation process such as teaching and learning materials or guidelines of good practices usually reach teachers by means of project reports, websites and/or participatory techniques. On the other hand, outcomes like empirical research findings and theoretical contributions tend to reach teachers by means of academic journals together with project reports, websites and face-to-face traditional events such as conferences.

Table 11. Number of teachers that use each specific strategy to reach each type of project outcome

Specific dissemination strategies	Teaching and learning materials	Assessment materials	Teacher training materials	Guidelines of good practices	Empirical research findings	Theoretical contributions	Review of literature / studies	Repository of resources practices	Network of people
Public project reports	**17**	**7**	**9**	13	5	6	3	**11**	**11**
Articles in academic refereed journal	2	3	2	1	**5**	**6**	**5**	2	1
Articles in professional journal	2	5	1	3	3	2	**5**	2	2
Brief documents	5	4	4	2	3	2	3	3	4
More than one text-based strategy	8	5	7	6	5	4	4	3	5
E-mail lists	4	1	-	1	1	2	2	3	3
Internet	23	15	15	14	12	8	9	17	9
Popularization / Mass media	-	2	-	-	2	-	1	-	1
Online social networking	2	2	-	4	2	3	4	2	7
More than one media-based strategy	7	3	8	7	4	6	3	3	5
Traditional events	11	5	**9**	8	**7**	**10**	6	4	**9**
Participatory techniques	**14**	**10**	7	**11**	**8**	4	**10**	**14**	5
More than one face-to-face strategy	8	9	6	5	6	4	2	2	11

2.2.3. What are the characteristics of the channels of each dissemination strategy used by teachers?

A. Language of dissemination

Concerning the language of dissemination, teachers recognize that they are usually informed of funded projects' outcomes in English, as shown in Table 12.

Table 12. Languages used in each specific dissemination strategies that reach teachers

Specific dissemination strategies	Native	English	Several languages (English included)
Public project reports	9%	**74%**	18%
Articles in academic refereed journal	17%	**67%**	17%
Articles in professional journal	21%	**54%**	25%
Brief documents	17%	**66%**	17%
E-mail lists	13%	**74%**	13%
Internet	13%	**69%**	19%
Popularization / Mass media	38%	**48%**	14%
Online social networking	24%	**72%**	4%
Traditional events	13%	**71%**	16%
Participatory techniques	20%	**60%**	20%

B. Length of dissemination

According to teachers, most of the dissemination strategies they use to get informed of funded projects' outcomes do not take too much time to make project outcomes known and understood, except for project reports and face-to-face strategies, which require more time. Table 13 summarizes the aforementioned findings on the dissemination length as appraised by teachers.

Table 13. Dissemination length of specific strategies as appraised by teachers

Specific dissemination strategies	Length (*)	
	Short	Long
Public project reports	**50%**	**50%**
Articles in academic refereed journal	**70%**	30%
Articles in professional journal	**60%**	40%
Brief documents	**73%**	27%
E-mail lists	**62%**	38%
Internet	33%	**67%**

Popularization / Mass media	**68%**	32%
Online social networking	**64%**	36%
Traditional events	14%	**86%**
Participatory techniques	17%	**83%**
(*) Length in number of pages or time teachers would spent having a look at or participating in a certain dissemination channel Short: Less than 25 pages or less than an hour Long: More than 25 pages or more than an hour or day (e.g. periodic events)		

2.2.4. On the quality of dissemination actions as perceived by teachers

Teachers were asked to qualify their degree of agreement with the following sentences concerning the actual dissemination actions carried out in each project:

a) *I could not go into the project results more in depth mainly due to time constraints*

32% of the teachers agreed with this statement, 36% neither agreed nor disagreed and the remaining 32% disagreed with it.

b) *I could not go into the project results more in depth mainly due to resource constraints*

24% of the teachers agreed with this statement, 13% neither agreed nor disagreed and the remaining 63% disagreed with it.

c) *I was actively involved in the communication process during the dissemination of the project results*

66% of the teachers agreed with this statement, 21% neither agreed nor disagreed and the remaining 13% disagreed with it.

d) *I was already familiar with the dissemination strategies and channels used in the project*

55% of the teachers agreed with this statement, 18% neither agreed nor disagreed and the remaining 26% disagreed with it.

e) *I was already part of a network / I had already a relationship with some partners of the project*

55% of the teachers agreed with this statement, 11% neither agreed nor disagreed and the remaining 34% disagreed with it.

f) *I consider the project results reached a lot of people*
68% of the teachers agreed with this statement, 21% neither agreed nor disagreed and the remaining 11% disagreed with it.

g) *I consider the project results are relevant to my teaching practice*
97% of the teachers agreed with this statement, whereas 3% of them disagreed with it.

h) *I consider the language was a barrier to the dissemination of the project results*
29% of the teachers agreed with this statement, 18% neither agreed nor disagreed and the remaining 53% disagreed with it.

i) *I consider the length of the dissemination channels / strategies was appropriate to get information of the project results (i.e. they were not excessively long and included the essential and necessary information)*
61% of the teachers agreed with this statement, 24% neither agreed nor disagreed and the remaining 16% disagreed with it.

j) *I consider the format and style of the dissemination channels / strategies were appropriate to get information of and understand the project results*
76% of the teachers agreed with this statement, 18% neither agreed nor disagreed and the remaining 5% disagreed with it.

k) *I received appropriate support from the people involved in the project to have access and understand the project results*
86% of the teachers agreed with this statement, 11% neither agreed nor disagreed and the remaining 3% disagreed with it.

l) *I received appropriate support from my institution and my colleagues (not involved in the project) to get information of the project results*
58% of the teachers agreed with this statement, 24% neither agreed nor disagreed and the remaining 18% disagreed with it.

Furthermore, in Q2 and in the Desire online discussion events for teachers, they were asked to make recommendations concerning the dissemination actions that funded projects carry out. Their recommendations focused on:

- The content of dissemination: Some teachers suggest extra contents that would be useful for teachers.
- More local or regional dissemination strategies: Some teachers emphasized the need for including dissemination materials in other languages than English and the need for organizing more dissemination initiatives (e.g. conferences) at a local or regional level.
- Improving some dissemination channels regarding their usability (e.g. project websites) or including other dissemination channels (e.g. social networks, mass media) so that people do not get lost.
- Timeline for dissemination: Some teachers consider that more time for dissemination is needed in order to get more people interested and to make them understand the outcomes of the project exchanging ideas with others.
- The target audiences: Some teachers recommend trying to reach and involve other target audiences such as students and young teachers.
- The actions after funded projects are finished: Some teachers would expect that networks of teachers can continue and can be potentiated after funded projects finish so that models of cascade dissemination can be applied afterwards.
- The involvement of teachers in dissemination actions: Some teachers pointed out the need for involving and supporting teachers in disseminating projects' outcomes to other teachers and stakeholders at a local level.
- The incentives provided to teachers: Some teachers suggested ways of further engaging and encouraging teachers (e.g. equipment for the school, training) in funded project.
- The support on the part of the partners: Some teachers highlighted the importance of receiving guidelines and support from partners involved in the project so that they can use or apply what has been disseminated.

2.2.5. How do teachers value the amount of information from science education projects that they receive?

As shown in Figure 7, almost half of the teachers (44%) who answered questionnaire Q2 consider that they do not receive too much information about the outcomes from European, international or national projects.
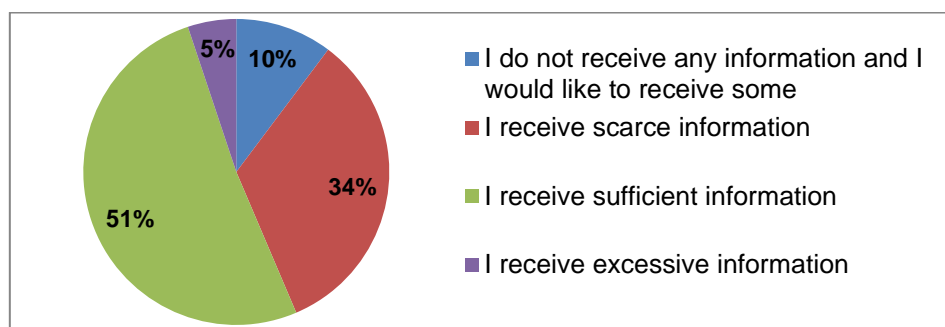
Figure 7. Teachers' appraisal of the amount of information received from funded projects

2.3. Policy-makers

In Q3 and in the Desire online discussion events for policy-makers, they were asked to make recommendations concerning the dissemination actions that funded projects carry out. Their recommendations focused on:

- Providing guidelines for further dissemination: Some policy-makers consider that innovative proposals should include specific directions on how to improve teachers' Pedagogical Content Knowledge about the specific theme of the proposal.

- Suitable research frameworks to bridge the gap between research and practice (e.g. The Model of Educational Reconstruction). Some policy-makers consider that academic researchers usually do not take into account teachers' conceptions, professional experience and real needs to delineate innovative proposals. In this sense, research projects and innovative proposals would need to be planned in a way based on real teachers' needs, doubts and interests.

- Research studies on how teachers adopt innovations: Some policy-makers consider that more research studies on how teachers adopt innovations are necessary so that they can identify what affects these educational processes.

- Style of communication between researchers and policy-makers: Some policy-makers suggest that brief messages may facilitate this communication, recognizing that policy-makers have an important role in the process of establishing effective teacher training courses.

- Involvement of teachers together with researchers on the design and evaluation of innovations, making part of teachers' job a research activity. According to some policy-makers, this should involve re-thinking several structural aspects in school organisation, and changing the current cultural background, in which research in (science and maths) education is carried out.

- Dissemination strategies: Some policy-makers think that more mass media (e.g. newspapers) should be used for dissemination purposes of funded projects in order to have a larger impact among teachers.

- Actions at a local and regional level: Policy-makers agree that basic ideas should be spread within local and national communities. For this purpose, some policy-makers suggest developing local consulting commissions involving teachers, researchers, students' families, school principals and administrators, and other relevant actors.

- Human mediation: Some policy-makers really think that a crucial feature of any dissemination action is the gradual guidance of stakeholders so that there is a drift from the practiced teaching modes to new, more satisfying ones.

- Systemic view of the dissemination actions, which takes into account the curriculum, school organization, teachers' current practices, affective and emotional relationship with students, teachers' social recognition, incentives (e.g. training, recognition for participating in projects), government implication, teachers centres' involvement, etc.

- Support to teachers and schools, organizing clusters or networks of discussion (face-to-face or online), to provide a stable reference and contact for school work.

- Timeline for dissemination actions: Some policy-makers consider that more time should be devoted to dissemination actions so that intermediate stakeholders can be involved and trained so that they can also disseminate projects' outcomes among teachers.

- Mainstreaming of innovations: Some policy-makers agree on the need for reaching more teachers so that research-based practices are spread.

2.4. Science museum organisers

In the Desire online discussion events for science museums' organisers, they were asked to make recommendations concerning the dissemination actions that funded projects carry out. Their recommendations focused on:

- The dissemination channels: Most science museum organisers recognize that they rely on direct contact with scientists to get information, as well as for understanding how a topic is tackled. The live human network seems more appreciated than the internet social network. Conferences on science

communication and education are seen as a very good access to new projects and practise.

- Research findings on informal science education: Many science museum organisers agree that there is a need for more research on informal science education or for a common European database were all on-going and finished science education projects would have to deliver their results. This searchable database would include material for specific groups of interest, and results from research-actions experiences which do not usually get published in academic journals.

- Involvement of stakeholders: Science museum organisers also agree on the need for involving the potential users in meetings or in an advisory board from the beginning of a funded project for dissemination purposes.

- National support and initiatives: Science museum organisers recognize the potential of national databases, teacher and science educator networks, and experts consulting, in order to connect people and to redirect them to appropriate sources and references.

- Reference database or portal: Many science museum organisers consider that there is not one specific place on the Internet to start their research about projects' outcomes or products. One strong suggestion coming out of the meeting is the idea of building one single EU database, organised in such a way to enable teachers, communicators, trainers to find through keywords and tags straight links to projects, reports and published references resulting from all EU projects related to a certain topic. Specifically, such a unique database would be a perfect starting point for practitioners seeking resources which come from different projects focused on similar topics.

2.5. Science event organisers

In the Desire online discussion events for science events' organisers, they were asked to make recommendations concerning the dissemination actions that funded projects carry out. Their recommendations focused on:

- Key messages from EU-projects: Science events' organisers recognize that messages from funded projects are often very complicated and not immediately usable.

- Dissemination channels: Most science events' organisers agree that the most efficient way of spreading knowledge about EU-projects is through personal

meetings and face-to-face discussions that facilitate the exchange and debate of findings from EU-project.

3. References

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