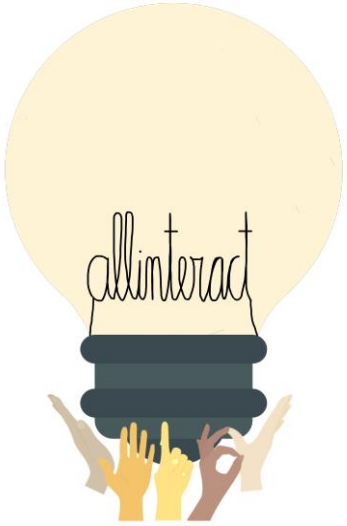
Are you aware?



Investigating the awareness of young students about the benefits of science for society and participating in scientific research

Faculty of Behavioural and Social Sciences

University of Groningen

Master's thesis

Name: Stèphanie Boshuijzen

Student Number: S4964608

Master's programme: Special Needs Education and Care

Primary supervisor: Dr. Mónica López López

Second assessor: Dr. Laura Batstra

Date: June, 2022

Total number of words: 10816

Abstract

In recent decades significant progress has been made in involving citizens in science. However, concerns about the participation of citizens remain. The main question of this thesis was therefore the following: “To what extent are young students aware of the benefits of science for society and participating in scientific research?” Focus groups have been conducted in order to answer this research question. The purpose of this thesis was to determine to what extent young students are aware of the benefits of scientific research for society, the social impact of science and the importance of participating in science. This thesis was undertaken to describe what kind of awareness-raising initiatives succeeding at engaging citizens in scientific participation and what policies that promote awareness-raising actions and citizen engagement in science young students know. Although it is complicated to give an unambiguous answer to the questions, it is possible to give a description of the awareness of young students about these topics.

Table of contents

1. Introduction and theoretical background

1.1 Background

During the past years, significant progress has been made in involving citizens in science (Chilvers & Kearnes, 2019) and promoting the awareness of the benefits of science for society and engaging citizens in participating in scientific research, has been an important item on the research agenda. Citizens have been participating in scientific research (Strasser et al., 2018). The Netherlands has gone quite far in thinking about societal impact of scientific research, according to van der Meulen and Rip (2000). However, science has struggled to build a more sustainable relationship with citizen participation. Concerns about the participation of citizens have continued in studies in the social field of science and innovation (Lezaun et al., 2017). Although investigating benefits for society from scientific research is an increasing research priority, there is no clear unanimity on best practices (Aguinis et al., 2014).

Research shows that people would participate in science eagerly, if they knew the advances of it for themselves and if they understood the scientific process better (Woolley et al., 2016). A critical obstacle in this process, is the fact that the impact of science on society is a complicated and indirect process with influences on multiple levels, where benefits for society present themselves over time (Morton, 2015). As a result of this time between the results of research and the consequences for society, citizens find it difficult to attribute the benefits of research to research (Spaapen & Van Drooge, 2011). Citizens have different types and levels of consciousness about the impact of science on their life (Bonney et al., 2016), however even when citizens are aware of the impact, they are not aware of the fact that they can contribute to science (NASEM, 2018).

Important in this matter is listening to the opinions of young people and showing interest in their ideas is important (Lundy, 2007). The concept that young people have the right to express their views and that their opinions should be taken into account is since the 80's of the last century stated in The United Nations Convention on the Rights of the Child (UNCR,1989). It is important that young people are involved in all relevant matters that affect them in society, including science.

In addition to engaging young students in science, it also seems to be a major problem to persuade students to pursue a career in science. Some European countries are struggling to

encourage youth to pursue a science-related career (OECD, 2018). This problem seems to have various reasons. According to recent research by Kotkas et al. (2021) not pursuing a career in science, has to do with the attitudes of students towards scientific research and a career in science. Research of Holmegaard et al., (2014) states that science is not implemented in the everyday life of students and is presented in an unattractive way. As awareness has been recognized as an important factor in supporting students to pursue a career in science (Tytler & Osborne, 2012), students have to be aware of the fact that it is possible to pursue a career in science.

In this regard, policies are important to bring a change. Generally research and policies have concentrated on the curriculum of science in schools (Jenkins & Donelly, 2006). Repeated attempts have been made to develop a better and more attractive school science curriculum (Roberts, 2002). In the last couple of years research policy decisions are also known as an effective way to produce more knowledge for scientific research (Mac et al., 2021) and therefore are very important to promote all the above. Moreover for exaggerating societal benefit, interaction between policy makers and researchers are necessary (Court and Young 2006).

1.2 Problem definition

Engagement in science is a major area of interest within the field of behavioral and social sciences. Previous studies have reported that although there are improvements on the engagement and participation of citizens in science (SWAFS, 2016), still, a lot of young people are not interested in participating in scientific research in general or having a career in science (Caprile et al., 2015). Several attempts have been made to engage citizens' participation in science. Actions to involve young people in science already exist, but many of them are still not willing to participate.

Recent evidence suggests that citizens however, do seek advantages from scientific research to make more reliable decisions for themselves and for their family (Chapman & Wyndham, 2013) and they are willing to be actively involved in science, if they become aware of the social impact of scientific research and the benefits of it for society (Allinteract, 2021). Since it is the responsibility of adults to involve young people in the decision-making process and to aim for higher forms of participation (Hart, 1992; Shier, 2001), scientists should make an effort to include young students into science. Furthermore most of those who study science at school

will not use this in their future careers (Driver & Leach, 1996), so other ways of engaging new talent should be explored.

Even though the academic world is working towards a more inclusive environment, some groups are still traditionally more excluded from science (Allinteract, 2021, including young people. Among other underrepresented groups, young students might not be seen as an underrepresented group, however although young students are not traditionally marginalized as a social group in science, research shows that they do have less access to scientific participation (Pandya, 2012). Despite the efforts made by researchers to involve young people in their projects, the fact that young students do not have as much access to participation remains a major problem for the youngsters because it leads to benefitting less from science (UN, 2019).

Along with this, at the same time this has a serious effect on researchers, for diversity in the participants ensures that the outcomes are usable for all populations (NC, 2019). Galinsky et al. (2015) reported that diversity in science ensures novelty, substantiated decision-making, competence and knowledge. Otherwise, science would only involve the input of scientists (Cohn, 2008). However, for instance research by Bornmann (2012) shows that outcomes of academic research published in scientific journals are not reaching the society and therefore are only important for the academic world in itself.

In addition to that, another point of concern is the fact that academics usually spread the outcomes of traditional research in articles and at academic conferences, which is an acceptable way to disseminate the results within the academic community (Ozanne, et al., 2017). However, this way outcomes are staying within this closed community. According to Lamm (2006), society can only benefit from the outcomes of scientific research if the results are transformed into consumable and salable products. Recently, researchers are experimenting with new ways of spreading outcomes, such as posting their findings on social media (Ozanne, et al., 2017).

1.3 Fostering participation of young people

As we established in the paragraph in the section above, the awareness of the students and the participation of them in science is of great importance. Science has a significant influence on society, whether people are conscious about that fact or not. For that reason, it is important that young people participate in science. To promote this participation, there are a couple of aspects known from literature that can help foster this.

First of all attitudes of professionals are known as important for shaping young people's ability to participate (Gal, 2017). The attitude towards the participation of youngsters should be positive (Bourke & Loveridge 2018) and a trusting, power-sharing relationship between adults and youth should be created (Andersson, 2017b)(Cahill & Dadvand, 2018). Participation should be based on attitudes and implemented in systems and organizational culture (Bourke & Loveridge, 2018). In order to disseminate this idea in society and science, these ideas should be set in rules and policies and be part of a detailed regulatory regime (Gal, 2017).

Another aspect that is important for promoting participation of young students in science is that people should have the right skills to do so. Bouke & Loveridge (2018) for example, speak about the fact that participation should be based on skills. If we want young students to properly participate in science and society, they need the right skills in order to do so. In order to acquire these skills the role of schools can be very important as according to Mager & Nowak (2012) participation in school can be seen as a training ground for participation in society. Because of this fact it is important to encourage participation in scientific research at a very young age. Some of the non-participation of young people might have to do with the fact that they don't feel confident enough to participate in science.

What also is seen as important is the fact that the participation is on the students' level and age appropriate, because too much perceived difficulty lowers feelings of competence (Patall et al., 2018) and stirs up more negative emotions in students (Kim et al., 2018). Also criticism discourages student participation (Weaver, 2005), so in order to increase participation, it is important to take all opinions into account and create an egalitarian dialogue with students in which all views may be heard and in which participants intervene to provide validity claims instead of power claims.

Furthermore there are also a couple of aspects known from literature that can foster the awareness of young students for choosing a career in science. For example Gunderson (2012) found out that it is important for young people to consider a career in science, the attitude and examples of teachers, parents and other relatable persons are important. In order to engage young students in science, there should be approachable examples of people who are employed in science, and they should be accessible for young people. One can think of persons in the personal circle of the youngster, for example friends or family (Jacobs & Bleeker, 2004).

1.4 Research

This thesis is part of a larger European-funded project; the ALLINTERACT project. While some research has been carried out on how to engage citizens in science, there is very little scientific understanding of promoting participation of young people. The major objective of the ALLINTERACT project is twofold. On one side it is to generate new knowledge about how to transform possible citizen participation in science into actual engagement in scientific research and on the other side to discover ways of diversifying the field of science and finding new ways to engage citizens in science. The idea of the project is that although citizens do not see the importance of participating in science or the benefits of research for society, they would be prepared to participate in scientific research when they become aware of the impact this research had on society and everyday life.

As part of this larger project, the aim of this thesis is to gain knowledge about a) the awareness of young citizens about the benefits and impact from scientific research for society, b) their awareness of initiatives succeeding at engaging citizens in scientific participation and foster recruitment of new talent in science, and c) the policies that promote these both. In order to do so it is important to choose the research design that will help answer the research questions (Brookes & Normore, 2015). Because the research is about the awareness of young students it is important to use a method that takes their ideas, opinions and awareness into account. In order to do so, the methodology that will be used are focus groups.

Considering all the above, the main question of this thesis was the following: "To what extent are young students aware of the benefits of science for society and participating in scientific research?" In order to answer this main question the following sub-questions were used:

a) To what extent are young students aware of how citizens benefit from scientific research?
b) To what extent are young citizens aware of the impact of scientific research?
c) What kind of awareness-raising initiatives succeeding at engaging citizens in scientific participation do young students know?
d) What kind of awareness-raising actions that foster the recruitment of new talent in science do young students know?
e) What policies that promote awareness-raising actions and citizen engagement in science do young students know?

The thesis is composed of four themed chapters. Chapter one presented the introduction and theoretical exploration of the study. Chapter two is concerned with the methodology used for this study. Following that, chapter three analyses the results of the focus groups. The final chapter draws upon the entire thesis, tying up the various theoretical and empirical strands in order to offer some conclusions.

2. Methodology

2.1 Method

The ALLINTERACT project (Allinteract, 2021) used a mixed methods approach. Four types of methodology have been used, namely: a systematic literature review, social media analytics, a survey, and an intervention study with communicative focus groups. This thesis focuses on the first part of the intervention study and explores young students' awareness of the social impact of science and the benefits of scientific research for society. In order to answer the research questions, data for this study were collected conducting two communicative focus groups. By employing qualitative modes of enquiry, this study tried to take the whole picture into account.

2.2 Focus groups

Qualitative methods offer an effective way of a more holistic research approach. A focus group is a qualitative research method with an explorative character. According to Powell & Single a focus group "is a group of individuals selected and assembled by researchers to discuss and comment on personal experience, the topic that is the subject of the research" (Powell & Single, 1996, p. 499). In other words, it is a form of group interview that profits from the interaction between researchers and participants in order to generate data. The difference with group interviews is that focus groups explicitly use this group interaction as part of the method.

Focus groups are especially useful for exploring people's experiences and knowledge (Kitzinger, 1994). The idea behind the focus group method is that group processes can help people to discover and define their opinions in ways that would be less easy to do so in an individual's interview (Kitzinger, 1995). Logically it was decided that the best method to adopt for this investigation. In this study, the use of focus groups provided knowledge on how students think about the research topic. The composition of the sample depends on the objective of the research and the availability of participants (Scribbr, 2017). Most studies with focus groups involve just a few groups, and some combine this method with other data collection techniques (Kitzinger, 1995). The constitution of a focus group needs great care to get the best quality of dialogue (Stewart and Shamdasani, 1990).

The focus groups were designed following the focus group protocol that was constructed within the ALLINTERACT project. (Allinteract, 2021). For this study two focus groups were

implemented, with 6 participants each (12 people in total). The focus groups were conducted with young citizens (age: 16-29). Criteria for selecting the participants were that they had to be students from the University of Groningen. Coming from different faculties and tracks to keep the focus groups as diverse as possible. Participation was voluntary. The decision to take part in the focus groups was taken in absolute freedom and participants weren't in any way pressured to participate. The possible risks and benefits of participating had been explained to the members of the focus groups (Harvard University, 2017). All participants had received written and oral information about the project and had signed a consent form. The records of the focus groups have been stored by the University of Groningen who collected the data in the dispositive approved by their ethical board.

Participants were recruited by asking in personal circles, placing calls in several large WhatsApp study groups (100+), reaching out to classmates, colleagues, friends of friends and asking members of the LGBTQ+ student association via Whatsapp. Consistent with the idea of ALLINTERACT's research that citizens are not willing to participate in science if they are not aware of the benefits of this research for society (Allinteract, 2021), most of the people asked were not interested in participating in the research.

Both focus groups have been recorded and transcribed for later analysis. By pseudonymization techniques, the privacy of the contestants was assured. Table 1 presents the pseudonyms and roles of the participants in the focus groups.

Table 1. Pseudonymous participants in focus groups and interviews undertaken by RUG

Focus group/interview	Pseudonym	Role
Focus group 1 (FG1)	Lucas	Student
Focus group 1 (FG1)	Julia	Student
Focus group 1 (FG1)	Yara	Student
Focus group 1 (FG1)	Kostas	Student
Focus group 1 (FG1)	Kelly	Student
Focus group 1 (FG1)	Liam	Student
Focus group 2 (FG2)	Mary	Student
Focus group 2 (FG2)	Mateo	Student

Focus group 2 (FG2)	Sophie	Student
Focus group 2 (FG2)	Eleni	Student
Focus group 2 (FG2)	Anika	Student
Focus group 2 (FG2)	Emma	Student

2.3 Design of the study

The focus groups conducted followed the individual and collective protection measures based in the country due to the COVID-19 pandemic. Because of the COVID-19 measures, social distance has to be guaranteed to guarantee the health of the participants (Kite & Phongsavan, 2017). Therefore, the focus groups have been implemented online (Howlett, 2020) on the 14th of July and the 09th of December 2021. The date and time were scheduled together with the participants. The focus groups lasted approximately 2 hours.

The language that was used during the focus groups was English, which is not the native language of any of the participants. However, the knowledge of the English language of each participant was sufficient to fully understand the opinions of others and to share their own opinions. Factors which could affect the development of the focus group have been foreseen and dealt with.

The focus group was led by the moderator and the assistant-moderator. The moderator of the focus groups was in charge of giving turns to participants who wanted to contribute to the discussion. The moderator did always prioritize those participants who were contributing less in order to ensure egalitarian participation. The assistant-moderator took notes, helped with the explanation of the scientific evidence, and asked further questions when necessary.

The outcome was an egalitarian dialogue between the researchers and the participants, following the Communicative Methodology (Gómez, Puigvert, & Flecha, 2011; Gómez et al., 2019). The scientists provided scientific evidence related to the topics of discussion and the participants shared their knowledge of daily life. Prior to the implementation, all researchers involved were trained on how to design and implement a focus group. Following that, the script and the supportive material (PowerPoint document) were created.

During the focus groups five topics were discussed, as can be seen in table 2. For each of these topics, 3 statements were used to encourage participants to talk about the topics and to

trigger the discussion between the participants. These statements were identified in previous steps of the overall project, and more specifically on the literature review and the social media analytics that was previously conducted.

The participants were welcomed to the focus groups in an informal way and the focus group started with an easy warm-up question. After that, each time the topic was shown to the participants. After the 3 statements were shown, participants were encouraged to react to the topics and statements and to each other. Then the scientific evidence was presented to the participants. After that, they were asked if it changed their opinions or not, if it brought them to new ideas or made them think about something. Then the same procedure followed for the next topic, with a break after 3 topics. At the end the contestants were thanked for their participation and contribution to science and were given contact information for any further questions.

2.4 Analysis

To analyze the transcripts of the focus groups, the dimensions and initial categories from the ALLINTERACT project (Allinteract, 2021) were followed (see Table 2). Quotes of the participants were extracted from the transcripts. All of these outings made by the contestants were categorized into 5 tables, each of the tables belonging to one of the 5 topics of the project. Full interview transcripts are included in the appendices.

For the purpose of analysis in these 5 tables, a difference was distinguished between the transformative dimension and the exclusionary dimension (Pulido et al., 2014). The transformative dimension included those messages that evidence what facilitates the subject of the topic they were related to. Fostering aspects named by the participants were placed in this category. The exclusionary dimension included those messages that show obstacles hindering the achievement of the targeted subject of the topic they were related to. Aspects that could be hindering this topic were placed in this category. The table also indicated the level of intervention, field of intervention, audience, level of access to scientific evidence and social impact (yes or no). Only topic a used a different table, also derived from the project.

In order to answer the research questions, a thematic analysis was executed. Thematic analysis is a qualitative research method, which was first introduced in psychological research (Flick, 2014). However, it can also easily be applied to (ortho)pedagogical research or other forms of behavioral or social sciences. Thematic analysis was developed by Braun and Clarke

(2006) and has similarities with narrative analysis (Taylor et al. 2012), discourse analysis and grounded theory analysis (Watling & Lingard 2012, Bansal et al., 2018). This method is known for analyzing qualitative data. It involves searching through a set of date identifying and reporting patterns and themes. Thematic analysis can be very useful to describe data in detail and to interpret the subject of research.

Using thematic analysis, the quotes of the participants were thoroughly reviewed while selecting and constructing themes. Each outing of the participants was labeled at what the statement was related to and statements pertaining to the same were grouped. Subsequently, an attempt was made to create an image of the awareness of the participants and their opinion of the research topics. Thenceforth general conclusions about the quotes were drawn from the statements the participants made about each topic and both of the dimensions, based on the clusters that came up from the table.

Qualitative researchers should be clear in the description of their research methods (Pratt et al., 2019) so that methodological transparency is guaranteed. Both for the sake of replication and trustworthiness so that becomes clear whether one can trust the interpretations of the researcher. In order to be as transparent as possible, the protocol of the focus groups (Allinteract, 2021) is followed, which is to some extent recognized as good practice in qualitative research (Yin, 2003). Moreover the dimensions and topics of the focus groups are shared. Following up on the naturalistic inquiry by Lincoln and Guba (1985), it is tried to 'show' the reader the findings, instead of 'tell' them by providing a lot of details and adding the quotes of the participants to the tables (see appendices). This way it is tried to be as transparent as possible. Yet the ordering of the topics sometimes differs in both focus groups, for participants referred to a different topic while discussing another topic. Still, even if one shared every question and topic, although it still would not lead to perfect replication (Pratt et al., 2019), since the same topics are discussed in each focus group, a general picture could be formed of the awareness of the participants.

Table 2. Definitions of dimensions and categories for focus groups.

Dimensions	**Transformative dimension** includes those messages that evidence what facilitates the social/political/scientific impact mentioned.

	Exclusionary dimension includes those messages that show obstacles hindering the achievement of the targeted social/political/scientific impact.
Topics	How citizens' benefit from scientific research.
	Citizen awareness of the impact of scientific research.
	Awareness-raising initiatives succeeding at engaging citizens in scientific participation, including the Open Access movement.
	Awareness-raising actions that foster the recruitment of new talent in sciences.
	Policies that promote awareness-raising actions and citizen engagement in science.

3. Results

3.1 TOPIC a) How citizens' benefit from scientific research

The focus group participants reported that citizens benefit from scientific research in the social, political, and scientific field. Looking at the social impact of scientific research, participants reported that research in education can create more equal opportunities for some children, e.g., those coming from working families. Moreover, they mentioned that research in education might better support an individual on their everyday decisions as well as to evaluate which information they can trust or not. In terms of research's political impact, the participants reported that research in education can inform policies and therefore support citizens to make important decisions such as whether a student should go to a school for special needs education. Finally, one participant, Lucas, indicated that he thought "research is the base for societies to move forward" (full interview transcripts are included in the appendices).

If we now turn to aspects that hinder citizens' benefit from the social, political, and scientific impact of scientific research, the focus group participants reported some aspects as well. For example, relevant to the social impact of research, they reported that although research in education is indeed conducted, it is not implemented in real life education. Therefore, citizens do not get to benefit from that. One participant, Anika, indicated that she thought "it's also because of the accessibility to the scientific research". According to the participants, citizens do not have access to research because they do not have the right tools (e.g., databases to give them access to scientific papers), and/or time and motivation to study so much. Additionally, according to the participants, most of the scientific papers are written in English and not all people can read/ understand English. Participants were skeptical about science and whether research is taking place to help society or for the purpose of profit and about whether they can trust the media which is usually the source from which they are being informed about research.

The participants recommended that citizens would benefit more from scientific research in education if research involved more actively the students and took into account real life education. Moving to the political impact of research, they reported that policies do not take into account the research in education. Mateo indicated that he thought in scientific research "we are like in our bubble " and "are not in real life". In terms of the scientific impact, they reported that research in education should take more into account the students, teachers, and real-life

education instead of focusing only on publishing papers for the benefit of research. Real life education should benefit from research and vice versa.

3.2 TOPIC b) Citizen awareness of the impact of scientific research

The students that took part in the focus groups reported several examples of citizen awareness of the impact of scientific research. It is worth mentioning that it was easier for the participants to identify how citizens benefit from research in everyday life and especially from medical science. One participant, Kostas, indicated that he thought in scientific research "we need the research in everyday life". An opinion often heard was that citizens are aware of improvements for daily life. Another view that was often mentioned was that it is important to take the opinion of citizens in general and students in particular into account, when they participate in scientific research. The students who participated in the focus groups found it very important that the research would be interesting for them. Students were aware of the fact that research is important for society to move forwards. They think that science can play a big role in improving society for all citizens. So if citizens want to influence the society they live in, it is important that they are active in the research that provides results for this society to improve. Last but not least, students mentioned that it is not expedient to make statements without proper evidence to state them.

The participants also reported some hindering aspects for the citizen awareness of the impact of scientific research. First of all the participants had difficulty to identify the impact from scientific research in education. Especially the participants of the second focus group were very resistant to acknowledge the impact shown by the scientific evidence provided by the moderator and assistant-moderator. They were mostly skeptical towards scientific research in education, questioning who benefits from this research and pointing out that the outcomes of this research does not reach public schools. What was most heard is that science has a bad image. Students stated science as not interesting, too difficult for most people, too far away from society and students therefore think that scientific research is not interesting to them. Or as Sophie stated "I think that it is too difficult for them" and "if you really want to reach all the people, you will really have to make it accessible and really simple".

The participants mentioned that awareness depends on one's own interests, but also on their country of origin, current life state and social economic background. Participants think that

it is very important to find the right people for the right topic, but also that some research topics are not very interesting for students in general.

Another point often shared is that students find most inventions from science so commonly used, that they don't even realize that research has preceded it. According to Sophie stated “because of we see all these benefits every day, a lot of people don't realize they exist”, which was underlined by Mary saying “because of we see all these benefits every day, a lot of people don't realize that they exist”. The participants stated that they just don't think about the fact that there is scientific research behind most inventions that improve society. Additionally students mentioned that they don't realize that there are actual people behind research. They seemed to see science as an abstract object, but not as something that people achieved.

Another point mentioned was that scientific research is not reaching the citizens, because scientists are not using the right platform of medium. In the opinion of the students, researchers use mostly their own platforms, instead of the platforms students and other citizens use, such as social media. In order to reach the students, researchers should use the mediums their targeted audience uses. Moreover the participants stated that science outcomes should be more visible to society and suggested that researchers could use marketing campaigns. Some students shared the opinion that scientists do research just for their own benefits. They do not trust the media and therefore does not give citizens a good idea of the real scientific outcomes. They showed their skepticism about the news that people get from the media and if this is the right information from research indeed.

3.3 TOPIC c) Awareness-raising initiatives succeeding at engaging citizens in scientific participation, including the Open Access movement

The focus group participants did not identify specific initiatives that succeed in engaging citizens in scientific participation. The students shared their own willingness to participate in research related mostly to medical science, especially after the recent pandemic, as well as their willingness to fill in a questionnaire to help someone with their research. Participants do seem to agree on the fact that it is important for citizens to be aware of scientific research. Students stated it is important to be up to date with the latest news from research and that research can make great improvements for society.

They did not however, specify how research makes these improvements and what

improvements for society have been made by scientific research. The participants pointed out that it is important for scientists, when they try to engage participants, that they keep certain objects in mind. The participants shared the opinion that it is important to get the right people for the right topic. As, among others, Lucas stated “I think it’s important to find the right people for the right research”. Participants would be more interested in taking part in scientific research, if the topic would be interesting to them personally. In addition to the subject mentioned in the discussion about topic b, about the need for more visibility of research in daily life. As one of the participants, Julia, indicated that she thought “”a solution would be to make them more in the spotlight”. Participants mentioned that science should be presented on social media. Or as Mateo suggested “Facebook, Instagram”. The participants mentioned in addition to this that research is not in the spotlight enough as it is today. According to the students science is not presented at the right medium right now in order to reach society. The participants also mentioned again that it is important that outcomes of scientific research should be more easily accessible for all and it should be presented in a language that citizens understand. Another point of view mentioned was that researchers have to use some really strong examples when presenting research. Finally, some of the students also agreed that there should be a reward for the participants to compensate for their time.

When the participants were asked to discuss research in education, they were mostly concerned about discussing their negative experiences from school. Instead of initiatives they offered advice for future research and stressed the importance of bottom-up approaches. For example, the students suggested that researchers in educational research have to first change the curriculum of future teachers in order to change the education. Some students also pointed out that they think researchers should talk with students instead of about the students, in order to get them more actively involved in topics that concern them.

Additionally, some hindering aspects for engaging citizens in scientific participation were added to the ideas about objects that researchers need to have in their mind when they try to engage participants. Participants again repeated that researchers do not use the right medium to reach all citizens and access to research should be ensured. Some students made the bold statement that scientific research in education never reaches the classrooms because policy makers and curriculum designers are not interested in research. Some students mentioned that in their county there is not a proper training for teachers, which is a huge problem in implementing

research in education.

Moreover, some students mentioned that some teachers are old and not aware of scientific research or interested in learning about science, which could be a hindering aspect in participation. Students also thought that the language is a problem, for most research papers are written in English and not all teachers have a knowledge of the English language that is sufficient to understand these papers and therefore the outcomes, which can be a barrier in transferring outcomes into education and the society. Mary did even go so far as stating that " only countries that have as their primary language English, benefit from all the research done".

The participants reported the concerning point that they thought that research in education is too far away from practice. The other verb is that at this point it is not easy to implement science into education, for it is too hard and therefore not being used. Research is, to their opinion, a field on its own and is therefore not practiced or implemented in education nor in society. Indefinitely this seems to be a problem for education.

On a more personal level, some of the participants stated that they think there are too few personal benefits for them to participate in research. They stated that they don't get enough of a personal reward from it and also that the outcomes and benefits for the participants are not clear. Additionally, they mentioned that it is often not clear to participants what the possibilities of science are which makes it harder to get citizens engaged in science.

3.4 TOPIC d) Awareness-raising actions that foster the recruitment of new talent in the sciences

On the topic of awareness-raising actions that foster the recruitment of new talent in sciences, the participants made a lot of suggestions. For example, organizing events was considered an encouraging action for awareness raising. Students mentioned that it is a good idea to organize tournaments in both elementary school and high school about several research topics such as physics or mathematics. The students also brought up the idea of organizing research projects in secondary school, where students of the high schools do research themselves in the classroom. The participants also talked about organizing science-events in schools, where companies and professionals come to tell students about their jobs and can ask questions. This way one would bring science into the classroom. As Giannis mentioned "tournaments about physics, mathematics", Emma brought up "events this university sometimes organizes, like open days"

and Mary complemented with “I think it would be beneficial for students to have professionals talk to them and how they work how the profession”.

Students mentioned that besides piquing the interest of young pupils, it would also be good for the youngsters to have a person they can ask questions about working in research too. The students speculated that this kind of event would increase the interests of students to work in science. Moreover the students spoke about organizing an open day at the university, so people can visit the university and see what it is like studying and having a career in science. So the students considered it would be equally important to bring science into the classroom and also to bring pupils and students from the classroom into the university and the world of science.

Following form this, the participants emphasized, was the importance of role models. In both focus groups the students pointed out the importance of role models and examples in recruiting new talent in science and for pupils to understand that becoming a scientist is not something that is impossible, but a goal they can actually reach. Or as one participant, Mateo, stated it “, I think one of the most important things is to have examples of people who have studied science, or something already, and make science near for you. Because in this way, you see that it's not something impossible, because you have an example, a concrete example”. Students underlined the fact that it is important for young people to know that science is something they can do themselves, something actually reachable.

Another important aspect of recruiting new talent in science was also mentioned by the students in two other topics, namely the importance of using the right media to reach the youth, i.e., the media they use frequently and also that it is important to make science more attractive in general to young students and pupils in education. The participants considered the idea of using campaigns in order to promote the outcomes of science. This way the outcomes of science would be more presented in everyday life.

Additionally, some hindering aspects for recruiting new talent in science were added by the students to the ideas about fostering awareness of young people of the ability to have a career in science. When the fostering aspect they mentioned in the paragraph above are not facilitated, students stated that this could be a real hindering factor for engaging young people in working in science. Participants stated that this also has to do with the idea that researchers are too much in the background. In the opinion of the students, researchers are not visible enough. Students

mentioned that the scientific world in general is not very visible in everyday life. As Julia stated "because it's all so in the background, the whole scientific world".

Moreover the students mentioned some other remarks according to the curriculum of schools. Participants pointed out that if scientists want to foster the recruitment of new talent in science it is important to keep in mind that the information about courses should be early in the curriculum. Besides it is important to include every pupil and to not exclude children who are not good at science are traditionally marginalized from it. In order to reach all children, students point out that there is not one way to reach and teach children but that different ways work for every person, for every child and every person is different.

3.5 TOPIC e) Policies that promote awareness-raising actions and citizen engagement in science.

In the last topic of the focus groups, the participants spoke about policies that can promote all the above topics. One of the participants, Yara, admitted that she had never thought about this subject "I have never really thought about engaging people in science", but also pointed out "but I think it's really important that we do that more often".

Although the participants came up with some ideas to improve policies, it also became clear that they have opposing ideas about policies that promote awareness-raising actions and citizen engagement in science. On the one hand some participants mentioned that in their opinion there are not enough policies to ensure citizen participation in science and according to them it would be a good idea to make more policies that promote the engagement of citizens in science. On the contrary some students stated the complete opposite, that in their opinion policies are going too far and that it is not necessary to have that many policies. Kelly for example stated "Generally, I don't think there are enough policies to ensure that citizens participate in science" where Sophie stated "Sorry, but I do not really agree with your opinion… I think that sometimes it goes too far". The participants clarified this by giving the example that in their opinion it is not a good idea to have policies for example that promote more women in science, because in their opinion it is not desirable to favor one person over the other based on their gender.

So policies is a topic the participants strongly disagreed on. Where they did agree on however, are the facts that policies should be primarily aimed at children and that policies should prevent discrimination, also in science. The participants all agreed on the fact that in their

opinion it is important to create equal opportunities for everyone no matter your gender, race or ancestry. All students did also agree on the fact that citizens should be involved in research topics that have their interest and to have the right person in the right place and that this is more important than anything else

Considering the ideas to improve the policies, students named the fact that first of all it is important that people should know the possibilities that exist in participating in research. Students stated that in their eyes, this is for many citizens not clear. Policies should promote the fact that people become more aware of the possibilities to engage in science. In order to do so the students thought it is very important that people are interested in topics that already have their interest, so that it would be more easy to recruit these citizens.

4. Conclusion and discussion

4.1 Conclusion

The purpose of this thesis was to determine to what extent young students are aware of the benefits of scientific research for society, the social impact of science and the importance of participating in science. This thesis was undertaken to describe what kind of awareness-raising initiatives succeeding at engaging citizens in scientific participation and what policies that promote awareness-raising actions and citizen engagement in science do young students know? Returning to the questions posed at the beginning of this thesis, it is now possible to give a description of the awareness of young students about these topics.

First of all this study has shown that the young students in the focus groups are, to a certain extent, aware of how citizens benefit from scientific research for the participants reported examples of benefits in the social, political and scientific field. Conversely, young students mentioned some aspects that hinder citizens' benefit from science as well.

Second, along with these benefits participants reported several examples of citizen awareness of scientific research withal, showing that to this topic they are also aware to some point. Moreover, they mentioned impacts on everyday life. However, these outings were followed by some hindering aspects for the citizen's awareness of the impact of scientific research, which mostly had to do with the image, visibility and accessibility of science. The participants stated that it is important to make research more interesting and more visible, by making use of the right mediums. They also stated some recommendations for education, which mostly had to do with changing the curriculum.

Third, the focus group participants did not identify specific initiatives that succeed in engaging citizens in scientific participation, so the students do not seem to be very aware of that. They are, however, aware of the hindering aspects for engaging citizens in scientific participation, for they named a lot of hindering factors in this context. On a more personal level, some of the participants stated that there are too few personal benefits for participating in science and that outcomes and benefits for are not clear.

Another point where the participants seemed to be well aware of is awareness-raising actions that foster the recruitment of new talent in sciences. On this topic the participants made a lot of suggestions, mainly to do with organizing all kinds of events for all

kinds of levels of education. Moreover they pointed out that it is very important to have role models to look up to. Forthcoming, the participants stated that an absence of these events and these role models, would be a very hindering aspect.

Last but not least is the awareness of the policies that promote all the above. Interestingly, the participants opposing ideas about policies that promote awareness-raising actions and citizen engagement in science. On the one hand some participants stated that there are not enough policies, while other participants on the other hand stated that there were not enough policies.

All in all it is not uncomplicated to give an unambiguous answer to the question to what extent young students are aware of the benefits of science for society and participating in scientific research. Evidently however, it can be stated that young students are to some extent aware and are indeed very well capable of sharing their opinions about the research topics, naming fostering and hindering objects to these topics and handing their recommendations.

4.2 Discussion

4.2.1 Concerns remain

As mentioned in the literature review, previous studies have reported that scientists are doing their best to involve citizens in science (Chilvers & Kearnes, 2019). Nevertheless, concerns about participation of citizens in science remain (Lezaun et al., 2017). The results of the analysis substantiate this concern for although the participants were aware of some benefits from scientific research in the social, political and scientific field, they also seemed to be unaware of other benefits for society and participating in scientific research. Moreover, in both focus groups a lot of hindering aspects on all topics were stated.

The impact on society presents themselves over time (Morton, 2015), whereby citizens find it difficult to attribute the benefits to research (Spaapen & Van Drooge, 2011). Students validate this by stating that most inventions from science are so commonly used, they don't realize research has preceded it and do not think about the connection between inventions and scientific research. Another aspect named by the participants, is that people don't realize that research has preceded an invention and that they don't realize that there are people behind science, which corresponds to the fact that even when citizens are aware of the impact, they are not aware of the fact that they can contribute to science (NASEM, 2018).

Thus, concerns about the participation of citizens have continued in studies in the social field of science and innovation (Lezaun et al., 2017) and if we look at awareness-raising initiatives succeeding at engaging citizens in scientific participation, this maybe could be justified because participants of the focus groups did not identify specific initiatives that succeed in engaging citizens in scientific participation. Moreover, the participants of the focus groups were resistant to acknowledge the impact of scientific research on society and were skeptical towards scientific evidence for if students have this attitude towards science, it is more likely that they are not willing to participate. Because people are willing to be actively involved in science, if they become aware of the social impact of scientific research and the benefits of it for society (Allinteract, 2021) the opposite could also be true and this could be a serious obstacle to participation from young students in science.

In line with that, the problem according to Caprile et al. (2015) is that there are still a lot of young people who are not interested in scientific research in general, participating in it or having a career in science. In a recent research by Kotkas et al. (2021) not pursuing a career in science, has to do with the attitudes of students towards scientific research and a career in science. Partly, this seems to be the case. However, participants named a lot of ideas and objects that they think could help raise awareness for a career in science and participants did agree that it is important for citizens to be aware of scientific research.

Moreover, according to Bornmann (2012) outcomes of academic research are not reaching the society. This is substantiated by the participants of the focus groups. They stated that research is not implemented in real life and therefore citizens do not benefit from science. The participants brought up the concern that in their opinion, the outcomes of science are not reaching the society. The students in the focus groups worried that research is too far away from society and therefore is not being used.

All of this could result in a situation in which science only involves the input of scientists (Cohn, 2008) and outcomes that are not suitable for all populations (NC, 2019). This is a serious reason for concern, because if this is true, science will stay a closed community that does not reach lots of citizens in society.

4.2.2 Fostering participation in science

In 2016, Wooley et al. published a paper in which they opposed the idea that citizens would participate in science if they clearly knew the benefits for society and for themselves. First of all, the participants of the focus groups stated several times that personal benefits of participating in scientific research are not clear to them, which could explain why not many citizens are willing to participate in scientific research themselves. Most students from the focus groups do however seem to seek advantages from scientific research for theirself, as investigated by Chapman & Wyndham (2013) and seem to be aware of improvements for daily life and of the importance of research for society to move forwards.

A second aspect that was stated a couple of times is the fact that students think that it is very important that everyone in the society can benefit from science. Therefore it is important that everybody has access, because if citizens have less access to participation, one benefits less from science (UN, 2019). Another possible reason can be that the students in the focus groups think that science is too hard to understand for many people. Too much perceived difficulty lowers feelings of competence (Patall et al., 2018) and stirs up more negative emotions in students (Kim et al., 2018). This could be a reason why citizens are not willing to participate in science

Third, participants stated that, in their opinion, science has a bad image, is too far away from the people and therefore not interesting. Although young students are not seen as a traditionally excluded group, they do have less access to scientific participation (Pandya, 2012).. The students stated this research, by pointing out that in their opinion there is something wrong with the image of science in general. This fits in perfectly with the statement of Holmegaard et al. (2014) that science is not implemented in the everyday life of students and is presented in an unattractive way. Despite the efforts of researchers being made, according to the participants a lot of citizens still do not have access to research

A fourth reason according to the participants of scientific research not reaching society, can be scientists not using the right platform of medium. In order to reach the students, researchers should use the mediums their targeted audience uses according to the participants. So it seems to be a good development that researchers are experimenting with new ways of spreading outcomes, such as posting their findings on social media (Ozanne, et al., 2017). In order for society to benefit from the outcomes of scientific research, these should be transformed

into consumable and salable products (Lamm, 2006).

Another interestingly point is that the students in the focus groups stated that they are not actively involved, and that organizations don't take the opinion of students into account. This statement contrasts with the idea of a trusting, power-sharing relationship as mentioned by Andersson (2017b) and Cahill & Dadvand (2018) and the research of Lundy (2007), which states that listening to the opinions of young people and showing interest in their ideas as part of this society is important. In order to reach the students, it is thus important to take the opinions of students into account.

Thereby, the attitude towards the participation of youngsters should be positive (Gal, 2017; Bourke & Loveridge, 2018). Some students also pointed out that they think researchers should talk with students instead of about the students, in order to get them more actively involved in topics that concern them. The participants stated very strongly that real life education should benefit from research and vice versa, but that in their opinion this is not the case at this point in time.

4.2.3. Fostering recruitment in science

Additionally, some ideas about fostering new talent in science were stated. According to the participants the first aspect, is the importance of starting to raise awareness at a very young age. This is supported by the research of Mager & Nowak (2012) which states that it is important to encourage participation in scientific research at a very young age. Students substantiate this by mentioning that the curriculum of future teachers should be changed.

Another important aspect on this topic as pointed out by the participants, is the presence of role models. This opinion of the participants supports the idea of Gunderson et al. (2012) that teachers, parents and other relatable persons are important for choosing a career in science. In both focus groups, role models were seen as very important aspect for recruiting new talent in science, because students think that pupils need examples of people who work in this profession and that it will show them that they can do it themselves too, which connects to the personal circle of young people as mentioned by Jacobs & Bleeker (2004). They pointed out that is very important to see that working in science is not an unreachable goal, which ties in seamlessly with the outcomes stated by Tytler & Osborne (2012) that awareness has been recognized as an important factor in supporting students to pursue a career in science. If youngsters don't have

good role models in their personal context, contact with scientists should be offered in a different way, according to the participants.

4.2.4. Policies

Finally, according to Bourke & Loveridge (2018), all of the above should be implemented in systems and organizational culture. The participants of the focus groups, however, had opposing ideas about policies that promote awareness-raising actions and citizen engagement in science. On the one hand asking for more policies and on the other hand for less. According to Gal (2017), however, it is important in order to disseminate participation in society and science, to set ideas in rules and policies as part of a detailed regulatory regime (Gal, 2017).

4.3 Strengths and limitations

Despite the fact that it is complicated to give an unquestionable answer to the question to what extent young students are aware of the benefits of science for society and participating in scientific research, the value of this research lies in the fact that it provides more information about the opinions, statements and awareness of young students. This project provided an important opportunity to advance the understanding of the awareness of young students of the social impact of science, the benefits of scientific research for society, engaging citizens in scientific participation and the recruitment of new talent for science and the policies that promote these all. The study offers some important insights into the aspects named by the young students in the focus groups, both fostering and hindering. Furthermore a number of reasons for concern and some recommendations are named by the participants as well. Therefore, this study makes a major contribution to research on this topic in general and the Allinteract project in particular.

The strength of my research lies in the fact that it gives an overview of what is already going strong in involving young people in science, but especially in the fact that it points out the aspects hindering participation of citizens in general and young people in particular, so that it becomes clear where science should work on in order to let people participate in science more. If researchers know what is hindering participation on this point, they can make an effort to remove these obstacles in order to promote participation in science.

Although every effort has been made to work as carefully as possible in this research, due to practical constraints, this paper contains a couple of aspects that could be

critically reflected on. First of all the reader should bear in mind that the study is based on only two focus groups with 6 young students each. Whichever may have been too small, for now only the opinions of the participants in the two focus groups have been taken into account.

Another potential problem is that all the participants in the focus groups were students from the University of Groningen and from the area of education. This is not a very diverse group and therefore is not representative of the population. More focus groups with different people from different study areas, could give different opinions and therefore different results.

Withal, the conclusion from the quotes is subject to interpretation. Some expressions could fit into more than one category. In that case the outcome also depends on the researcher. In this study, it was decided to place utterances only under one category, but it could also be chosen to have the same utterance appear under multiple categories, with other potential outcomes as a result.

4.4 Recommendations

4.4.1 Recommendations for future research

This research has thrown up many questions in need of further investigation. More research is needed to better understand the awareness of young students about the benefits of science for society and participating in scientific research. Not to mention the awareness of other groups of other minority groups and citizens in general.

In general, students in both focus groups are aware of the fact that research helps society to move forward and that it can be a great help in decision-making processes. It would be interesting to compare the experiences of other students within the same age range. Considering the participants mentioned that it is important for them that their opinion is taken into account and that they can actively participate in science, it is recommended that there are more focus groups conducted about several topics considering young students.

Consequently, the participants of the focus groups were resistant to acknowledge the impact of scientific research on society and were skeptical towards scientific evidence. This information can be used to further investigate this attitude towards science. Along with this resistance, participants pointed out several times that the topic of research should be interesting to the citizens participating in research. On the grounds that a person's interest is very personal, further research needs to examine more closely what makes certain research topics interesting to

citizens in general and young students in particular. The issue of what topics are interesting to participants, is an intriguing one which could be usefully explored in further research.

Additionally, the participants emphasized the importance of good role models. This also emerges from the literature. Taken together, these findings support strong recommendations to make role models a main topic on the research agenda. The absence of these role models seem to continue to encourage a cycle of non participation. Therefore it seems to be very important to find out how to set good role models, how to get them in contact with students and how to implement this all in education.

Considerably more work will need to be done to determine whether it is possible to make the existing policies more visible and more easily accessible, and what is the most convenient way to do this.

4.4.2 Recommendations for policy and practice

In addition to the suggestions for further research, are a number of important suggestions for policy and practice to be made. One of the main hindering objects named by the participants for more participation of citizens in science, is the fact that research does not connect to real life. There is, therefore, a definite need for more connections between science and society. A key policy priority should be to convince young students and other citizens of the benefits of scientific research for society and for participating in science for their personal lives. Moreover the bad image of science as pointed out by the participants should be changed. According to the participants it is important to make science more attractive to different kinds of citizens and to make the topics of research more interesting to many people.

Another important practical implication is that research should be made available to all kinds of people. By reason of participants stating that science is often too hard to understand, outcomes of scientific research should be presented in a more easy language in order to reach more citizens. Thereby, almost all outcomes are presented in English, which makes it less accessible to people who do not master the language. Therefore, the most interesting research results should be translated in many different languages. Thereby making science accessible for all people and more easy to understand, is important stated by the participants, in order to accomplish more diversity in participants so that the outcomes are usable for all populations. Additionally,

important to the participants seems to be the topic of research being interesting to the participants, for this is mentioned several times during different research topics.

These more accessible research outcomes should be distributed both online and in real life. Thus science and research would be more easily accessible and be more represented throughout the whole society. A suggestion about this topic had been made by the participants. According to them it is important that science is represented in the right media. It should be more represented on social media and the platforms that reach the youth. With that, science should also be presented in a more attractive way, according to the participants. Important hereby is to include the opinion of the youth themselves, since they know best on what platforms and media they are most active. Thereby, the students state that more use should be made of marketing campaigns and that science should be more represented throughout society.

In order to recruit more talent for science, the participants made several suggestions of organizing events in all levels of education. For the recruitment of new talent in science, it would be interesting to bring science into the school and bring the schools into the university. Participants stated that these events all should be presented in different ways, for not every person is the same. As students think that pupils need examples of people who work in this profession, it is important to consider more actively involve role models of people working in science, in education. The students mentioned the importance of professionals coming to tell students about their jobs and organizing open days at the university, so people can see what it is like to have a career in science.

Unless governments adopt new policies on participation, awareness and enhancement will not be attained. For exaggerating societal benefit, interaction between policy makers and researchers are necessary. The most important matter according to the participants was the fact that people should know policies exist. Additionally, according to the students, new policies should be made in consultation with young people, other minority groups, people of practice and citizens in general. These policies should be primarily aimed at citizens and should encourage participation in science.

5. References

Aguinis, H., Shapiro, D.L., Antonacopoulou, E.P., & Cummings, T.G. (2014), "Scholarly Impact: A Pluralist Conceptualization," Academy of Management Learning & Education, 13 (4), 623–39

ALLINTERACT – H2020 european research. (2022). ALLINTERACT. Geraadpleegd op 1 oktober 2021, van https://allinteract.eu/

Andersson, E. (2017). The pedagogical political participation model (the 3P-M) for exploring, explaining and affecting young people's political participation. Journal of Youth Studies, 20(10), 1346–1361. https://doi.org/10.1080/13676261.2017.1333583

Bansal, P. T., Smith, W. K., & Vaara, E. (2018). New Ways of Seeing through Qualitative Research. Academy of Management Journal, 61(4), 1189–1195. https://doi.org/10.5465/amj.2018.4004

Bonney, R., Phillips, T. B., Ballard, H. L., & Enck, J. W. (2015). Can citizen science enhance public understanding of science? Public Understanding of Science, 25(1), 2–16. https://doi.org/10.1177/0963662515607406

Bornmann, L. (2012). Measuring the societal impact of research. EMBO reports, 13(8), 673–676. https://doi.org/10.1038/embor.2012.99

Brooks, J. S., & Normore, A. H. (2015). Qualitative research and educational leadership. International Journal of Educational Management, 29(7), 798–806. https://doi.org/10.1108/ijem-06-2015-0083

Cahill, H., & Dadvand, B. (2018). Re-conceptualising youth participation: A framework to inform action. Children and Youth Services Review, 95, 243–253. https://doi.org/10.1016/j.childyouth.2018.11.001

Caprile, M.; Palmen, R.; Sanz, P.; Dente, G. (2015). Encouraging STEM studies for the labor market. EMPL Committee, European Parliament.

Chapman, A., & Wyndham, J. (2013). A Human Right to Science. Science, 340(6138), 1291. https://doi.org/10.1126/science.1233319

Charteris, J. (2019a). Roseanna Bourke and Judith Loveridge (eds.): Radical Collegiality Through Student Voice: Educational Experience, Policy and Practice. New Zealand Journal of Educational Studies, 55(1), 267–269. https://doi.org/10.1007/s40841-019-00152-1

Charteris, J. (2019b). Roseanna Bourke and Judith Loveridge (eds.): Radical Collegiality Through Student Voice: Educational Experience, Policy and Practice. New Zealand Journal of Educational Studies, 55(1), 267–269. https://doi.org/10.1007/s40841-019-00152-1

Chilvers, J., & Kearnes, M. (2019). Remaking Participation in Science and Democracy. Science, Technology, & Human Values, 45(3), 347–380. https://doi.org/10.1177/0162243919850885

Cohn, J. P. (2008). Citizen Science: Can Volunteers Do Real Research? BioScience, 58(3), 192–197. https://doi.org/10.1641/b580303

Court, J., & Young, J. (2006). "Bridging Research and Policy: Insights from 50 Case Studies," Evidence & Policy, 4 (November), 439–62

Ebmeier, H., & Hart, A. W. (1992). The Effects of a Career-Ladder Program on School Organizational Process. Educational Evaluation and Policy Analysis, 14(3), 261–281. https://doi.org/10.3102/01623737014003261

Flick, U. (2014). An Introduction to Qualitative Research. SAGE Publications.

Gal, T. (2017). An ecological model of child and youth participation. Children and Youth Services Review, 79, 57–64. https://doi.org/10.1016/j.childyouth.2017.05.029

Galinsky, A. D., Todd, A. R., Homan, A. C., Phillips, K. W., Apfelbaum, E. P., Sasaki, S. J., Richeson, J. A., Olayon, J. B., & Maddux, W. W. (2015). Maximizing the Gains and Minimizing the Pains of Diversity. Perspectives on Psychological Science, 10(6), 742–748. https://doi.org/10.1177/1745691615598513

Gómez, A., Padrós, M., Ríos, O., Mara, L. C., & Pukepuke, T. (2019). Reaching Social Impact Through Communicative Methodology. Researching With Rather Than on Vulnerable Populations: The Roma Case. Frontiers in Education, 4. https://doi.org/10.3389/feduc.2019.00009

Gómez, A., Puigvert, L., & Flecha, R. (2011). Critical Communicative Methodology: Informing Real Social Transformation Through Research. Qualitative Inquiry, 17(3), 235–245. https://doi.org/10.1177/1077800410397802

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2011). The Role of Parents and Teachers in the Development of Gender-Related Math Attitudes. Sex Roles, 66(3–4), 153–166. https://doi.org/10.1007/s11199-011-9996-Harvard Cancer Center. (2017).

Holmegaard, H.T.; Madsen, L.M.; Ulriksen, L. To Choose or Not to Choose Science: Constructions of desirable identities among young people considering a STEM higher education programme. Int. J. Sci. Educ. 2014, 36, 186–215.

Howlett, M. (2021). Looking at the 'field' through a Zoom lens: Methodological reflections on conducting online research during a global pandemic. Qualitative Research, 146879412098569. https://doi.org/10.1177/1468794120985691

Jacobs, J. E., & Bleeker, M. M. (2004). Girls' and boys' developing interests in math and science: Do parents matter? New Directions for Child and Adolescent Development, 2004(106), 5–21. https://doi.org/10.1002/cd.113

Jenkins, E.W., and J.F. Donnelly. (2006). Educational reform and the take-up of science post-16. Paper presented at the Royal Society conference 'Increasing the take-up of science post-16', March 16, 2006.

Kim, E. J., & Lee, K. R. (2019). Effects of an examiner's positive and negative feedback on self-assessment of skill performance, emotional response, and self-efficacy in Korea: a quasi-experimental study. BMC Medical Education, 19(1). https://doi.org/10.1186/s12909-019-1595-x

Kite, J., & Phongsavan, P. (2017). Insights for conducting real-time focus groups online using a web conferencing service. F1000Research, 6, 122. https://doi.org/10.12688/f1000research.10427.2

Kitzinger, J. (1994). The methodology of Focus Groups: the importance of interaction between research participants. Sociology of Health and Illness, 16(1), 103–121. https://doi.org/10.1111/1467-9566.ep11347023

Kitzinger, J. (1995). Qualitative Research: Introducing focus groups. BMJ, 311(7000), 299–302. https://doi.org/10.1136/bmj.311.7000.299

Kotkas, T., Holbrook, J., & Rannikmäe, M. (2021). Exploring Students' Science-Related Career Awareness Changes through Concept Maps. Education Sciences, 11(4), 157. https://doi.org/10.3390/educsci11040157

Lamm, G.M. (2006). Innovation works. A case study of an integrated pan-European technology transfer model. B.I.F. Futura, 21(2), 86– 90.

Lezaun, J., Marres, N., Tironi, M. 2017. "Experiments in Participation." Handbook of Science and Technology Studies: Fourth Edition, Cambridge: MIT Press.

Lincoln, Y. S., and E. G. Guba 1985 ‘‘Establishing trustworthiness.’’ In Naturalistic Inquiry: 289–331. Newbury Park, CA: Sage

Lundy, L. (2007). ‘Voice’ is not enough: conceptualizing Article 12 of the United Nations Convention on the Rights of the Child. British Educational Research Journal, 33(6), 927–942. https://doi.org/10.1080/01411920701657033

Macq, H., Tancoigne, L., & Strasser, B. J. (2020). From Deliberation to Production: Public Participation in Science and Technology Policies of the European Commission (1998–2019). *Minerva*, *58*(4), 489–512. https://doi.org/10.1007/s11024-020-09405-6

Mager, U., & Nowak, P. (2012). Effects of student participation in decision making at school. A systematic review and synthesis of empirical research. Educational Research Review, 7(1), 38–61. https://doi.org/10.1016/j.edurev.2011.11.001

Morton, S. (2015), “Progressing Research Impact Assessment: A ‘Contributions’ Approach,” Research Evaluation, 24 (4), 405–19.

Mulier, K., & Samarin, I. (2021). Sector heterogeneity and dynamic effects of innovation subsidies: Evidence from Horizon 2020. Research Policy, 50(10), 104346. https://doi.org/10.1016/j.respol.2021.104346

National Academies of Sciences, Engineering, and Medicine, & Education, D. O. B. A. S. S. A. (2019). Learning Through Citizen Science. Amsterdam University Press.

Nature Collections. (2019). Nature. Geraadpleegd op 21 januari 2022, van https://www.nature.com/collections/

OECD. PISA (2018). Where All Students Can Succeed. Geraadpleegd op 22 juni 2022, van https://www.oecd-ilibrary.org/ education/pisa-2018-results-volume-ii_b5fd1b8f-en

Ozanne, J. L., Davis, B., Murray, J. B., Grier, S., Benmecheddal, A., Downey, H., Ekpo, A. E., Garnier, M., Hietanen, J., Gall-Ely, M. L., Seregina, A., Thomas, K. D., & Veer, E. (2017). Assessing the Societal Impact of Research: The Relational Engagement Approach. Journal of Public Policy & Marketing, 36(1), 1–14. https://doi.org/10.1509/jppm.14.121

Pandya, R. E. (2012). A framework for engaging diverse communities in citizen science in the US. Frontiers in Ecology and the Environment, 10(6), 314–317. https://doi.org/10.1890/120007

Patall, E. A., Hooper, S., Vasquez, A. C., Pituch, K. A., & Steingut, R. R. (2018). Science class is too hard: Perceived difficulty, disengagement, and the role of teacher autonomy support from a daily diary perspective. Learning and Instruction, 58, 220–231. https://doi.org/10.1016/j.learninstruc.2018.07.004

Pulido, C., Elboj, C., Campdepadrós, R., & Cabré, J. (2014). Exclusionary and Transformative Dimensions. Qualitative Inquiry, 20(7), 889–894. https://doi.org/10.1177/1077800414537212

Powell, R. A., & Single, H.M. (1996). Focus Groups. International Journal for Quality in Health Care, 8(5), 499–504. https://doi.org/10.1093/intqhc/8.5.499

Pratt, M. G., Kaplan, S., & Whittington, R. (2019). Editorial Essay: The Tumult over Transparency: Decoupling Transparency from Replication in Establishing Trustworthy Qualitative Research. Administrative Science Quarterly, 65(1), 1–19. https://doi.org/10.1177/0001839219887663

Roberts, G. (2002). SET for success: The study of people with science, technology engineering and mathematical skills, London: HMSO.

Romm, N. R., Nel, N. M., & Tlale, L. D. (2013). Active facilitation of focus groups: exploring the implementation of inclusive education with research participants. South African Journal of Education, 33(4), 1–14. https://doi.org/10.15700/201412171340

Shier, H. (2001). Pathways to participation: openings, opportunities and obligations. Children & Society, 15(2), 107–117. https://doi.org/10.1002/chi.617

Spaapen, J., & van Drooge, L. (2011), "Introducing 'Productive Interactions' in Social Impact Assessments," Research Evaluation, 20 (3), 2011–18.

Stewart, D. W., & Shamdasani, P. N. (2014). Focus Groups (3rd Revised edition). SAGE Publications.

Strasser, B. J., Baudry, J., Mahr, D., Sanchez, G., & Tancoigne, E. (2018). "Citizen Science"? Rethinking Science and Public Participation. Science & Technology Studies, 52–76. https://doi.org/10.23987/sts.60425

Swaen, B. (2021, 12 november). Wat is een focusgroep of focusgroep-interview? Scribbr. Geraadpleegd op 11 december 2021, van https://www.scribbr.nl/onderzoeksmethoden/focusgroep

Taylor J., Sims J., Haines T. P., (2012). The influence of protection, palliation and costs on mobility optimization of residents in nursing homes: a thematic analysis of discourse. Int J Nurs Stud. 49(11):1364–1374.

The Guide to Human Research Activities. https://www.dfhcc.harvard.edu/crsresources/ODQ_Documents/07_Education/Guide_to_Human_Research_Activities.pdf

Thiessen, D., & Cook-Sather, A. (2007). International Handbook of Student Experience in Elementary and Secondary School. Springer Publishing.

Tytler, R. & Osborne, J. (2012). "Student attitudes and aspirations towards science." Handbook of Science Education. Dordrecht: Springer.

Unicef UK. (2022, 14 april). UN Convention on the Rights of the Child - UNICEF UK. Geraadpleegd op 22 april 2022, van https://www.unicef.org.uk/what-we-do/un-convention-child-rights/

United Nations. (2019, 4 november). Vulnerable and key populations. United nations. Geraadpleegd op 11 maart 2022, van https://www.undpcapacitydevelopment-health.org/en/legal-and-policy/key-populations/

Van der Meulen, B., & Rip, A. (2000). Evaluation of societal quality of public sector research in the Netherlands. Research Evaluation, 9(1), 11–25.

Watling CJ, Lingard L. 2012. Grounded theory in medical education research: AMEE guide no. 70. Med Teach. 34(10):850–861.

Weaver, R. R., & Qi, J. (2005). Classroom Organization and Participation: College Students' Perceptions. The Journal of Higher Education, 76(5), 570–601. https://doi.org/10.1353/jhe.2005.0038

Woolley, J. P., McGowan, M. L., Teare, H. J. A., Coathup, V., Fishman, J. R., Settersten, R. A., Sterckx, S., Kaye, J., & Juengst, E. T. (2016). Citizen science or scientific citizenship? Disentangling the uses of public engagement rhetoric in national research initiatives. BMC Medical Ethics, 17(1). https://doi.org/10.1186/s12910-016-0117-1

Yin, R. K. 2003 Case Study Research: Design and Methods. Thousand Oaks, CA: Sage.

6. Appendices

6.1 Complete table with findings of topic a) How citizens' benefit from scientific research

	Benefits from social impact (i.e. direct benefits for social actors	Benefits from political impact (i.e. evidence-based policies which have led to benefits for social actors);	Benefits from scientific impact (i.e. scientific research which has contributed to the advancement of science with social impact).
Transformative dimension	Yara: Yes, I think what I started thinking about was the [dutch word] we have it in the Netherlands and as a researcher I do believe that research is important for citizens and that it can improve our lives. For example, the [dutch word] I know that from research, teachers in primary education are often like prejudiced by how they see children. For example, they have met their parents and they've seen their report cards from previous years and they often have like some kind of image about the child and his capabilities. And in the Netherlands, we have this [dutch word] that was designed by educational researchers that kind of measures somewhat objectively what the child can do and what level of education is most suited for the child. And it's often the case, if I am correct, that the teachers estimate it lower for some children for	Julia: I was thinking about the corona crisis. Because of the scientific research that is done we know that social distancing works and that vaccinations can help and that is what I hope policy makers use to make like really big decisions about everyone in the country. So, if you don't have scientific knowledge, you don't have anything to... how to say it? You don't know what to do, I think. It's a lot of situations really important and on an individual level you have to like to decide whether a child has to go to a special needs education or not, then you have to base that on test that are valid and on scientific research that it's better for a kid to do that because it has a lot of consequences for someone, so I think that it's really important.	Lucas: I think research is the base for societies to move forward. Cause I think if they do no research, it kind of stops. And I think it's also important for, like, countries and, like, the societies within the countries to move forward, because if for example would stop doing research now, we would just, like, stay the way it is right now.

	example from working class families. Then the [dutch word] will show. So, due to this test, we can create more equal opportunities somehow for these children. So, I think that is one of what research can do to give us a more objective measure of for example an education of what someone can do.		
	Julia: […] what I was thinking about is that a lot of decisions that are made that have a big impact on the whole society and on a person on an individual level… well, when it's like based on scientific research you have a lot more certainty that you make the right decision instead of looking at opinions or… basing it on something else than scientific study. […] personally, I found scientific research really important for me to decide what knowledge I have to take seriously and what knowledge I don't.		
Exclusionary dimension	Lucas: I think school education in Germany hasn't really changed in recent decades or there have been just very minor changes. So, I think when it comes to education in primary and secondary school, I think there is less research implemented. I think there is research done but there is less research implemented than for example in university studies. […]So, I think there need to be more things implemented.		Mateo: I think in research, we are like in our bubble, and we need to, to publish in journals and this kind of thing, but this journal, is not, they are not in their real life. They don't read, for example, for this reason, I think Facebook, Instagram, I don't know, why this kind of stuff could help not only in papers, papers in journals, it's very important […]

	Mateo: I don't want to be negative in this regard, but, I really think that science, scientific research is not reaching the citizens. Why I tell, why I tell this? Because, honestly, I think we are right now in a moment in which we, we believe what WE [emphasis] want to believe. […] So, I think right now science is not (…) getting to reach normal people. Besides, I think science is not in, for example, in, in apps for young people are on in these types of things. So, it's difficult to reach young people if you are not using in their media, the correct media. So, I think there are several factors that are getting the things more difficult for, for science to reach people.	Eleni: So at least in my department, mathematics, a lot of research happened for sure. But the policy was not really interest[ed] in research. So, there is the people who design curriculum and the design cool material, but [..] this material never reached the school classroom. So, another example: it was an idea some years ago that using technology in the classroom benefit the students. Good. So, they gave to all the first-year students, elementary school, if I remember correctly, some small laptops. Okay, the students got the laptops [but] no use, after that. […] Teachers were not really educated on how to use these laptops in their classrooms. So, there is research on that. And for sure, there is literature on how to use a technology in your mathematical classroom, for example, but the teachers never really came into touch with a say, a literature. So, there is a gap. [..]and a problem is that most resources in English, okay, it's not in Greek. The language is an issue. […] Second, I don't, at least the teachers in Greece are not that young. [… So, they were not really interested in learning something new, I apply something more	Anika: Yeah, because it's way easier to just talk about school and how it all takes place. But when you actually come to a class, take a look yourself, you can see that it's really easy to say, "oh, yeah, they should just be more in interaction with all the kids. And it's not that hard" until you're in the class. And you can see it yourself that it's not that easy, as it's, as it said. Moderator: Yeah. So, you think it should work both ways. So maybe the scientists should also go into the classroom? And, also the evidence should come into the classroom? So. it's two ways to it? Is that correct? Anika Yeah, exactly.
	Anika: Yeah, I think it's also because of the accessibility to the scientific research. Because when you study, at RUG, it's really easy to use Smartcat [a database], and to look up what you want to look up. But when you don't study at RUG or at any other school like that, it's not that easy to get the right information, or how do you get? How do you know if it's really true or not? And people these days, are questioning everything. […]And it's, it's not easy to read for most of the time. Or it's in English, which can also be…[difficult] […] or that		

	you're not motivated to read it? Because it's too difficult.		
	Sophie: I think that we are very biased. From, from, from, the science, I think that there is a lot of good science. There's also a lot of bad science because, for example, publication by though a lot of research that is done, we never read. And I think like the media is really biased because they only publish what they want, what is good in their opinion. And there is also a lot researchers, there are only done to research because it's for their own benefits. And it's foreign and regions to earn money have to get money for their own… [profit] […]. And I think with us, like a pure researcher, and that really wants to find a true, it's always good, and we can all benefit. And we can all benefit from it.		
	Mateo: So, in my, in my, in my opinion, at least in Spain, education is not taking into account a lot of things regarding to science. And for this reason, the students don't understand a lot of things that they, they all day, all of this happening a in our in our life	Mary: I don't think in Greece, science, education, or in the research done in education ends up to being practiced at all.[…] And […] most of the research is done in English. So, I think only countries that have as their primary language, English, benefit from all the research done. […] I don't think language is a problem is that governments don't put enough stress into their teaching associations or whatever to get better. […] there's there wouldn't be point of	

		having research and education, and it just being published in, in articles, like Mateo said earlier, if it doesn't get practiced, and the students, the citizens benefit from it. There is no like that it's you know, we spend so much money on research that at the end, is not being used.	

6.2 Complete table with findings of topic b) Citizen awareness of the impact of scientific research

	Aim of the awareness raising initiative	Promoting organization	Level of intervention	Field of intervention	Adience (targeted and real)	Level of access to scientific evidence	Social impact
Transformative dimension	Kostas: Yes, so, yes, I think we need the research in everyday life because if you take for example the smallest thing a bottle of water, let's say, they do many research of what kind of ingredients, what kind of filters they will use […] so, yes, I think it's very, very important because with that we can make improvements.	public	local/topdown	society	citizens	high	yes
	Yara: Yes, I think what I started thinking about was the [dutch word] we have it in the Netherlands and as a researcher I do believe that research is important for citizens and that it can improve our lives.	public	international/bottom-up	science	scientists	low	no
	Lucas: Yes, I think research is the base for societies to move forward. Cause I think if they do no research, it kind of stops. And I think it's also important for like countries and like the societies within the countries to move forward, because if for example would stop doing research now, we would just like stay the way it is right now. (…) I think it's important for the society in near	public	international/top down	society	citizens	medium	yes

	future, but more important for the society if you look, I don't know, in 20 years from now. So, I think it's like the base for society to move forward.						
	Julia: Yes, I agree especially on the part where he said that its so important for society to move forward (...) So I think that it's really important.	public	international/top down	society	citizens	medium	yes
	Kelly: I think that what I am taking from this session to process in the next days or time period, is how important citizens are in contributing and engaging in science.	public	international/bottom-up	society	citizens	medium	yes
	Yara: I agree with Kelly that it's interesting to think about it. And I have never really thought about engaging people in science as something to do but I think it's really important that we do that more often.	public	international/bottom-up	society	citizens	medium	yes
	Lucas: I think the thing I am taking from most is that research is something that you can think okay its happening they found this and this, but I never thought that okay there are people involved and that I myself just by contributing in a study or a research can like help people or like help the society to move forward. So, like the importance of, hm, even though it might be sometimes inconvenient, you don't always get something out of it, to see like the bigger	public	international/ bottom-up	society	citizens	medium	yes

	picture of participating in the study and to see like others can help on the long term.						
	Yara: Yes, that's me. I just thought about my mom because she was sending me all these videos about the vaccinations and that you might get infertile when you get one and she was like "are you sure you want to do this? " And was really towards my mom and like "okay, I know that you saw this but where is your evidence? You know, these are just people claiming this and this. If I just… I don't believe that its true without any scientific evidence. So, that's when I kind of asked her if she had validated her source.	private	local/ bottom-up	family	family	high	yes
	Lucas: Yeah, I think it's fake news and also like the importance of seeing if someone refers to an article to research like to see and have an idea of how research must look like, cause if you do a study of 5 persons and you find out something that happens to all of these persons, like obviously research has found out. So, I think it's also very important to distinguish between the quality of research and to like have an eye on research if it's appropriate or if it's just there… ?	public	national/ topdown	society	citizens	high	yes

	Emma: And the reason why I participate is? Well, because I would like to…to help the research, I think it's an interesting subject and I wanted to contribute to the research.	private	local/ bottom-up	students	students	medium	no
	Sophie: And I do part I do participate in the study because I thought it will [not clear] to the opinions of others and to share my own opinion about topics.	private	local/ bottom-up	students	students	medium	no
	Mateo: And I'm participating in this study because first of all, I like to talk, I like to speak [laughs]. And in this topic, in this topic, science education, science in general, politics, these kind of things, I love to discuss about this, this kind of stuff. So, for the for this reason, I am participating. And of course, I want to help you. So.	private	local/ bottom-up	students	students	medium	no
	Anika: And why I take part of this investigation research is because I think it's really important that people get to know more about these subjects and why it's important to that every layer of the society takes part in this kind of stuff.	private	local/ bottom-up	students	students	medium	no
	Eleni: And so, the reason that I'm here, first of all, say, like, I like the methodological approach. So, I want to learn more about focus groups and how focus groups work. And on the one hand is this, on the other	private	local/ bottom-up	students	students	medium	no

	hand, it's okay to talk a little bit about science and discuss things with other people. And, yes, that's why I'm here.						
	Emma: Yeah. So I'm an example of it awareness in daily life. So I had a family member who had breast cancer, and then she went to the hospital. And then she went for a second opinion to another hospital. And there was a new treatment. This was also in investigation. And well partially because of that new treatments that she decided to try. See, recovered. So that really increased my awareness of scientific research in health, healthcare.	private	local/ bottom-up	family	family	high	no
	Sophie: Yes, well, I use a sheet for example, for my lifestyle and what I eat every day and so I try not to eat as much sugar. It's not always easy, of course, because I love chocolate. But I really try to have a healthy lifestyle, because science says that a healthy lifestyle is better.	private	local/ bottom-up	student	student	high	no
Exclusionary dimension	Kelly: Yes, well, regarding this I thought about something while you were talking. Judging from my experience for example before attending this premaster, I never actually took some time to think who is doing the research. I mean, I knew that somebody out there, I don’t know, companies, governments, does the	public	national/ /topdown	students	students	medium	yes

	research. But I never actually made the connection. Maybe I was always very busy or bothered by other things, more important, I don't know. (...) One year ago I was also not aware about the whole procedure of the PhDs, the research conducting at the universities, how they help with the scientific research, people, society and evolution […] So, I don't think everybody Is completely aware, not at the same degree about how research is conducted and by who […] I don't think everybody recognizes how for example this solution now exists, for example like the ones we mentioned before about the covid, about the vaccines, about the water. I think that everybody knows that there is, somebody behind it, but I don't think people analyze the steps and the procedure.						
	Kelly: I think depending where people live, maybe the country or depending on the stage they are in their life or depending on the educational background, I think some people are aware and others are not so much aware.	public	international/bottom-up	society.	citizens	medium	yes
	Julia: Yes. Well, I totally agree with what was said just now because from my experience what I heard a lot before I went to university was that everyone go to	public	national/ /topdown	students	students	medium	yes

	university, that you're not doing anything, you're just reading and writing and that is not beneficial for society because I still sometimes get it when I am back home. Like they say like oh why would you go to university why would you do that? You're not benefiting anyone, so I don't think that a lot of people are mindful that everything that is around them stems from some scientific evidence and that that is the reason why everything is so good for us now.						
	Yara: Yes, I also agree with what they said, and I think that especially in the news and the newspapers sometimes they just say "oh, research finds…" and that's all they say about the research and then they go immediately to the results so maybe also make people understand more what research is and how research is conducted. I think that would help maybe for the awareness that is actually the job that people do, its not just some magic that generates random results.	public	national/top down	society.	citizens	medium	yes
	Julia: Yes, I would like to add that one of the things why people are also unaware of it is because for a lot of people and I know that because of my environment. They think "oh, its university, there are a lot of	public	national/bottom up	society.	citizens	medium	yes

	smart people, and I don't want to like get into scientific knowledge because I don't understand it, it's too hard for me. They are all scientists, so I don't have to do anything with it because I won't understand anyway".						
	Julia: It's like a really big threshold for them to even think about "oh, let me read a research paper or let me think about that" because I know from that experience that people are a little bit too afraid, or they see that the threshold is too high to even consider that they have something to do with it themselves in a daily life. So, I think that is one of the things why people are not aware of it, and they really don't feel like getting into that subject at all.	public	national/bottom up	society.	citizens	low	yes
	Mateo: I don't want to be negative in this regard. But, I really think that science, scientific research is not reaching the citizens. Why I tell, why I tell this? Because, honestly, I think we are right now in a moment in which we, we believe what WE [emphasis] want to believe. I mean, if there is something that it's, it's not, I don't like it, It's more, it's a, it's more likely that I don't believe it. So, I think right now science is not getting is not, It's not. Yeah, it's getting to reach normal people.	public	national/ top down	students	students	low	no

	Besides, I think science is not in, for example, in, in apps for young people are on in these types of things. So, it's difficult to reach young people if you are not using in their media, the correct media. So, I think there are several factors that are getting the things more difficult for science to reach people.						
	Sophie: Yeah, well, I think that we are very biased. From the science, I think that there is a lot of good science. There's also a lot of bad science because, for example, publication by though a lot of research that is done, we never read. And I think like the media is really biased because they only publish what they want, what is good in their opinion. And there is also a lot researchers, there are only done to research because it's for their own benefits. And it's foreign and regions to earn money have to get money for their own… ah..profit. And I think with us, like a pure researcher, and that really wants to find a true, it's always good, and we can all benefit. And we can all benefit from it. (…) Well, I want to give an example. We, I had, I had college a from X a few years ago. And she told a story about your [not clear]. And there was leaking a PowerPoint from him where he	private	local/topdown)	students	students	low,	no

	did, he did research on a medicine, I guess it was X that is a medicine for children who are psychotic. And he, and he said in his PowerPoint, that he will show which ratio for the study that was already done. So he was really biased. And I read more examples for that. Sometimes, like in Big Pharma, there's a lot of there is done a lot of research in benefit before that's and for that medicine, that it's much better than it really does.						
	Mateo: Yeah. In this regard, in education, I think there is a big problem regarding to, to the scientific, in the scientific view. I mean, at least in Spain, what we receive in, for example, in primary education or in secondary education, we only memorize the big ideas of science, how to explain the things we only memorize. But we don't take into account the other part of science, for example, how science works in order to get these big ideas to explain to explain the our reality. So, in my opinion, at least in Spain, education is not taking into account a lot of things regarding to science. And for this reason, the students don't understand a lot of things that they, they all day, all of this happening a in our in our life. So more or less, I think I explained. (…) Now,	private	national/topdown	teachers	teachers	low	yes

	when, obviously they take, they take something, but if you present them an exam, in which you only have to repeat a part of a text, you are going to do only need to memorize, and unfortunately, this is what happens a lot of times in science education in primary. So, if you if you, if you encourage them to memorize, they are going they are going to do is to do this. So…						
	Sophie: Another thing is that if we, if we have the awareness of it, so because of we see all these benefits every day, a lot of people don't realize them don't realize that they exist. So this is how they're relevant problem to take into account.	public	national/topdown)	society	citizens	high	yes
	Sophie: But I don't see really that it is doing that for a lot of people. Because in Holland, we say it's, it's a far from my bed show. Really, because for example, when I talk with my parents, or my grandparents about science, they really don't understand what I mean. And so that's really not interesting for a lot of people.	public	national/ bottom-up	society.	citizens	low	yes
	Emma: Well, I think that only for high educated people, they are interested in science. And for a lot of, like, middle or low educated people,maybe that they are interested.	public	local/topdown	society.	citizens	medium	yes

	Emma: But they don't really understand what it's saying and how research is done. So it's, so I think that it's too difficult for them.	public	national/ bottom-up	society.	citizens	low	yes
	Mary: Yeah. I would like to say that, of course we have benefits from science in our daily life. For example, I don't know if you realize, but in this pandemic era, we use it a lot of times. I think this is not related to medicine, it's other kind of science. But I think the problem is that one thing is that we benefit from science. Another thing is that we have the awareness of it, so because of we see all these benefits every day, a lot of people don't realize that they exist. So this is a relevant problem to take into account.	public	national/ bottom-up	society.	citizens	high	yes
	Sophie: Yeah, but because we all see these benefits in our daily life. So we don't realize that they exist, because they exist from our beginning in the morning.	public	national/ bottom-up	society.	citizens	high	yes
	Emma: Yes. She asked something about the time that we are going through, like the pandemic I assume. And I just think that as a citizen, it is important to always maintain the critical view. Also, on media, because there's a lot of like XX says, bias and framing. And also, when you look at medical science, I think as a citizen, do you	public	national/ top down	society.	citizens	low	yes

	benefit a lot, because, for example, surgery, and medicine, but in my opinion, I think it's sometimes forgotten that there there is, for example, in this time, there is also an underlying pandemic, because a lot of people do not have a healthy lifestyle. But well, in the media, I don't hear a lot about this subject to improve healthy foods. For example, because for Big Pharma, with with medicine and vaccines don't doesn't have benefits from that kind of news in media, they have a lot of interests in purchasing of medicine and vaccines. So. So my point is always remain a critical view on science, for example, medical science, and what the media tells you, you can do research yourself.						
	Anika: And with other subjects, I'm not really interested or I don't care about that subject as much as other subjects. So then it's like, yeah, okay. Not really bothered by this. And sometimes I really hope to learn new things and to get more information. And when doing it, it's a bit of a disappointment, so my hopes were too high. And then I'm, like, led down. So that can be frustrating at times as well.	private	local/bottom-up	students	students	low	no
	Sophie: And I really want to say something about what Mateo said and I said it before	public	national/topdown	society	citizens	high	yes

	but what I read in a standard media like the NOS it's only like a lot of good things about vaccination, but when I read like other media you also read like more critical things about vaccination. So and for that, I really think that a lot of people really think that there is a lot of good research but yeah, what I wanted to say is that I think it's really difficult for people to stay critical about research.						
	Sophie: Well, I think that only for high educated people, they are interested in science. And for a lot of, like, middle, low educated people, it's, maybe they are interested, but they don't really understand what it's saying and how research is done. So it's, so I think that it's too difficult for them.	public	international/top down	society	citizens	low	yes

6.3 Complete table with findings of topic c) Awareness-raising initiatives succeeding at engaging citizens in scientific participation

	Aim of the awareness raising initiative	Promoting organization	Level of intervention	Field of intervention	Audience (targeted and real)	Level of access to scientific evidence	Social impact
Transformative dimension	Julia: So I think that a solution would be to make them more in the spotlight if you know what I mean. So, people see what they do and see what kind of work they do because when I tell my parents what I do in my internship, it's like in a research group in a senior secondary education they are like "oh, oh, that's really interesting, never thought about the fact that somebody has to think about those things". It's like they take it for granted that it's all there, the knowledge and how it works.	public	international/bottom-up	society	citizens	low	yes
	Kelly: And I think that they should be more credited with their findings cause research is hard at the end.	public	international/bottom-up	society	citizens	low	yes
	Liam: Yes, I was just thinking cause my friends at home do a lot of scientific research and they said how they got into it was that... there was a lot of marketing that they did and there was a lot of social media posts. That's how they actually found it. So, I think that it's the case of how you communicate like… I think that people would be willing to do scientific participation but its kind of in the background for a lot of people you know. So, I think if you can pay stuff like marketing or do stuff on social media, I think that's a really good way. Because I know that a lot of my friends do it and that's how they got into it themselves so…	public	international/bottom-up	society	citizens	low	yes

	Lucas: Yes, I think like the most common way from what I saw is like paying people to participate in research. I think that's especially in medical research. I think one of our friends did it last year, it was from UMCG here in Groningen but he did research on different medicines. I think for those kind of research, I think they pay people to do it because they are interested in the outcome. I think for those kind of researchers it's a lot about like giving people something to do it.	public	local/topdown	participants	participatns	low	no
	Julia: One thing I was thinking about is that the Wikipedia for example, the language that is used is a lot less like it's not so hard like a language that is used in scientific papers. So, if people do not have a background in the scientific field, they can use the Wikipedia page and understand what it says. So, I think that the language that is used is really a big component about whether people are going to use the scientific knowledge or not because when it's too hard they won't understand, or they might feel like… yeah… that it's too much.	public	international/bottom-up	society	citizens	high	yes
	Lucas: I think it's important to find the right people for the right research. Find someone who is implicitly or very specifically interested in a specific topic, who thinks okay it's something I like or something I am interested in. I for example would participate in those kind of research cause I know it's something I am interested myself so I am curious about the outcome, I think I could gain something, so I think it's about marketing it the right way and marketing the research to the right persons.	private	international/bottom-up	science	researchers	low	no

	Lucas: So, I think therefore its quite difficult because you give your time and if you don't receive a payment, you don't see that you can gain something yourself especially like these days, where everyone is pretty busy, I think it's quite hard to get someone to participate in voluntary research.	private	local/topdown)	science	students	medium	no
	Kelly: Yes, regarding that for example I agree I would not take part, I would not be interested to take part in let's say a physics research, but I think that I would be interested in things concerning me or my background. So, I think that depending on the subject of the research, there would be people that would be interested. Like future, like students now that love physics or those who want to study something about physics, or they work at this field, and they want to evolve their knowledge and their background. So I think not everybody is eligible for taking part in all kinds of research. I think people should be divided based on their background.	private	international/bottom-up	science	students	low	no
	Mateo: I think, sorry, I think their mark, the most important thing is to change the default, the training for a future teachers, right, you change this, you will change the education?	private	national/topdown)	education	teachers	medium	yes
	Anika: I think you have to make the students responsible as well, so that they feel part of what they're doing. Because otherwise it's there, it's just talking about not talking with and I think that's is as well with topics like science, or in general. As long as you're still talking about it, it's not going to be part of what they get, or it's it will stay far away in that way. So, I think it really helps to interact with the topics that	public	international/bottom-up	education	students	high	yes

	they're doing, and that they feel they can change something as well.						
	Eleni: Um, yes. Okay. And it seems interesting, you always learn something new. So, at least for me, for myself, participating in some, I don't know, some things like that or filling a questionnaire is something that I would do in order to help some other researchers to produce scientific evidence so that's my opinion.	private	local/ bottom-up	science	students	medium	no
	Anika: Yeah, because it depends on the subject. Some subjects I'm really interested and then I think it's really cool.	private	local/ bottom-up	science	students	medium	no
	Mateo: I think, right now, we have a very good example of scientific initiative. And I think the COVID-19 vaccination was the best image. I mean, the people know really good about which type of vaccination vaccines work in which technology. And I think before this, no one knew anything about this kind of technology. So I think right now, we have a very good example in our life of initiatives.	public	internationa l/topdown	society	citizens	high	yes
	Sophie: Okay, so yeah. I think if you really want to reach all the people, you will really have to make it accessible and really simple for a lot of people.	public	internationa l/ bottom-up	society	citizens	high	yes
Exclusionary dimension	Lucas: But I think that other than that you need to be connected all like interested yourself in the outcome and I think it's a lot of how you can motivate someone to participate in research even though a person thinks probably he won't get an outcome of it.	private	local/botto m-up	society	citizens	medium	no
	Julia: It's just that I didn't even think that all these possibilities were also participating, and I think that this is	private	local/botto m-up	society	citizens	low	no

	also one of the things why people might not be participating, because they, even I well I have a scientific education but even I did not even think of all these possibilities, so I don't think that for everyone is clear that this is possible with science, so yeah.						
	Anika: Yeah, I think it's also because of the accessibility to the scientific research. Because when you study, at RUG, it's really easy to use Smartcat [a database], and to look up what you want to look up. But when you don't study at RUG or at any other school like that, it's not that easy to get the right information, or how do you get? How do you know if it's really true or not? And people these days, are questioning everything. So, it the weight of being investigated and investigated by some scientists, I don't know how happy it is these days. I don't know if you get me. (...) Yeah. And it's, it's not easy to read for most of the time. Or it's in English, which can also be… ah…difficult. Or that you're not motivated to read it? Because it's too difficult.	private	local/topdown)	society	citizens	low	yes
	Eleni: Yes. So at least in my department, mathematics, a lot of research happened for sure. But the policy was not really interested] in research. So, there is the people who design curriculum and the design cool material, but they this material never reached the school classroom. So that's what I feel that happened in Greece. (…) So, another example: it was an idea some years ago that using technology in the classroom benefit the students. Good. So, they gave to all the first-year students, elementary school, if I remember correctly, some small laptops. Okay, the students got the laptops [but] no use, after that. They didn't. Teachers were	private	national/top down)	education	teachers	low	yes

	not really educated on how to use these laptops in their classrooms. So, there is research on that. And for sure, there is literature on how to use a technology in your mathematical classroom, for example, but the teachers never really came into touch with a say, a literature. So, there is a gap. (...) Yes, for many reasons. Yes. So and a problem is that most resources in English, okay, it's not in Greek. The language is an issue. And if we can say, that it's an issue. Second, I don't, at least the teachers in Greece are not that young, let's say [laughs]. I mean, most of the teachers are over 40, at least from my experience, when I was at school. So, they were not really interested in learning something new, I apply something more, I don't know how to explain it. (...) Yes, I feel the research never actually reaches the schools. That's my point of view, or at least, that's what I'm thinking. That happens in Greece.						
	Mateo: This is another problem, because I think in research, we are like in our bubble, and we need to, to publish in journals and this kind of thing, but this journal, is not, they are not in their real life. They don't read, for example, for this reason, I think Facebook, Instagram, I don't know, why this kind of stuff could help not only in papers, papers in journals, it's very important, but okay, it doesn't make any sense for the teachers, I think.	public	international/bottom-up	science	citizens	low	yes
	Anika: Yeah, because it's way easier to just talk about school and how it all takes place. But when you actually come to a class, take a look yourself, you can see that it's really easy to say, "oh, yeah, they should just be more in interaction with all the kids. And it's not that hard" until you're in the class.	private	local/bottom-up	education	researchers	low	yes

	And you can see it yourself that it's not that easy, as it's, as it said. Because my internship at this moment is at school with children who have lower IQ, and sometimes with some other problems as well, like autism or stuff like that. And there are always two people in the class, and the classes are between eight and 14 kids. But still, it's because the demand of the children is so different. It's still really difficult to provide for all their needs.						
	Sophie: Okay. I really do agree with Mateo and Anika. I think it's really hard to give all children equal equity, because some because some children need more. And I; And last year, I worked in a class with almost 30 children and with one teacher. So, it's, it's really hard to give all the children what they really need. And also, what I see in Holland is that for example, when, when, when a parents have more money, they buy extra lessons for the children or, they can help them better with the work if they are high educated by themself and.. So I think that's we willing to put more money and attention in educating to all the children what they really need.	private	local/bottom-up	education	researchers	low	yes
	Mary: So, I have the experience, I have the, the unique experience that me my younger brother, who is 18 years old, younger than me, have had the same primary school teacher. So, when, when I was 12 years old, I was I was taught by the same person that my brother was taught when he was eight years old, and they're 18 years apart. Luckily, the teacher he has is, is really passionate about her work. And could see that she tried really hard to have all the kids in her class, up to popular standards. But I don't think in Greece, science,	private	local/bottom-up	education	students	medium	yes

	education, or in the research done in education ends up to being practiced at all. And as ... said before, most of the research is done in English. So, I think only countries that have as their primary language, English, benefit from all the research done. (…) And I don't I don't sorry, I don't think language is a problem is that governments don't put enough stress into their teaching associations or whatever to get better.						
	Mary: Well, yes, there's there wouldn't be point of having research and education, and it just being published in, in articles, like Mateo said earlier, if it doesn't get practiced, and the students, the citizens benefit from it. There is no like that it's you know, we spend so much money on research that at the end, is not being used.	private	local/bottom-up	education	researchers	low	yes

6.4 Complete table with findings of topic d) Awareness-raising actions that foster the recruitment of new talent in sciences

	Aim of the awarenessraising initiative	Promoting organization	Level of intervention	Field of interventi on	Audience	Level of access to scientific evidence	Social impact
Transformativ e dimension	YARA I remember from high school that we had like a day when all the women, all the girls were able to participate in some kind of a women's day in specifically to technical youths of research because there are some, they are underrepresented. There is mostly a male dominant field, and it was all of the girls were able to join this day for free and go to different companies to learn about what they did, and we could skip the classes of the day just for this day. I didn't participate myself, but I know that they offered it to us.	private	local/top down	education	students	medium	yes
	YARA Yes, I think maybe just like I mean I did end up in science somehow, so I guess my interest got sparked but maybe just more like I remember the things I liked about science as a child or adolescent, I think it was mostly about experiments. Those kind of things I really like to just kind of to put things together, in different color, or something exploding, I really like those kind of experiments. So, I think those kind of things where you can see what happens that it might awaken some interest but that's for	private	local/bottom-up	education	students	medium	yes

	me. I don't know if anyone else can relate to that.						
	GIANNIS So, I think, I remember in for example high school and elementary school there were like tournaments about physics, mathematics, and that kind of stuff. So, many kids who were very good in those sciences, those kind of courses, they really liked to take part and also, I think I have a friend at the university, they also took part in a tournament about formula one, so it's very good initiative to attract younger people with that kind of stuff, tournament, and that kind of stuff, because we give them motivation.	private	local/top down	education	students	medium	yes
	JULIA Yes, because I was thinking about the last year of secondary school, I think Yara knows what I mean with [dutch word] but I don't know the English translation. It was mandatory for everyone in the sixth grade to like do your own project so you could do it alone but also with someone else. You could like think of a research question and do the research yourself, not on a scientific level of course, but you got to use the resources and you had to like read all the articles and the books and then you had to come up with your… it had to be not only the experimental but also the literature, what you did and then at the end, when everyone was done, they had like a	public	local/top down	education	students	medium	yes

	market place in the school where everyone had to present their own project. So, we were able to see what everybody did and that way you also connected what they did to what you actually could do yourself. Because it was not a scientist who did it, it was you, yourself who did some kind of research. So, I think that was the first time I connected the idea that I could be a scientist myself.						
	EMMA So I had to think of events that events, this university sometimes organizes, like, open day where citizens can come and they know there are, I don't know the word, they can come to the university, and there they can see examples of experiments. And it's even for children. And it's accessible for all citizens. So I had to think about events like that. I know there are I don't know the word. They can come to the university, and there they can see examples of variables, experiments, and intentions. And it's also, even for children. And so it's accessible for all citizens. So I had to think about events like that, yeah came across my mind.	public	local/top down	education	students	medium	yes
	MATEO I would like to say that, apart from from what you explained, I think the best way to promote scientists or people who like science is to show it in a cool way or location. I'm sorry, I'm a teacher. So for me, everything is related	public	international/top down	society	citizens	high	yes

	to location. So yeah, the point is not only for the students science facts to memorize, because this is boring. And it is worrying for the student. They will not be scientist and they will not be interested in science. Yeah. (…) Yeah, I think, I think one of the most important things is to have examples of people who have studied science already. Because in this way, you'll see that it's not something impossible, because you have an example, a concrete example, near to you. (…) I was thinking, for example: a friend or a sister or a brother or someone near.						
	MATEO Yeah, I think one of the most important things is to have examples of people who have studied science, or something already, and make science near for you. Because in this way, you see that it's not something impossible, because you have an example, a concrete example. Near from you. MODERATOR You mean something like a role model? Someone? MATEO Yeah I was thinking, for example, in a friend, in a sister in a brother something near for someone that. MODERATOR So you see, it's not impossible, and you can do it as well. Is that what you are saying? MATEO Exactly! Exactly. This is the point. Yeah. Yeah.	public	international/ bottom-up	society	citizens	high	yes

	MARY I think it would be beneficial for students to have professionals talk to them and how they work how the profession actually is they can be educated on you know, there's a female doctor or a female microbe biologists that can can inspire people, mostly.	private	local/top down	education.	students	medium	yes
	ELENI Yes. For me, for mathematics students at least it's somehow different. I was good in maths, I studied maths, that's what I did, at least at school. So there is not something interesting behind this. But ignore that and to motivate the students engaged with maths. But in order to motivate students engage with maths when I teach, I'm trying to share with them some ideas of eh what are the applications of maths in real life and how they can use mathematics in general. And what I found interesting now in order to engage students is to use memes from the social media. So students use a lot of social media and pictures are there they are funny, sometimes they also have some meaning behind them. And these humans like seeing that okay, scrolling the social media one of their Facebook page or Instagram page, they can found some nice ethical topics or they can find their some meme some gifs related with mathematics. And this is something that makes you this makes students more interested for some reason. And there is some research	private	local/top down	education	students	low	yes

	behind that they started to investigate that a little bit how this kind of approach can facilitate students engagement with mathematics. So I think yeah, that's what I'm doing at least with the students that I did.						
	ELENI Yes I think they would be super nice even in subways for example or a big screen say when you go I don't know to the supermarket if a picture appears with some funny science evidence I don't know cards for decision, something like that. ASSISTENT-MODERATOR: Something like a campaign for example. ELENI Yes, a campaign that may be interesting. I don't know what let's say tomatoes appear in maths an example. So an example in the supermarket how you can have the tomatoes at your plate later this evening. With a small slide or a funny picture in your advertisement. There are ways to introduce science in everyday events, let's say in your every day in every your everyday life.	public	national/ top down	society	citizens	high	yes
	MATEO Yeah, yeah, yeah. Because I mean in a more concrete way in the part of Tiktok videos, I think that they would be amazing for... Because we have to take into account which population we will reach. With this apps, we will reach young people. So it's important to use them.	public	national/ top down	society	citizens	high	yes

	ANIKA You can use games as well to make it more interactive or as well with painting or coloring. You can make a math exercise, and then use it like that, because I used that to get a younger girl. She was 9, and she didn't want to do any school things. But she loved to draw. So then I made a clear plastic thing, a drawing that she can only make with the right exercises for mathematics. So she had to do three plus one, okay, all the four answers are green, all the six answers are red. And in that case, she was also doing math, but not feeling like she was doing math because she was painting and coloring and that was the thing she likes. So looking in different ways to learn kids the same, but using alternatives.	public	national/ top down	society	citizens	high	yes
	MATEO Yes. No. I would like to say that. Two weeks ago, I was asked for a national project in Spain. And they asked us companies in a compulsory way to disseminate our research in social fairs. Says there were I don't know how to say, like to present the results with a lot of researchers in in an open area in our media in my city. So and this was compulsory. Yeah, yeah. So this is a way to, to disseminate the results.	private	national/botto m up	science	researchers	high	no
Exclusionary dimension	YARA Hm, yes, maybe, I don't know. I didn't have like a technical program already so I had choses my courses and it wasn't technical at all	private	local/bottom-up	education	students	low	no

	so I think that maybe they should have done it earlier before we chose the courses. Because to me it was like well... all of those fields were already closed off, so it didn't feel useful to me because I didn't have the opportunity to follow those professions anyway.						
	GIANNIS On the other hand, they exclude the rest of the kids, who are not very good on those sciences but at least you know, there is something. (…) Yes, absolutely, for sure. It would be better. If... not only after the school but during the school, I think.	private	national/topdown)	education	science	medium	yes
	KELLY Yes, I wanted to say that I really agree with what she said that the only times I learned something about research was when I read a newspapers or when I saw something on tv stating "this university found this" for example. But if you don't read the newspaper or if you don't watch the television news then you don't actually get to know who did research. Like she said, they are like at the background, in the shadows.	public	internationa/bottom-up	society	researchers	low	no
	MARY And in Greek schools, we don't get professionals coming and talking to the kids about their their jobs and how they really are. (...) Yes, in Greece, we don't even get the fireman or the police officer. We don't have career day, for example. So yes, if an initiative like that happened, especially in middle school,	private	national/bottom-up	education	students	medium	yes

	I'd say and maybe also in primary school, the students can aspire to become the scientists they meet. Because something in their speech or in their everyday life inspired them to, to follow a track since I don't know. They were young.						
	ANIKA Yeah, I think there's too much of a focus to use the ways to teach kids the things that we know from before, like, there's only that way you do it the good way. And I don't think that's the case. MODERATOR So you say actually, that it should be interesting to the people. And maybe that's also with the initiatives to get new recruitment, maybe. Also, it should be interesting. ANIKA Yeah, because for each case, something else works.	private	national/bottom-up	education	students	medium	yes
	JULIA And what I was thinking when I saw the question about “what are some initiatives or actions” I was thinking that they might not be aware because it’s all so in the background, the whole scientific world. You see singers, you see on the street builders and that is really in your face but people who are in the scientific world, they are all so far away from the vision from everyone in society.	public	international/ bottom-up	society	researchers	medium	yes

6.5 Complete table with findings of topic e) Policies that promote awareness-raising actions and citizen engagement in science

	Aim of the awarenessraising initiative	Promoting organization	Level of intervention	Field of intervention	Audience (targeted and real)	Level of access to scientific evidence	Social impact
Transformative dimension	KELLY Maybe something that I could think like if these policies could come from the governments etc., maybe researchers at the universities maybe they should be obliged to… how can I say it, to use the citizens in one way or another, I don't know how. For example, right now it's the focus group, I like the fact that as a citizen I participate and that I contribute somehow. Maybe with this way or another, scientists or researchers could make citizens participate and maybe they should show to the government that they use this policy like we use these participants. Maybe if it was regulated for example that every research or every department should engage citizens at research, something like that.	public	national/top down	society	citizens	high	yes
	KELLY Yes, regarding that for example I agree I would not take part, I would not be interested to take part in let's say a physics research, but I think that I would be interested in things concerning me or my background. So, I think that depending on the subject of the research, there would be people that would be interested.	public	national/top down	education	students	medium	yes

	Like future, like students now that love physics or those who want to study something about physics, or they work at this field, and they want to evolve their knowledge and their background. So I think not everybody is eligible for taking part in all kinds of research. I think people should be divided based on their background.						
	LUCAS I think the thing I am taking from most is that research is something that you can think okay its happening they found this and this, but I never thought that okay there are people involved and that I myself just by contributing in a study or a research can like help people or like help the society to move forward. So, like the importance of, hm, even though it might be sometimes inconvenient, you don't always get something out of it, to see like the bigger picture of participating in the study and to see like others can help on the long term.	private	local/bottom up	science	students	high	yes
	KELLY I think that what I am taking from this session to process in the next days or time period, is how important citizens are in contributing and engaging in science. Maybe it's important to come up with ways how they can contribute even more, make them aware. I think that after this session I understood or started to think that people are not aware for the science taking place around them and how they can help, how they	public	international/ bottom up	science	students	high	yes

	can engage more. And maybe this is for future society and policies to take into consideration. Maybe researchers as well.						
	YARA I agree that it's interesting to think about it. And I have never really thought about engaging people in science as something to do but I think it's really important that we do that more often.	private	local/bottom up	science	students	high	yes
Exclusionary dimension	KELLY Generally, I don't think there are enough policies to ensure that citizens participate in science. From my experience. I never heard or understood something that would make the citizens wanting to engage more.	private	local/bottom-up	society	citizens	low	no
	JULIA Yes, I have a question actually. because I was thinking that these policies when you make them for the social sciences, that it is a lot easier for them to include the people and maybe use focus groups or interviews, but I was wondering how can you for instance with physics, how can you… is it beneficial for them and the participants themselves to participate in that kind of research? Because I would not, I cannot think of a way that I can participate in such research.	private	local/bottom-up	society	citizens	low	no
	JULIA Yes, I agree with what you said. It's just that I didn't even think that all these possibilities were also participating, and I think that this is also one of the things why people might not be participating, because they, even I well I have a scientific education but even I did not even think	private	local/bottom-up	society	citizens	low	no

	of all these possibilities, so I don't think that for everyone is clear that this is possible with science, so yeah.						
	JULIA Yes, I can think of one policy that actually does other things, does not promote the science and the participation. I think that because studying is so expensive now, you have to like take a loan and it's not really promoting the idea of being a scientist especially if you want to do a PhD you have to study for a way longer time and because a lot of people do not want to take the loan and maybe their parents might not have that much money, I think there is no policy that promotes for anyone to be in science. Even when you are from a lower economic status that is a really high threshold to even consider going to the university so… I think that's one policy that should be better.	public	national/top down	society	students	medium	yes
	SOPHIE Yeah, well at first I think it's okay. It's good that you have a group of diversity and different people. But I think that, I don't know how to say it in English but I think 'dat we aan het doorslaan zijn'. Maybe you can translate it. MODERATOR That sometimes it goes too far. SOPHIE Yeah. Well, sometimes I read things like, oh, we need 50% of a minority group, we need 50% of women. And when I think, for	public	international/ top down	society	citizens	medium	yes

	example, well in my study, well the most are women. And I think that women are more naturally interested in things like social work and caring. But I think from naturally men mostly are more interested in maths and physics. And I think that's okay. And I don't think that we need policy to make group very diversity and we need is so much percent of black people and so much percent of white and no, I do not agree with that. Because, yeah, well, you need the best people in the best places. And it's.. and I don't think that is matter if there's a black woman or a white lesbian, it doesn't matter who you are, it does matter if you good or bad, your work.						
	SOPHIE Yeah, I think it's up to the person themselves, but well, I think we don't have to discriminate people. Not in a good way, but also not in a bad way. Of course. Yeah. I really think I'm really, for example for a anonymous sollicitation. So you don't see the name or the face of the people you only see where they worked and where they studied. I think that that it's more important than your gender or, or sexually oriëntation.	public	international/ top down	society	citizens	medium	yes
	ANIKA Well, I think it's, especially with the patriarchy where we live in, it's really difficult to not take in consideration that a lot of things start at the bringing up of the younger children.	public	international/ top down	society	citizens	medium	yes

	ANIKA Oh, yeah, exactly. But I think it's really important that there is the difference between all the kinds of the vision of what people have and that there's a healthy discussion within a company as well. And so when it comes down to policies and doing positive discrimination, I think it's important because otherwise some people don't even get the chance to get at the same place where I as a white woman with a Dutch name can have an option to do yeah [sollicitatie] ASSISTANT-MODERATOR Finding a job. MODERATOR A job interview. ANIKA Yeah, yeah job interview, that's what it is.Because some people are already discriminated by only their name. So I agree that it would be great if it was anonymous. But in the first place, I think it's important that before we can make it anonymous, we have to make it equal because now it isn't. But this is a really complicated discussion, especially at this time in the evening in not even your native language.	public	international/ top down	society.	citizens	medium	yes
	SOPHIE Yeah. I want to react to what assistant-moderator said, and I also attracted my attention. Because I also studied at like [unclear] for a few years, and I have learned that women and men are are different, and have different interests from naturally because, like, they're so is a very known study, that they try to raise girls like boy	private	local/bottom-up	education	students	medium	yes

	so they gave them toys, like cars and they gave boys like toys like dolls, and makeup. But at the end of the day, they weren't really interested in that kind of toys, and when they had a chance to choice their own toys, their choice, really, that was for their gender. So I think that it is also that like boys have more testosterone, and they have like different hormones. And their brains are different than girls. So I really think that from nature, girls are more interested in social things, and boys are like more interested in math and things. And I don't really understand what the problem is, if we have more girls in social things, and we have more boys in maths. What is the problem about that? Why? Why must everything be equal? Well, today, I don't get the point. Sorry, but I do not really agree with your opinion.						