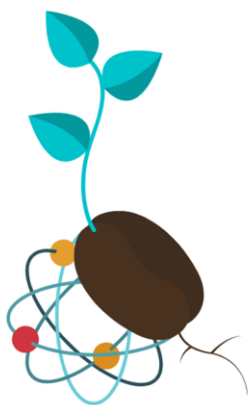


DELIVERABLE 5.3 POLICY RECOMMENDATIONS



SEEDS

VERSION 3

VERSION CONTROL SHEET

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DISCLAIMER

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ABBREVIATIONS

CoR	Gemeente Rotterdam
EC	European Commission
ECSA	Verein Der Europaeischen Burgerwissenschaften - ECSA E.V.
EU	European Union
EMC	Erasmus Universitair Medisch Centrum Rotterdam
HL	Healthy Lifestyle
HLB	Healthy Lifestyle Behaviours
HUA	Charokopeio Panepistimio
IISPV	Fundació Institut d'Investigació Sanitària Pere Virgili
PA	Physical activity
PE	Physical Exercise
R&I	Research & Innovation
SEEDS	Science Engagement to Empower aDoleScents
STEM	Science, Technology, Engineering and Mathematics
SWAFS	Science With And For Society
UN	United Nations
UOE	University of Exeter

EXECUTIVE SUMMARY

The SEEDS (Science Engagement to Empower aDoleScents) project used extreme citizen science to directly empower teenagers from underserved communities such that they sustain the positive changes they have initiated in their own lives and school environments, both in terms of their abilities to live healthy lives as well as their perceptions of STEM (Science, Technology, Engineering and Mathematics). The SEEDS project ran in four European countries: Greece, Spain, The Netherlands, and the United Kingdom.

In this deliverable the findings of the project are summarized, and policy recommendations are given. The policy brief in the appendix contains a more extensive summary of the results of the project.

The most important findings and policy recommendations from the project are:

- Using makeathons as a methodology of citizen science, generates lots of ideas and empowers participants among young adolescents (13-15 year olds) from underserved communities. The overall satisfaction on this approach by student-ambassadors, schools and researchers was high. In the relative short time of the intervention implementation period a significant improvement on one of the three primary lifestyle behaviours was found among the intervention group in comparison with the control group. On the other two lifestyle behaviours no significant effects were found, but the direction of the observed changes was in favor of the intervention group. Therefore, we recommend its use in future projects as well as further development and research to achieve more positive impacts on the lives of youth.
- As schools are important facilitators of co-creation of interventions with pupils and the need for financial resources is low (interventions do not need to be expensive), it is important to motivate schools to adopt this approach and provide schools with tools and training to implement the approach. Local public health agencies could play a role in facilitating and motivating schools. Local governments could provide additional (financial) resources. Integration in local health policies is recommended.

1. INTRODUCTION

Empowering teenagers to educate themselves in their health and to engage with STEM is a subject that connects many of the UN's Sustainable Development Goals and is more urgent than ever as was shown in the global COVID-19 pandemic where there has been so much disruption to formal education and to teenagers' home lives.

Moreover, adolescence is a great period to promote healthy lifestyles since teenagers are sufficiently mature to understand the reasons behind adoption of healthy behaviours and their choices in adolescence can have a long-term impact on their individual health and wellbeing.

Teenagers may be considered a hard-to-reach group, as they could be more difficult to engage in research and health education programs than adults or younger children, particularly in deprived communities.

The overall aim for the SEEDS project is to use extreme citizen science to directly empower teenagers such that they sustain the positive changes they have initiated in their own lives and school environments, both in terms of their own perceptions of STEM/STEM careers and their abilities to live healthy lives. Additionally, it is intended that the SEEDS approach becomes an appreciated and widely established means of engaging teenagers and others in key decisions that relate to them. The reason for these aims lies in the fact that overweight and obesity during childhood and adolescence is one of the most important issues in global health. In the last decades, the prevalence of obesity in children has increased dramatically. In 2018, evidence shows that almost one in five (19%) 15-year-old children was either overweight or obese on average across European Union (EU) countries, whereas in 2010 it was one in six (16%).

It is recognized that overweight is caused by a wide variety of factors. One of these factors is elevated energy intake, which often includes a disproportionate amount of refined carbohydrates or processed food usually consumed as snacks or sugary drinks. Other causes are physical exercise deficiency and sedentary behaviour. Longitudinal studies demonstrate an average decline in physical activity from adolescence to young adulthood. Weight gain is also promoted by environmental, behavioural, biological, and genetic factors whose interactions have driven the current levels of worldwide obesity. Teenagers grow up in "obesogenic" environments that increase the propensity to consume energy-dense foods and promote sedentary lifestyles. Moreover, socioeconomic inequalities are another factor related to the worldwide obesity epidemic. A higher prevalence of obesity is observed in disadvantaged and marginalized communities than in groups with higher socioeconomic status.

The SEEDS project has offered a lot of lessons learnt during the different phases of the project and based on the different types of data that were gathered. In this report we connect those lessons to concrete policy recommendations for teenagers themselves, schools, stakeholders, local and national governments. In the appendix a policy brief is provided that summarizes the project and its main findings, recommendations, and legacy.

2. PROJECT DESCRIPTION

The SEEDS project ran in four European countries: Greece, Spain, the United Kingdom, and The Netherlands. The objectives of the SEEDS project were the following:

- To improve healthy lifestyles: To engage adolescents from deprived neighbourhoods in designing interventions that increase physical activity, reduce prolonged sedentary time, and increase healthy snacking choices.
- To increase STEM interest: To engage adolescents from deprived neighbourhoods in designing interventions that seed interest in scientific methodologies, promote STEM careers and empower them by enhancing their critical thinking capabilities.

High schools in deprived areas in each country were recruited for participation and randomized as intervention or control schools. Within the intervention schools, student ambassadors aged 13 to 15 years old were recruited and trained. The student ambassadors participated in all-phases of the project including an exchange to Brussels to disseminate the results. Key behaviours were identified on physical activity, sedentary behaviour and snacking behaviour through focus groups with the student ambassadors. During focus groups with relevant stakeholders, ways to overcome barriers and facilitate these healthy and active lifestyles were discussed. During focus groups with relevant stakeholders, ways to overcome barriers and facilitate these healthy and active lifestyles were discussed. In a Makeathon, a one-day event that bring people from different backgrounds together to work on solutions to specific problems, student ambassadors and stakeholders jointly designed interventions focusing on healthy and active lifestyles with students in a leading role. These interventions were implemented at the intervention schools. The effects of the interventions were evaluated by comparing intervention schools to control schools. Baseline and end-of-study questionnaires to assess the effectiveness of the citizen science intervention in promoting healthy lifestyles, determinants and STEM outcomes were used.

Additionally, relevant indicators on implementation and process of the different phases of the project were gathered.

3. LESSONS LEARNT

In the project several lessons were learnt in each phase of the project based on the scientific literature that was searched, the data gathered in focus groups and makeathons with students and stakeholders, data gathered using questionnaires among students and data gathered on key indicators of the process and during exchange meetings. The lessons learnt can be subdivided in the following four themes:

1. Lessons learnt on use of citizen science methodology.
2. Lessons learnt on design, development, and implementation of intervention
3. Lessons learnt on collaboration with stakeholders, response, and feasibility
4. Lessons learnt on effectiveness of SEEDS on behaviour change and STEM interest

3.1 Lessons learnt on use of citizen science methodology

In our project we studied the scientific literature on use of citizen science methodology in similar fields as in the SEEDS project. We implemented a citizen science methodology based on choosing student-ambassadors in schools, having focus groups discussions, performing makeathons with students and selected stakeholders and organizing exchange between student-ambassadors from different schools and countries. The following lessons can be drawn.

1. Centering empowerment of the teenagers and their stakeholders by ensuring their voices are listened to and they are actively engaged throughout all stages of the project was of crucial importance in the project.
2. It is possible to generate intervention ideas on improving lifestyle with teenagers 13-15 years old from deprived areas during the relative short time of a makeathon. It is also possible to focus on the feasible ones and reach a consensus on these intervention ideas with teenagers from different high schools even though this is felt as a challenge for students.
3. Pupils feel heard and valued with this approach.
4. Teachers see possibilities for other subjects of makeathons like food waste, screen time and mental health, dealing with internet, less sugar, inclusiveness (cultural diversity, gender expression/sexual orientation, equal opportunities).
5. Preliminary conclusions from the systematic reviews on collaborative approaches to enhance healthy lifestyle behaviours among youth:
 - a. In the scientific literature we identified various ways of collaborating with teenagers regarding healthy lifestyle topics (e.g., co-creation, youth-led, peer-led, co-design). There is variety in the intensity of collaborating, for some it is only in the developmental phase, but others also use peer-led activities.
6. Significant results on healthy lifestyle behaviours (physical activity and nutrition) were found in 6 out of 11 studies in favor of the intervention group. Studies included in this review had a

great variety in duration of intervention, ranging from 5 weeks to 3 years. However, this did not influence the significance of results/effects of the intervention, as both shorter and longer studies showed both significant and non-significant results. Preliminary conclusions from the scientific scoping review on increasing STEM interest:

- a. There is some evidence from best practices that STEM interest can be increased in adolescents.
7. Conclusions on determinants of healthy behaviours according to focus groups:
- a. Broadly adolescents hold positive attitudes towards engaging in healthy lifestyle behaviours.
 - b. Friends appeared to be both barriers and facilitators of PA but not in eating decisions.
 - c. Parents are important barriers and facilitators in terms of provision of food.
 - d. Teachers and staff appear to be important facilitators to provide healthy lifestyle information and setting good examples under the condition that teachers are respected.
 - e. School day structure and school environment appear to be important barriers for healthy lifestyle behaviours (HLB).
 - f. Awareness of HLB needs to be addressed as knowledge on HLB and resources are limited in groups with lower socioeconomic positions.
 - g. Role models are important facilitators.
 - h. High prices of healthy food are a barrier.
 - i. Collaboration with stakeholders is important to create more inviting environments for HLB.
8. Lessons learnt from doing makeathons:
- a. Teenagers have lots of ideas to share. Their experiences are very helpful in shaping interventions.
 - b. The makeathon structure needs to be carefully designed to ensure the teenagers can meaningfully and actively contribute. This includes amongst others considering the language used, the materials created and the structure of the day.
 - c. Adults supporting these events or attending as stakeholders can default to traditional relationships with teenagers (student-teacher/child-parent), which runs counter to teenager empowerment. Clear training needs to be provided for adults to prevent this as it can diminish the teenagers' power.
 - d. Teenagers tend to co-create within the limits of what they think is possible. It's important to remind them of the potential for change and to highlight the support and resources that are available to them.
9. When organizing a focus group and makeathon there are several practical lessons.
- a. It is important to have clear in advance what the aim and questions are to be answered in the meetings.

- b. It is important to clearly explain the citizen science approach to the participants, parents, and teachers by indicating what is expected from each of them at the different stages of the project.
 - c. It is possible to do makeathons hybrid (online and face-to-face). However, students strongly prefer face-to-face makeathons
 - d. It is important to adapt the working methods in makeathons/focus groups to the target groups of young people and professionals.
10. The Brussel exchange with other countries was an important motivator for the student-ambassadors. However, the working sessions in Brussel lasted too long, and some students felt exhausted.

3.2 Lessons learnt on design, development and implementation

These lessons are based on the process evaluation, observations, and final exchange conference

1. Intervention design should be a collaborative process, with input from teenagers, researchers, and stakeholders.
2. Also, with limited financial resources it is possible to develop school interventions based on the makeathon results
3. Schools and teachers have an important facilitating role in guiding students in designing and implementing interventions.
4. Interventions were focused on changing the environment and on the encouragement of individual behaviour change.
5. Cooking workshops, healthier school canteens, more active classes and breaks, health and sport challenges/ competitions, healthy lesson packages, new sports, challenge for improving water consumption and involving parents were among the interventions that were chosen by pupils.
6. Students indicate they would like to continue with some of the intervention activities in their high schools in the following academic courses.
7. Screen time reduction interventions did not seem to be effective as students were unable to achieve the objectives of this intervention activity.
8. Physical activity interventions need to be sufficiently varied and attractive
9. Interventions during schooltime are most easy to attend for students
10. Implementation of interventions might fail due to different restraints in time, personnel, or schedule.
11. In deprived neighbourhoods students may have difficult family backgrounds that need to be taken into account when designing interventions.
12. It is already clear that some interventions will be continued after our study, but it is important to determine a sustainability plan to assuring their continuation.

13. The preliminary conclusions from the scientific study of the SEEDS interventions are that although there are similarities between the lifestyles of European adolescents, the interventions implemented in each country were different. Whereas in Spain and The Netherlands the interventions were focused on scholar activities such as cooking workshops and challenging physical activities, in the United Kingdom the intervention was focused on 2 specific challenges (on water consumption and jump rope activities), and in Greece the intervention was focused on environmental changes to increase physical activity and healthy snacks selection in the school canteen.

3.3 Lessons learnt on collaboration with stakeholders, response and feasibility

These lessons are based on the process evaluation, observations, and final exchange conference.

1. Stakeholders mention ambassadors are empowered by SEEDS. They themselves feel inspired by the ambassadors/teenagers. They mention that teenagers came up with unexpected valuable ideas. The stakeholders also experience participation of teenagers has added value for stakeholders themselves in achieving their targets.
2. Stakeholders play an important role in the delivery of interventions if current practice can be enhanced with the ideas from the makeathons / pupils
3. In some instances, it was hard to find schools that were willing to collaborate, probably partly due to covid or because uncertainty about interventions that will be chosen as a result of the makeathons. Schools also indicate that sustainability of interventions is important for them and continued support for the implementation of interventions. Some schools expressed reluctance to participate in one-time projects.
4. More than 200 students of 25 schools were actively involved in the makeathons of which 70 student ambassadors. The percentage of students that was reached by the activities that were implemented ranged from 56% to 92% between countries.
5. Student ambassadors indicate that it is not easy to motivate and convince other students
6. Teachers mention their own motivation has been essential
7. Teachers say that the engagement of the researchers is important.
8. Teachers say local government, councils, school management, families and communities, and social workers are important.
9. Teachers stress they need time to work with students in approaches like the SEEDS approach.

3.4 Lessons learnt on impact on behaviour change and STEM interest

These lessons are based on the preliminary effect evaluation (see for details Deliverable 4.2) and final exchange conference.

1. A small increase in physical activity for the intervention group was observed while for the control group no change was observed.
2. Concerning the consumption of fruits or berries during school hours, an increase was observed only for the intervention group and a decrease in the control group
3. Concerning the consumption of vegetables, the SEEDS intervention is effective in increasing this consumption.
4. The difference between intervention group and control group on healthy lifestyle behaviours reached statistical significance for vegetable consumption.
5. The intention of teenagers to have a job in the future that uses science slightly decreased for both groups in the follow-up. No statistically significant differences were found between intervention and control group.
6. Teachers indicate they noticed some effects on healthy choices among adolescents. However, intervention effects might need a more prolonged time period to become measurable.
7. Stakeholders indicate impact on ambassadors probably was higher than on other students, considering they participated in all the stages of the project.
8. Stakeholders indicate uncertainty about the sustainability of impact after the project is finished

4. RECOMMENDATIONS

Based on the lessons learnt we have several policy recommendations.

Our policy recommendations are arranged around the themes of the lessons learnt and have a broad range including fields citizen engagement, health, and STEM policies.

The policy recommendations are meant for secondary schools, relevant stakeholders within and outside the education field, as well as for local and national governments to help them to contribute to healthy lifestyles and science interest in adolescents.

An open consultation policy was followed to obtain feedback, knowledge and insights from local stakeholders and stakeholders from the quadruple helix represented in the advisory board of SEEDS

4.1 Recommendations on use of citizen science methodology

1. On the use of citizen science methodology, we have the following recommendations:
2. Using makeathons, as a methodology of citizen science, can generate many ideas and empower participants among young adolescents (13-15 year olds) from underserved communities and is therefore recommended as a valuable approach to improve healthy lifestyle behaviours in these groups.
3. Adolescents and stakeholders indicate that more themes are suitable for the makeathon approach. In line with this, we recommend experimenting with the approach on subjects like mental health, inclusiveness and circular economy.
4. Student-ambassadors point at the school environment, structure of schooldays and engagement of school staff as important barriers for healthy lifestyle behaviours. Schools should create more healthy school environments with more opportunities for students to engage in healthy lifestyle behaviours throughout the day with the encouragement and resources provided by local and national governments.
5. As friends are a barrier as well as a facilitator for engaging in physical activity for adolescents, physical activity interventions directed at adolescents should address these barriers and facilitators sufficiently and incorporate enough possibilities for interaction with friends during physical activity.
6. As parents are an important barrier and facilitator for healthy food choices and habits of adolescents, more effort is needed to support families of adolescents in building healthy food habits. Local and national governments need to integrate these efforts in their public health policies.
7. The approach followed in SEEDS did not only include working with makeathons, but also the formation of a group of student-ambassadors, that received training on healthy lifestyles and contribution of science, provided input on barriers and facilitators and assisted in design and

implementation. The overall satisfaction on this approach by student-ambassadors, schools and researchers was high. This approach needs further development and research as it might be a promising way forward to achieve positive impacts on the life of youth.

4.2 Recommendations on design, development and implementation

On the design, development, and implementation of interventions on healthy lifestyle behaviours we have the following recommendation:

1. As schools are important facilitators of co-creation of interventions with pupils and the need for financial resources is low (interventions do not need to be expensive), it is important to motivate schools to adopt this approach and provide schools with tools and training to implement the approach. Schools need to invest time for organising and supervising the activities. Local public health agencies could play a role in facilitating and motivating schools. Their role is also important for design of interventions and involving relevant stakeholders. Local governments could provide additional (financial) resources. Integration in local health policies is recommended.
2. Activities with a focus on preparing food at school, like cooking workshops or preparing healthy lunches, were appreciated by many pupils. Schools were able to organise these types of activities. Therefore, we recommend to implement this type of activities in more schools in collaboration with professionals on this issue like dietitians or nutritionists.
3. Pupils had many ideas on increasing physical activity at school outside physical education lessons like activities in the break, and more varied sports activities during PE lessons. Therefore, we recommend local public health agencies to help schools develop and implement break activities and to offer a more differentiated sport lessons. We recommend schools to take up this recommendation themselves.

4.3 Recommendations on collaboration with stakeholders, response and feasibility

On the collaboration with stakeholders, schools, students, feasibility, and sustainability we have the following recommendations:

1. Ambassadors indicated it is difficult to motivate other pupils to engage in healthy behaviour. We recommend to focus on interventions that are attractive for pupils and to spend sufficient time and develop a strategy to involve and motivate other pupils in early phases of the project.
2. Pupils were highly motivated by the Brussels exchange and felt empowered. We recommend governments and schools to organise exchanges with schools in other countries and work and exchange on common challenges.

3. Sustainability is not guaranteed but is important to schools. Therefore, we recommend (local) governments to support schools and guarantee resources over longer periods of time.
4. Meetings with education departments could increase the sustainability. The meetings should not only include the explanation of the results of the project, but also be directed at searching new ways to sustain these types of approaches in high schools. For example, by training teachers on the use of citizen science methodology with practice-based examples.

4.4 Recommendations on impact on behaviour change and STEM interest

On the impact the SEEDS project was able to achieve, we have the following recommendations:

1. The SEEDS project provides evidence for behaviour change on one of the three primary outcomes of healthy lifestyles (vegetable consumption) in a relative short period of time. This is promising. Further research is required to understand how the SEEDS approach and consecutive interventions contributed to the results found. Further development, implementation and research using the SEEDS approach is warranted. Future studies might benefit from longer or recurrent periods for the design of intervention phase and longer follow up periods for effect evaluation.
2. The SEEDS project did not find effects on STEM interest. Although student ambassadors were trained in using citizen science, no specific activities were implemented directed at STEM interest of all students. This might explain the results found. Further development of the approach is recommended to be able to achieve the goals on STEM interests.

APPENDIX: POLICY BRIEF

INTRODUCTION

Institutional changes are required to respond to the increased interactions between Research & Innovation (R&I) stakeholders in society. Research funding organisations accept more inputs from citizens and organisations that used to be considered outsiders to the world of R&I. Examples include citizen science, extended peer review in funding agencies, co-creation of public policies and agenda setting in research and innovation programmes.

Good practices are widespread in Europe like in citizens' and citizens' associations engagement in science. The good practices in this fields are much more easily, efficiently, and sustainably implemented when the organisations funding, performing or associated to R&I have significantly adapted their governance frameworks to open up through a process of institutional change.

Results should contribute to a greater involvement of all stakeholders in R&I, a better and more sustainable engagement with citizens and society as a whole, and a more scientifically interested and literate society. It is expected that the topic will support a significant number of impactful and sustainable institutional changes in partner organisations. Consortia are expected to evaluate their activities and provide evidence of societal, democratic, economic, and scientific impacts of institutional changes.

The SEEDS project

Empowering teenagers to educate themselves in their health and to engage with STEM is a subject that connects many of the United Nations (UN)'s Sustainable Development Goals and is more urgent than ever as was shown in the Global COVID-19 Pandemic where there has been so much disruption to formal education and to teenagers' home lives.

The SEEDS project used extreme citizen science to directly empower teenagers from underserved communities such that they sustain the positive changes they have initiated in their own lives and school environments, both in terms of their own perceptions of STEM (Science, Technology, Engineering and Mathematics)/STEM careers and their abilities to live healthy lives. The reason for these aims lies in the fact that overweight and obesity during childhood and adolescence is one of the most important issues in global health. In the last decades, the prevalence of obesity in children has increased dramatically. In 2018, evidence shows that almost one in five (19%) 15-year-old children was either overweight or obese on average across European Union (EU) countries, whereas in 2010 this was one in six (16%).¹ Furthermore, a higher prevalence of obesity is observed in disadvantaged communities than in groups with higher socioeconomic status. From a health equity perspective, it is essential to ensure that adolescents

¹ OECD/European Union (2020), "Overweight and obesity among children and adolescents", in Health at a Glance: Europe 2020: State of Health in the EU Cycle. OECD Publishing, Paris. <https://doi.org/10.1787/7402dbb2-en>

from underserved communities are also involved even though they are usually regarded as hard to reach. This is important as scientific evidence shows less affluent adolescents are less likely to meet the current recommendations for a healthy and active living. Finally, adolescence is an important period to promote healthy lifestyles since teenagers are sufficiently mature to understand the reasons behind adoption of healthy behaviours and their choices in adolescence can have a long-term impact on their individual health and wellbeing.

EVIDENCE AND ANALYSIS

The most important findings from the project are:

1. Centering empowerment of the teenagers and their stakeholders by ensuring their voices are listened to and they are actively engaged throughout all stages of the project was of crucial importance in the project. Teenagers indicated that they felt heard and valued with the SEEDS approach.
2. The SEEDS approach shows that students from underserved communities can be reached and involved very well. The findings show it is possible to generate a wealth of intervention ideas on improving lifestyle with teenagers 13-15 years old from more deprived areas during the relative short time of a makeathon, our collaborative creation event. Our findings are that teenagers were very well capable of focusing on feasible ideas and reach a consensus on these intervention ideas with teenagers from different high schools even though this is felt as a challenge for students. Furthermore, the intervention ideas were focused on both changing the environment as well as on changing individual behaviour.
3. The involvement of stakeholders in R&I has been much appreciated and more breadth of support has been created for comparable initiatives. Teachers for instance see possibilities for other subjects of makeathons like food waste, screen time and mental health, dealing with internet, less sugar, inclusiveness (cultural diversity, gender expression/sexual orientation, equal opportunities). Local stakeholders felt inspired and saw possibilities to achieve their goals in collaboration with teenagers.
4. Intervention design should be a collaborative process, with input from teenagers, researchers, and stakeholders. However, based on our findings it is important to stress that schools and teachers have a crucial role in facilitating and supporting students in designing and implementing interventions.
5. The budgets for interventions in the SEEDS project were not high. However, our findings show that also with limited financial resources it is possible to develop school interventions based on the makeathon results. This is likely to improve the sustainability of interventions as well.
6. Our findings show cooking workshops, healthier school canteens, more active classes and breaks, health and sport challenges/ competitions, healthy lesson packages, new sports, challenges for improving water consumption and involving parents were among the interventions that were chosen and most appreciated by the teenagers. Students indicate

they would like to continue with some of the intervention activities in their high schools in the following academic courses.

7. In terms of the improvement of lifestyle behaviours our project shows in the relative short time of the intervention implementation period a significant improvement on one of the three primary lifestyle behaviours studied among the intervention group in comparison with the control group. On the other two lifestyle behaviours no significant effects were found, but the direction of the observed changes was in favor of the intervention group.
8. In terms of the improvement of STEM interest no intervention effects were found.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Our findings have the following implications for policy.

1. Using makeathons as a methodology of citizen science, generates lots of ideas and empowers participants among young adolescents (13-15 year olds) from underserved communities. The SEEDS project adds to the evidence of using this form of citizen science to improve healthy lifestyle behaviours in these groups. We recommend its use in future projects.
2. The approach followed in SEEDS did not only include working with makeathons, but also the formation of a group of student-ambassadors, that received training on healthy lifestyles and contribution of science, provided input on barriers and facilitators and assisted in design, implementation and dissemination. The overall satisfaction on this approach by student-ambassadors, schools and researchers was high. This approach of using citizen science needs further development and research as it might be a promising way forward to achieve positive impacts on the lives of youth also on other health topics.
3. As schools are important facilitators of co-creation of interventions with pupils and the need for financial resources is low (interventions do not need to be expensive), it is important to motivate schools to adopt this approach and provide schools with tools and training to implement the approach. For example, by training teachers on the use of citizen science methodology with practice-based examples. Schools need to invest time for organising and supervising the activities. Local public health agencies could play a role in facilitating and motivating schools. Their role is also important for design of interventions and involving relevant stakeholders. Local governments could provide additional (financial) resources. Integration in local health policies is recommended.
4. Based on our findings, the implementation of cooking workshops, healthier school canteens, more active classes and breaks, health and sport challenges/ competitions, healthy lesson packages, new sports and challenges for improving water consumption were among the interventions that were chosen and most appreciated by the teenagers. Implementation of these types of activities on other high schools might be a promising approach and should be considered by local governments and high schools.

5. Sustainability of interventions after the project period is possible and is important to schools. Therefore, we recommend (local) governments and education departments to support schools and guarantee resources over longer periods of time.
6. The SEEDS project provides evidence for behaviour change on one of the three primary outcomes of healthy lifestyles in a relative short period of time. This is promising. Further development, implementation and research using the SEEDS approach is warranted and deserves financial support.

PROJECT OBJECTIVES AND METHODOLOGIES

The SEEDS project ran in four European countries: Greece, Spain, The Netherlands and the United Kingdom. The objectives of the SEEDS project were the following:

- To improve healthy lifestyles: To engage adolescents from deprived neighbourhoods in designing interventions that increase physical activity, reduce prolonged sedentary time, and increase healthy snacking choices.
- To increase STEM interest: To engage adolescents from deprived neighbourhoods in designing interventions that seed interest in scientific methodologies, promote STEM careers and empower them by enhancing their critical thinking capabilities.

High schools in deprived areas in each country were recruited for participation and randomized as intervention or control schools. Within the intervention schools student ambassadors aged 13 to 15 years old were recruited and trained. The student ambassadors participated in all-phases of the project including an exchange to Brussels to disseminate the results. Key behaviours were identified on physical activity, sedentary behaviour and snacking behaviour through focus groups with the student ambassadors. During focus groups with relevant stakeholders, ways to overcome barriers and facilitate these healthy and active lifestyles were discussed. In a Makeathon, a one-day event that bring people from different backgrounds together to work on solutions to specific problems, student ambassadors and stakeholders jointly designed interventions focusing on healthy and active lifestyles with students in a leading role. These interventions were implemented at the intervention schools. During implementation student ambassadors were still involved. The effects of the interventions were evaluated by comparing intervention schools to control schools. Baseline and end-of-study questionnaires were used to assess the effectiveness of the citizen science intervention in promoting healthy lifestyles, determinants, and STEM outcomes.

Additionally, relevant indicators on implementation and process of the different phases of the project were gathered.

SUSTAINABILITY AND LEGACY

ECSA, in collaboration with the other partners, created different guidelines in flashcard format about how to empower teens to manage their health and how to empower teenagers in health issues, for health professionals and teachers respectively. These flashcards will be distributed to health and education governmental department, and different education and health associations.

In addition, each partner developed a booklet for the control high schools and other interested high schools about how to implement the citizen science methodology projects in high schools.

Products of SEEDS that are freely accessible to the public can be found on our website <https://seedsmakeathons.com>.

- Video on SEEDS results and impact
- Flashcards for schools
- Toolbox for the implementation of a citizen science project on high schools
- Deliverables describing the methodology, implementation, and impact of the project

Upcoming scientific publications will be added to the website in the coming years.

PROJECT IDENTITY

Project name	Science Engagement to Empower aDoleScents (SEEDS)
Coordinator	Fundació Institut d'Investigació Sanitària Pere Virgili (IISPV)
Consortium	Charokopeio Panepistimio (HUA) City of Rotterdam (CoR) Erasmus MC Rotterdam (EMC) University of Exeter (UOE) Verein Der Europaeischen Burgerwissenschaften - ECSA E.V.
Funding scheme	H2020-SwafS-2018-2020: SwafS-31-2020: Bottom-up approach to build SwafS knowledge base
Duration	January 2021 – December 2022 (24 months).
Budget	EU contribution : € 1 099 502,50
Website	https://www.seedsmakeathons.com
Cordis	https://cordis.europa.eu/project/id/101006251/es
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