

D4.2: Second version of the Description of TIME4CS training programs

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List of Abbreviations

CS	Citizen Science
CS-ICP	Institutional Contact Point for CS
D	Deliverable
EC	European Commission
ECTS	European Credit Transfer and Accumulation System
IA	Intervention Area
GA	Grounding Action
MOOC	Massive Open Online Course
OS	Open Science
PES	Public Engagement in Science
RPOs	Research Performing Organisations
RRI	Responsible Research and Innovation
STEM	Science, Technology, Engineering, and Mathematics
TC	Training Course
TP	Training Program
TS	Training Section



Executive Summary

The current document, titled 'D4.2: Second version of the Description of TIME4CS training programs', has been developed within the framework of the TIME4CS project which is funded by the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 101006201.

The main objectives of this Deliverable are to:

- Map and introduce current insights into citizen science training programs across Europe;
- identify the key concepts, capabilities, and infrastructures for citizen science training, partly from training identified and partly from insights from WP1 and WP2; and
- describe the updated training programs in TIME4CS.

To this end, the document gives a short overview of the literature on citizen science training and maps out current citizen science training offered across Europe. It proceeds to identify the key concepts, capabilities and infrastructures addressed in current training offered as well as those required to embed citizen science into research performing organisations based on work done in work packages 1 and 2. The document ends with an updated description of the TIME4CS training program planned.

In total, four training courses (one for each of the four Intervention Areas (Research, Education & Awareness, Support Resources & Infrastructure, and Policy & Assessment)) have been developed further. The training courses can be combined into a complete training program, or used separately, depending on the needs and requirements of the implementing institution. All training courses are based on previous analysis performed by the TIME4CS consortium, specifically WP1 and WP2, and on the analysis of best practices identified in current training programs performed in WP4. Training courses will be assessed in close coordination with WP5.



1. Introduction

The overall objective of TIME4CS WP4 is to build capacity within institutions for the use of responsible research and innovation (RRI), especially through citizen science (CS) and public engagement in science (PES). To better understand how to build this capacity through developing and conducting CS and PES (henceforth referred to as 'CS') training, T4.1 mapped existing CS courses and extracted relevant information in terms of key concepts (incl. content, audience, training type, and assessment), capabilities (incl. skills trained and learning goals), and infrastructures (incl. training format, publisher, and knowledge exchange opportunities) within identified training resources. Furthermore, key concepts, capabilities, and infrastructures were identified from work done in WP1 and WP2, and gaps in current identified training were exposed and incorporated into the TIME4CS training courses. The TIME4CS training courses were developed, based on 'plug-and-play' training sections developed to support the identified Grounding Actions (GAs) in WP1 (D1.2). Finally, as it is planned to make the training courses available on the EU-citizen.science platform, in this version of the deliverable, the descriptions of the training courses are based on a template for development of training courses for that platform. Ensuring that our training program can be hosted on that platform, ensures the sustainability and accessibility of our TIME4CS training courses beyond the duration of the project.

Embedding CS in research performing organisations (RPOs) requires concerted effort and dedication, not only from a few dedicated researchers using CS as a method (bottom-up), but also from management and support functions within RPOs (top-down). These two approaches, bottom-up and top-down, are related to the two theoretical approaches TIME4CS builds on to effect institutional change, i.e., the social approach and the organisational approach, respectively. The social approach requires significant commitment of individuals to change their own behaviours, views, and mindsets, whereas the organisational approach focuses on modifying organisational structures, such as norms, procedures, and protocols¹.

With these two approaches and their involved individuals in mind, it becomes obvious that capacity building is required for researchers as well as management and other staff members. Hence the TIME4CS training programs needed to be developed with a variety of audiences in mind, focusing on the GAs and how to affect the institutional change needed to embed CS practices in RPOs.

The report is structured in the following way: Chapter 2 introduces our mapping of CS training across Europe. Chapter 3 presents identified key concepts, capabilities, and infrastructures in training material identified and needed for embedding CS in RPOs, from the mapping done and from work done in WP 1 and WP2, respectively. Our planned TIME4CS training courses are described in Chapter 4 and the report ends with the conclusion.

This deliverable is the second version of the description of the TIME4CS training program. The main difference between the first version and this version is the use of the EU-citizen-science template as a basis

¹ Berger, P. L., and T. Luckmann. 1966. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Garden City, NY: Anchor Books



for the description and planning of the training courses. We decided to combine our previous three training modules within each Intervention Area within one course, instead having each previous training module as one or more sections within the courses. This version also includes course overview plans with detailed descriptions of course content for each course as well as an overall equality impact assessment for the TIME4CS training program. Development of the courses will now proceed, and hence the final description of our programs will evolve as they are developed, implemented and evaluated. The next and final version of the description of training programs is scheduled for December 2023 (M36).

1.1 Insights from the literature

Hundreds of papers and reports have been published that either mention, or partly or entirely address the topic of CS and training in various ways. Many of them just mention that training of volunteers was conducted within their CS projects. Others discuss more in-depth the training regimes of volunteers for specific projects², the benefit of volunteer training to researchers³, CS training linked to learning or formal education⁴, or training in relation to ensuring data quality and reliability, for example in contributory CS projects^{5,6}. As can be seen, all these types of papers and reports mainly focus on the CS projects themselves or learning related to CS projects. They do not address the metalevel of CS with a focus on supporting and embedding CS in RPOs. Moreover, as the analyses in D1.2 and D1.3 demonstrated, this type of training does not influence the institutional acceptance of citizen science.

Though publications on CS training programs aimed at creating institutional change are lacking, recommendations of raising awareness among researchers have been put forward as a necessary step to better embed CS in RPOs^{7,8}. Also, outputs from the European Commission (EC)⁹ and other EC-funded

² Lasky, M., Parsons, A., Schuttler, S., Mash, A., Larson, L., Norton, B., Pease, B., Boone, H., Gatens, L., & Kays, R. (2021). Candid Critters: Challenges and Solutions in a Large-Scale Citizen Science Camera Trap Project. *Citizen Science: Theory and Practice*, 6(1), 4. <https://doi.org/10.5334/cstp.343>

³ Thornhill, I., Loiselle, S., Lind, K., & Ophof, D. (2016). The Citizen Science Opportunity for Researchers and Agencies. *BioScience*, 66(9), 720–721. <https://doi.org/10.1093/biosci/biw089>

⁴ Citizen Science in Higher Education, Special Collection (2021). *Citizen Science: Theory and Practice*. <https://theoryandpractice.citizenscienceassociation.org/collections/special/citizen-science-in-higher-education>

⁵ Katrak-Adefowora, R., Blickley, J. L., & Zellmer, A. J. (2020). Just-in-Time Training Improves Accuracy of Citizen Scientist Wildlife Identifications from Camera Trap Photos. *Citizen Science: Theory and Practice*, 5(1), 8. <https://doi.org/10.5334/cstp.219>

⁶ Ratnieks, F. L. W., Schrell, F., Sheppard, R. C., Brown, E., Bristow, O. E., & Garbuzov, M. (2016). Data reliability in citizen science: Learning curve and the effects of training method, volunteer background and experience on identification accuracy of insects visiting ivy flowers. *Methods in Ecology and Evolution*, 7(10), 1226–1235. <https://doi.org/10.1111/2041-210X.12581>

⁷ Ayris, P., Román, A., Maes, K., & Labastida, I. (2018). Open Science and its role in universities: A roadmap for cultural change. LERU. <https://www.leru.org/publications/open-science-and-its-role-in-universities-a-roadmap-for-cultural-change>

⁸ Wyler, D., Grey, F., Maes, K., & Fröhlich. (2016). Citizen science at universities: Trends, guidelines and recommendations. LERU. <https://www.leru.org/publications/citizen-science-at-universities-trends-guidelines-and-recommendations>

⁹ European Commission, Directorate-General for Research and Innovation, Delaney, N., Iagher, R., Tornasi, Z., Institutional changes towards responsible research and innovation: achievements in Horizon 2020 and recommendations on the way forward, Publications Office, 2020, <https://data.europa.eu/doi/10.2777/682661>



projects^{10,11} have focused on for example institutional changes required to implement RRI in RPOs, including training aspects. Many resources and trainings are also available on Open Science (OS)¹²; however, they rarely cover CS comprehensively.

¹⁰ d'Andrea, L., & Alfonsi, A. (2021). Deliverable 3.3 Guidance document on RRI-oriented grounding actions. GRACE. http://grace-rri.eu/wp-content/uploads/2022/01/GRACE-D3.3_Guidance-document-on-RRI-oriented-grounding-actions.pdf

¹¹ Tokalić, R., Buljan, I., Mejlgaard, N., Carrió, M., Lang, A., Revuelta, G., & Marušić, A. (2021). Responsible research and innovation training programs: Implementation and evaluation of the HEIRRI project. *Forensic Sciences Research*, 6(4), 320–330. <https://doi.org/10.1080/20961790.2021.1970319>

¹² Swiatek, C., McCaffrey, C., Meyer, T., Svenbro, A., Wojciechowska, A., Clavel, K., Brinken, H., & Egerton, F. (2020). Open science training methods and practices across European research libraries: Survey analysis. https://ulir.ul.ie/bitstream/handle/10344/8972/McCaffrey_2020_Open.pdf



2. Mapping citizen science training across Europe

The [EU-citizen.science](https://eu-citizen.science) platform provided the basis for mapping CS training in Europe, as the team behind the platform has put considerable effort into compiling, and encouraging the CS community to contribute, CS training resources. Additionally, training courses were identified based on the case studies in WP1, as most universities do not list their courses on the EU-citizen.science platform. Metadata were compiled for the identified trainings, covering general information, key concepts, capabilities, and infrastructures (Table 1), enabling a gap analysis of those compared to the identified need (3.3 Gaps in existing training modules). The full list of CS training resources identified is available on Zenodo¹³.

Table 1 – Metadata collected for identified citizen science trainings in Europe

Essential key themes	Metadata	Metadata description
General training course information	Title	Course title
	Year	Year first run/published
	Author(s)	Name(s) of training creators
	Language(s)	Which language(s) the course is available in
	Accessibility	Is the training course open to all, restricted, paid for?
	Time required	How long (approx.) is required to complete the course?
Concepts covered	Content description	Brief description of the course content
	Audiences (number of resources targeting listed audience)	CS Project Leaders & Initiators (34) Researchers & Academics (31) Community Members & Citizens (22) Civil Society Orgs & NGOs (22) Educators (20) Students (12) All Audiences (11) Librarians (5) Policy & Decision Makers (5) Government employees (2) Journalists (1)

¹³ Zenodo: <https://doi.org/10.5281/zenodo.6840274>

Essential key themes		
Essential key themes	Metadata	Metadata description
	Training type (number of resources of a certain type)	MOOC (39) Static resource (Guide, Handbook, Toolkit) (26) Webinar (4) Onsite training (3) University course (2)
	Assessment	What type of assessment of trainees is conducted, if any?
Capabilities covered (skills trained)	Content themes (number of resources dealing with theme)	Introduction to CS (40) Engagement (40) Best practices (27) Communication (26) Project management (23) Data quality and standards (18) Research design and methods (17) Regulations and ethics (16) CS stories (14) Evaluation of citizen science (14) Link with formal education (13) Co-creation (10) Empowerment (10) Impact (10) Project sustainability (6) Reflections on science (6) Event planning (4) Transferability (3) Funding (1)
	Learning goals	Description of learning goals of training
Infrastructures covered	Training format (number of resources with certain format)	Online/onsite (69/3) Website (69) Course (44) Text (Guide, Handbook, Toolkit) (26) Video (13)
	Publisher	Who published the resource
	URL	Link to website



Essential key themes	Metadata	Metadata description
	Knowledge exchange opportunities	Any knowledge exchange possible in relation to the training?



3. Key concepts, capabilities, and infrastructures for citizen science training

The mapping of existing courses allowed for an identification of key concepts, capabilities, and infrastructures that together define current best practices for CS training and training resources. Analysed in the context of knowledge produced by the TIME4Cs consortium about best practices for institutional integration of CS in RPOs and Implementers' roadmaps, this information allows for an identification of the institutional support that may already be gained by implementing training programs but also for an identification of gaps in existing best training practises compared to the demands of institutional change.

3.1 Key concepts, capabilities, and infrastructures in identified CS training material

The key concepts, capabilities, and infrastructures covered in identified CS training materials cover a wide range; however, they are not equally represented in the materials identified, as shown in Table 1.

3.1.1 Key concepts

Audiences: A lot of identified training targeted CS project leaders & initiators (34), and/or Researchers and academics (31). Trainings for Community members and citizens (22), Civil society organisations & NGOs (22), and Educators (20) were also well represented. New target audiences have also emerged such as policy & decision makers (5), librarians (5), and journalists (1). As the CS community identifies additional important stakeholders, we expect to see more of these specifically targeted training resources rather than the more generic introductions-to-CS-type training.

Training type: Here, 'training type' includes any kind of written, recorded, or onsite materials and courses purposefully developed as training resources, and therefore excludes scientific articles, reports, and other materials where the aim is not training. Training resources counted here as 'courses' were generally listed as 'MOOC' (Massive Open Online Course) and included an assessment component, often one or more self-assessment quizzes, and often had the option for participants to gain some sort of recognition, such as a badge or certificate, on completion. Most (38) identified training resources were online courses of varying duration from 1 hour only up to 40 hours over 10 weeks. Only three identified courses were onsite (two university courses and one run by an NGO), though more RPOs were identified offering CS or CS-related courses through the WP1 case studies but further information was unavailable, and these were therefore not included in the final list.

Many (26) identified training resources were written guides, handbooks, or toolkits (collections of multiple resources). Only four training resources were recorded webinars, though more are likely available on CS association websites and YouTube channels^{14,15}.

Assessment: Most identified courses do not have formal assessment, though most of the online courses do have quizzes or reflection questions for participants to evaluate their learning. Some platforms also provide a badge or certificate to participants, often on condition of completing at least 50% of a quiz correctly. The two identified onsite university courses do have formal assessments in the form of exams where a pass provides formal degree credits such as European Credit Transfer and Accumulation System (ECTS). Also, the one other onsite course provides formal recognition in the form of 1 ECTS on course completion. Other resources such as guides, handbooks and toolkits may have reflection questions for readers, but there are no assessments as such.

3.1.2 Key capabilities

Content themes/skills trained: Identified training resources deal with many different themes and aim at providing training on many different aspects of CS. Themes can be grouped into five main topics:

- 1) About CS, including Introduction to CS, Best practices, and CS stories;
- 2) CS project design and management, including Project management, Co-creation, Engagement, Communication, Regulations and ethics, Funding, and Event planning;
- 3) The science aspect, including Data quality and standards, Research design and methods, and Reflections on science;
- 4) CS in education, including Link with formal education; and
- 5) Outcomes of CS projects, including Project sustainability, Evaluation of CS, Impact, Empowerment, and Transferability

As can be seen from these five main topics, they are very much focused on CS as a field or as specific projects, not on embedding CS into organisations and requirements from the institutional perspective to enable successful CS projects. However, the topics addressed in identified training corresponds well with the identified audiences for the trainings.

Learning goals: Where available, these correspond with the content themes in a way to enable a deeper understanding of CS in general, and of CS project management, the scientific aspects, and outcomes of CS in particular.

3.1.3 Key infrastructures

Publisher and URL: Training resources have been developed and made available by a range of different organisations and entities, including NGOs, government entities, EC-funded project consortia, CS

¹⁴ Citizen Science Association YouTube: <https://www.youtube.com/channel/UChTgtlf9BqiEpWiczvH0jbA>

¹⁵ Australian Citizen Science Association YouTube Channel:
<https://www.youtube.com/c/AustralianCitizenScienceAssociation>



associations, and universities. As most resources are online, also a variety of different platforms have been used for hosting the resources and facilitating learning, including well-known MOOC provider platforms, institutional, project-related, or stand-alone websites.

Knowledge exchange opportunities: Knowledge exchange can be a valuable medium for learning, but due to the online and continually accessible formats of most identified training resources, this aspect is mostly not included. Some MOOC platforms do have a participant forum, but it is unknown how utilized they are. Only the onsite courses where interaction between participants can be directly facilitated, can knowledge exchange occur between participants.

3.2 Institutional support required for citizen science training

The TIME4CS project has already provided useful lessons regarding institutional support required for the implementation and adoption of CS in RPOs.

In WP1, information about institutional integration of CS in FRs and 38 RPOs around the world was collected and analysed. Based on the analysis of FRs, the *D1.2: Best practices repository of TIME4CS front-runners* identified several recommended GAs for each IA and several best practices adopted by FR institutions¹⁶. These tentative conclusions were extended and validated by the analysis performed in relation to the TIME4CS case study repository¹⁷. The *D1.1 Collection of case studies of institutional adoption of citizen science* analysed information from 38 RPO cases to better understand a variety of pathways that can lead to CS-related institutional integration¹⁸. The *D1.3 Lessons learned repository of TIME4CS: Building the TIME4CS knowledge base framework* used Fuzzy-set Qualitative Comparative Analysis of information collected from a survey of 38 RPOs to recommend specific pathways with high promise of success, namely the development of CS projects from multiple disciplines, the promotion of CS champions, and the availability of institutional plans, strategies, or policies¹⁹.

WP2 has so far resulted in the development of a roadmap framework to assure CS-related institutional change by Implementers. The *D2.1: Compilation of roadmaps and Grounding Actions for the Implementers* presents roadmaps for the four TIME4CS Implementers²⁰. The roadmaps have been tailored to reflect specific institutional demands and requirements, but also the main barriers to institutional change at each of the Implementers. The different roadmaps clearly indicate that the implementing institutions differ in terms of existing institutional support for CS and therefore also in terms of the institutional support required for CS

¹⁶ Mondardini, R., & Roffler, U. (2021). D1.2: Best practices repository of TIME4CS front-runners. <https://doi.org/10.5281/zenodo.5017361>

¹⁷ TIME4CS (2021). TIME4CS-Case Studies: Mapping and Analysing the Adoption of Citizen Science Initiatives by Research Performing Organisations. <https://time4citizenscience.wordpress.com/>.

¹⁸ Herrera, A., & Hacklay, M. (2021). D1.1: Collection of Case Studies of institutional adoption of CS. <https://doi.org/10.5281/zenodo.5807507>

¹⁹ Herrera, A., & Hacklay, M. (2022). D1.3: Lessons learnt repository of TIME4CS. <https://doi.org/10.5281/zenodo.6402090>

²⁰ Vilarchao, E., Fleck, M., & Ipolyil, I. (2021). D2.1: Compilation of roadmaps and Grounding Actions for the Implementers. <https://doi.org/10.5281/zenodo.5743298>



training. Since the Implementers have devised GAs in relation to training, awareness raising, identification of CS contact points, development of CS policies/guidelines, and participation in CS networks (see figure 1), it will be important that training resources have a broad scope of application in terms of their audiences, topics, activities, and assessments.

The identification of key concepts, capabilities, and infrastructures in existing training programs (see section 3.1 Key concepts, capabilities, and infrastructures in identified CS training material) provides support for the need for broad institutional support of diverse training resources. These findings have been compared with the available information about institutional integration in many different RPOs (WP1) and the envisioned institutional change by implementers (WP2). In the following sections, we present the conclusions that have been drawn from the comparison.

3.2.1 Audiences for training programs

In terms of *audiences*, RPOs need to provide CS training for researchers and students from all faculties. An important pathway to institutional integration is the development of cross-disciplinary interest in CS. Since the development of CS projects from multiple disciplines is important to CS-related institutional integration, for RPOs with more than one faculty it will be important to target audiences from all faculties. Although many CS projects have a natural science or technical science background, CS offers opportunities for researchers in all disciplines. If training programs are specialized for certain disciplines, it is necessary to make sure that many disciplines, not just natural and technical sciences, are covered.

Moreover, CS training should also be provided for other RPO staff members (for example, public information officers, librarians, and research support workers) and for managers. Existing training programs tend to focus on researchers, most likely because they are seen as gateways for new CS projects and activities. In many cases this will be true. However, institutional integration of CS requires more than new CS projects. This means that training programs need to be targeted at non-researchers as well.

To promote CS champions in the RPO, careful selection of audiences of training programs might be necessary. Individuals (researchers, key staff members, or managers) who already have expressed interest in CS – or have interest in aligned topics such as OS or RRI – will be obvious candidates. As regards the promotion or development of institutional CS plans, managers at all levels should be considered as part of the audience (or specific training programs should be developed for managers).

3.2.2 Training types and formats

Many types of trainings programs and resources have been identified. Needless to say, the training programs must be targeted to the envisaged support task at hand. Ordinary courses or seminars may be suitable for researchers or students who need general introduction to CS, whereas more specific tasks such as policy development or promotion of champions will require dedicated training activities such as workshops or master classes.



Specific attention should be devoted to train-the-trainer concepts as they have the potential to introduce cascading effects in the organisation, which potentially serve to institutionalise the changes envisaged²¹. The train-the-trainer concept is also mentioned by Implementers who aim to develop training courses for researchers and students. Although many existing training programs are not explicitly developed as a train-the-trainers concept, they can be used as such pending some moderation, for example by inclusion of exercises that allow participants to develop ideas and design modules for continued training in the RPO.

Assessments serve (at least) two purposes in current CS training programs. Assessments are used to assess skills acquired by participants, but also to recognize and motivate participants to mobilise their skills to produce institutional change after training. WP1 found in their analyses that formal teaching bringing formal credits, such as ECTS, are important for institutional change, so a focus on formal recognition of training will be key for Implementers. Assessments should typically reflect specific learning goals established for the training at hand. They may be organised in accordance with formal structures for learning activities at the RPO, or they may be designed to serve ad hoc purposes.

3.2.3 Training content and skills (learning goals)

Many different skills with aligned learning goals are relevant to institutional changes for CS. Five main topics covered by existing training resources were identified above. They primarily relate to the design and process of CS projects. Less attention has been given to tasks aimed specifically for changes within RPOs such as development of CS policies and guidelines. Fundraising for CS, for example, is only covered by one existing training resource. Policymaking is not listed at all. Such tasks have been identified as important to specific pathways to CS-related institutional integration. They have also been adopted by the Implementers in TIME4CS as part of their roadmap framework process.

3.2.4 Infrastructures

Existing CS training programs already provide crucial infrastructure that can be used by the TIME4CS consortium to develop additional CS training programs. There is a wide range of online training programs (often as MOOCs), syllabuses, learning goals, guides, handbooks and more that may serve as inspiration for new training programs specifically targeted at the RPO.

Although knowledge exchange will be relevant for all RPOs, it is particularly important for RPOs seeking to develop train-the-trainer concepts. Existing training programs rarely provides for knowledge exchange during or after the training, except online forums where participants can interact with other participants and/or lecturers.

²¹ Jacobs, R. L., & Russ-Eft, D. (2001). Cascade Training and Institutionalizing Organizational Change. *Advances in Developing Human Resources*, 3(4), 496–503. <https://doi.org/10.1177/15234220122238427>



3.3 Gaps in existing training modules

Based on the analysis, the following gaps in existing training modules relating to institutional change envisioned by the TIME4CS consortium have been identified. These gaps along with existing best practices have informed the development of training programs/modules presented in section 4. TIME4CS training program.

3.3.1 Limited view of potential audiences for training programs

When working towards implementing CS in RPOs, it is crucial to recognize the importance, not only of training scientific staff and students, but also training other staff members such as communication, outreach, and policy staff, as well as management. These audience groups are not specifically targeted in identified publicly available training resources. However, one reason for this apparent lack of training for RPO staff, apart from researchers, is likely to be due to such trainings mostly being kept in-house for staff members only, and thus the resources are not shared publicly. This reasoning was substantiated by the findings from WP1 case studies where three RPOs responded that they had CS training for staff, with more RPOs being in the process of developing such training.

Twelve of the case study RPOs also indicated that they had CS training, either as independent CS courses or as part of other courses, for students. These RPO CS courses are also underrepresented on the EU-citizen.science portal, where only two such courses are currently listed.

Many existing training programs are directed towards audiences outside the RPO: Communities, citizens, educators, policymakers, journalists, etc. Although such audiences have not been explicitly addressed in the TIME4CS analysis of institutional change, they could be important as external stakeholders. Therefore, communities and stakeholder analysis will be included in the training courses described below.

3.3.2 Additional skills required

Existing training programs tend to focus on the skills needed by researchers and others to design, develop, and carry out CS projects. They rarely address other aspects of the RPO. Institutional integration of CS also depends on the availability of plans and strategies, and Implementers in TIME4CS have identified the development of guidelines, policies, and support infrastructures as important GAs, see [Figure 1](#) below. Moreover, developing institutional skills that enable the planning of fundraising activities for CS could be seen as necessary. It goes beyond the individual project. These organisational skills and resources need to be included in training programs that aim for broad institutional change related to CS.

3.3.3 Little attention given to infrastructures

No training programs address the design and/or maintenance of infrastructures needed for CS training. Although many, if not all, provide some infrastructure in terms of online resources, they do not specifically encourage participants to set up or develop more infrastructures that can be used in connection with training



or learning. For this, additional work and additional skills are required, often in terms of educational, communicative, or technical resources.

In addition, the infrastructure needed to provide for knowledge exchange within the RPO receives little attention in existing training programs. This is particularly true for knowledge exchange to take place after the training has been completed. Institutional change may depend on cascading effects such as train-the-trainer programs or infrastructures in place to facilitate knowledge exchange within the RPO.

An institutional contact point for CS is one of the GAs of the TIME4CS project, but it also receives no attention in existing training programs. This gap may be remedied by training programs, which specifically aim to build strategies for the inclusion of contact points in the organisation, and trainings programs targeted at staff members in such contacts points.



4. TIME4CS training program

The TIME4CS training courses (TCs) aim to support institutional CS adoption within the four intervention areas (IAs): 1) Research; 2) Education and awareness; 3) Support resources and infrastructure; and 4) Policy and assessment. The TCs cover all grounding actions (GAs) identified and described in WP1. Accommodating their roadmap frameworks to their specific institutional contexts, the Implementers have selected several GAs for implementation in their organisation, see Figure 1.

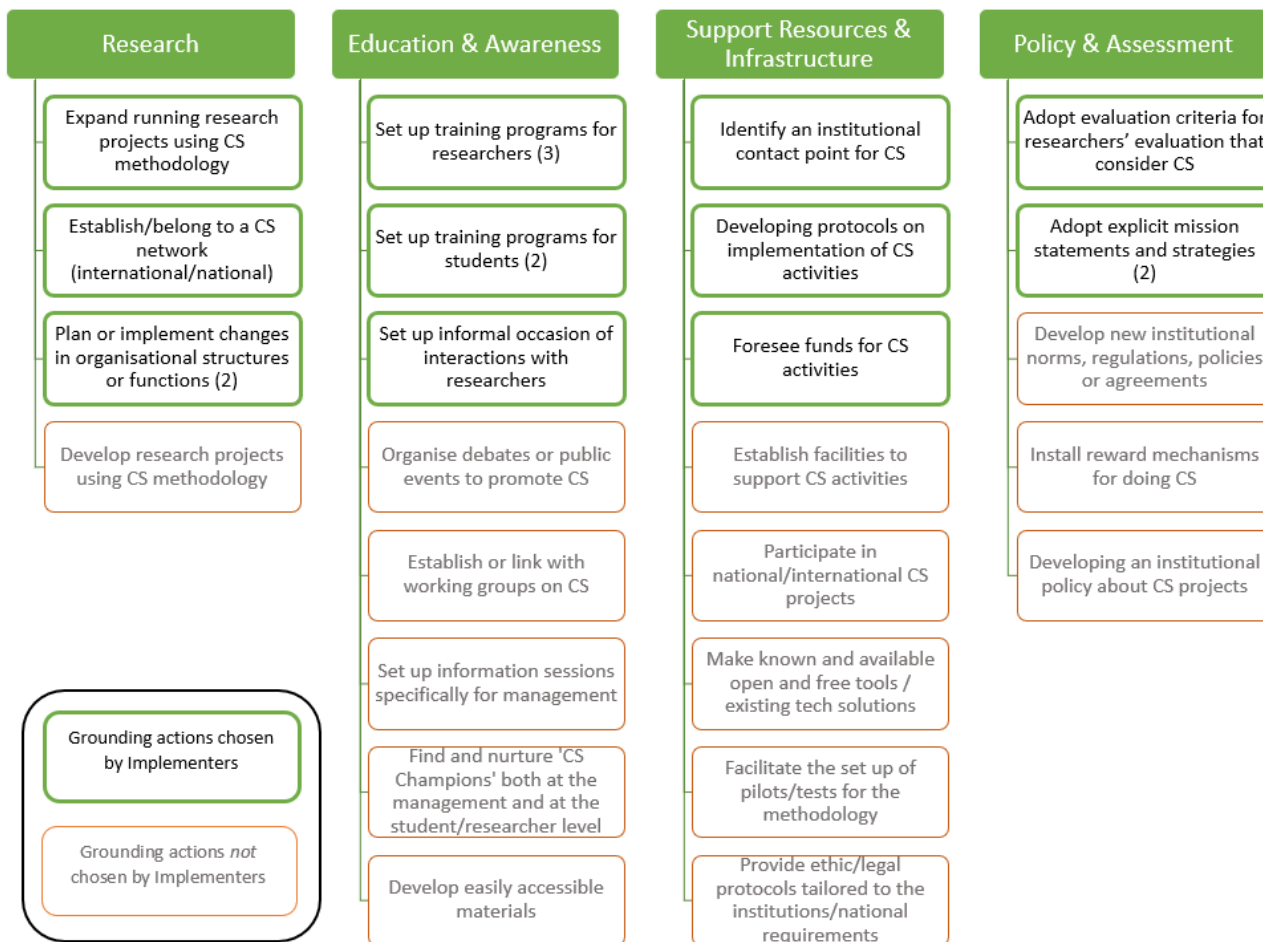


Figure 1. Overview of the GAs selected by Implementers in green boxes and the number of Implementers choosing a GA in parentheses. Non-chosen GAs in orange boxes.

The TCs will consist of training sections (TSs) that focus on relevant GAs for each of the IAs. In effect, the selected collection of TSs in a TC will cover the GAs chosen by the host Implementer, and in coordination with the host Implementer, and thus the TCs delivered to each Implementer will be different and tailored to their context. The TSs will all have presentations and learning activities that will result in outcomes for the participants. There are presentations planned for TSs which will be prepared by the organisers (or trainers). The organisers will also lead/moderate the learning activities and make sure that all participants produce an outcome (or are active in producing joint outcomes).

The duration of each TS will be about 20 minutes depending on the GA(s) covered. It is expected that one TC will last about 2 hours and consist of 4-6 TSs depending on the needs of the participants. TCs are developed both for online and onsite use, and we will use them as basis for the extended onsite Implementer workshops; however, where possible the additional resources and training will be made available online for the wider community and other interested parties as well.

In addition to the described TCs, webinars are also being developed and one webinar has already run in Task 4.3 to support the TCs. Recordings of the presentation part of these webinars will also be available online and hence available to the wider citizen science community and other interested parties.

4.1 Intervention Area: Research

For research environments to adopt CS, it is important that researchers, students, and administrative staff come to recognize CS as an evolving set of research methods that may have added value for their research. Researchers should feel prepared to develop new projects using CS methodology or incorporate CS into existing projects. Administrative staff should understand what CS entails to support the researchers in the best possible way. They should all also understand the potential social and environmental benefits of CS. There are opportunities involved in CS with extensive networks and funding opportunities that researchers should know about. The TIME4CS research GAs reflect the many opportunities for embedding CS in research activities and policies.

4.1.1 TC1: Citizen Science Research and Methodology

The aim of TC1 is to provide participants with basic understanding of CS and CS as part of OS and enable them to develop and plan research projects that employ CS and OS methodologies. It will also allow participants to situate CS as part of the wider OS movement, enabling them to produce arguments for CS as a form of OS. And finally, it will introduce institutional changes needed to embed CS in research performing organisations (RPOs). Participants will get to realize the problems involved and have time to articulate possible solutions.

GAs covered

- Develop research projects using CS/OS methodology
- Expand running research projects using CS/OS methodology
- Plan or implement changes in organisational structures or functions
- Establish/belong to a CS network
- Establish or link with working groups on CS

Intended audience(s)

- Researchers at all career stages
- Graduate students
- Research-support staff in research performing organisations (RPOs) or non-governmental organisations (NGOs)



Course description

This is a free course of two hours that provides participants with basic understanding of citizen science, enabling them to develop and plan research projects that employ citizen science methodology. The course is designed for researchers, graduate students, and research-support staff employed in research performing organisations, and no prior knowledge of citizen science is needed for this course. Citizen science as a research methodology offers unique opportunities for researchers and RPOs or NGOs seeking to engage volunteers in data collection and analysis while also expanding their research portfolio in terms of public participation in research and open science.

Course length

The course requires 2 hours. It has six individual sections, which each takes approximately 18 minutes, plus two standard sections, an introduction (5 min) and a summary (7 min)

Learning outcomes

By the end of this course, the learner will be able to:

- **Objective 1:** Describe and implement citizen-science methodologies in new research projects
- **Objective 2:** Expand existing research projects to include citizen-science methodologies
- **Objective 3:** Plan and implement changes in organisational structures that will facilitate the adoption of citizen-science research in the organization

Main division - topics

- **How many topics (sections) are in the course?** 6 [+2 standard sections]
- **Provide a title and a short description (1-2 sentences) for each section:**
 [Note "Welcome and introduction", "Conclusion and self-assessment", "Further information and learning", "Sources and acknowledgement" are mandatory and part of every course on EU-citizen.science]
 - **Welcome and introduction to the course** - introduction to the course from the course tutor. Overview of the content and the learning outcomes. Teaser and a sample story of citizen science achievements in research.
 - **Section 1: Citizen science methodologies:** providing examples of research activities that employ citizen science methodology, and an overview of citizen science accomplishments in data collection, data processing, curriculum-based projects, and community science
 - **Section 2: Determining whether citizen science is right for your research project:** asking and answering questions that will help participants determining whether citizen science is suited for specific project ideas and/or for the organisation, and presenting a decision framework for choosing and using citizen science
 - **Section 3: Planning your citizen science project:** scoping the research problem, designing a protocol and a data management plan, establish a timeline, providing a budget



- **Section 4: Data management and open science practices in citizen science projects:** ensuring compatibility with open-science standards in terms of publication, data management, and public outreach
- **Section 5: Communication, public engagement, and volunteer management in relation to citizen science projects:** guide to community engagement techniques, recruiting and retaining volunteers for citizen science projects, and communicating with stakeholders and the general public
- **Section 6: Developing institutional road maps for integration of citizen science in RPOs:** identifying institutional resources and infrastructure specifically needed for citizen science projects, and planning activities to initiate change using the TIME4CS Reflection Tool
- **Summary and self-assessment** - summary of the course and end of the course quiz
- **Further information** - other sources of information and further learning on citizen science
- **Sources and acknowledgement** - a list of sources that are used in the course.

Overview course plan

Welcome and introduction to the course (5 minutes)

What can we expect to learn from this section? Introduction to the course from the course tutor. Overview of the content and the learning outcomes. Provide teaser/story of CS.

What?	How?	Why?
I.1 Introduction from the course tutor (1 min)	A one minute video, introducing the course to the learner. Introduction of who made the course, and what is covered in it.	Welcome the student, and provide assurance about the credibility of the course
I.2 Course overview (1 min)	Overview of the course structure in text and a slides+audio - explaining the elements that will appear in each section	Familiarity with the mezzo-structure of the course and the reason to learn in
I.3 What citizen science may accomplish (3 min)	Provide an example of a citizen science research project with real benefits for researchers and participants using this list of Case Studies CitizenScience.gov (maybe examples from different disciplines so that the participants can choose)	Make the course interesting and worth exploring

Section 1: Citizen science methodologies (18 minutes)

What can we expect to learn from this section? The section enables participants to understand and use the terminology that describes different types of citizen science methodology.



What?	How?	Why?
1.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the topic of citizen science research methodologies through examples of different types of citizen science projects: data collection, data processing, curriculum-based projects, and community science	Explaining to the learner why it is worth following the course
1.2 Example one (2 min) - eBird (data collection)	The story of eBird and how it became the world's largest biodiversity-related science projects, with more than 100 million bird sightings contributed annually by eBirders around the world and an average participation growth rate of approximately 20% year over year	Demonstration of what can be achieved with crowdsourcing of data collection
1.3 Example two (2 min) - Galaxy Zoo (data processing)	The story of Galaxy Zoo and how it has mobilised volunteers to perform millions of classification of galaxies and resulted in over 450 publications	Demonstration of what can be achieved with crowdsourcing of data processing
1.4 Example three (2 min) - FoldIt (data processing through gamification)	The story of FoldIt and how players have contributed to advanced research on human health, cutting-edge bioengineering, and the inner workings of biology	Demonstration of what can be achieved with curriculum-based citizen science projects
1.5 Example four (2 min) - the SEEDS project in Spain, the Netherlands, Greece and the UK (curriculum-based projects)	The story of the SEEDS project and how it encourage teens to explore health issues that are important to them and generate new knowledge while producing scientifically reliable results	Demonstration of what can be achieved with curriculum-based citizen science projects
1.6 Example five (2 min) - the Local Environment Action on Food (LEAF) project (community citizen science)	The story of the LEAF project and how it engaged residents from 17 communities across Alberta, Canada, as research partners to support the creation and application of food environment evidence	Demonstration of what can be achieved with community-based citizen science methodology
1.7 Overview of citizen science methodologies and what they accomplish: crowdsourcing (data collection and/or data processing), curriculum-based projects, and community science (2 min)	Bringing the stories together and elaborating on key terms for citizen science methodology: crowdsourcing and volunteered thinking/computing (data collection and/or data processing), curriculum-based citizen science (formal and informal science education), and community science	Helping participants to organise information about individual examples and enabling them to use relevant terminology
1.8 Summary (1 min)	Explaining the learning from the session	
1.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of the type of



What?	How?	Why?
		methodologies employed in citizen science

Section 2: Determining whether citizen science is right for your research project (18 minutes)

What can we expect to learn from this section? This section enables participants to determine whether citizen science is suited for specific project ideas and/or for the organisation by using a decision framework for choosing and using citizen science.

What?	How?	Why?
2.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the decision-making process before embarking on a citizen science project	Explaining to the learner why it is worth following the course
2.2 Reasons for choosing citizen science as research methodology (2 min)	Going over reasons for choosing (and not choosing) citizen science as a research methodology	Demonstrating that there are many reasons for choosing citizen science
2.3 Defining the aim of the project (2 min)	The need for well-defined aim, incl. questions to assist participants in defining their project's aim	Assisting participants in defining project aims
2.4 The importance of participation and engagement (2 min)	Degrees of participation and ways in which to determine the right level of engagement	Enabling participants to perform an analysis of different projects' level of participation and enhance engagement (if applicable)
2.5 The scale of sampling and the complexity of the protocol (2 min)	Raising questions about the scale of the project, types of data, and the planning of the protocol	Encouraging participants to think about different scales of sampling and analysis with a view to the complexity of the protocol
2.6 The motivations of volunteers (2 min)	Understanding how different citizen science project resonate with people (volunteers) in different ways	Enabling participants to design project based on understanding of volunteers' motivation
2.7 The decision framework (4 min)	Presenting a decision framework for determining whether citizen science is a suited methodology or not	Enabling participants to use the decision framework
2.8 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
2.9 Quiz (3 min)	Multiple-choice test about key terms in the decision framework	Test the understanding of decisions needed to be made during planning and design phases



Section 3: Planning your citizen science project (20 minutes)

What can we expect to learn from this section? This section enables participants to determine whether citizen science is suited for specific project ideas and/or for the organisation by using a decision framework for choosing and using citizen science.

What?	How?	Why?
3.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the planning process before embarking on a citizen science project	Explaining to the learner why it is worth following the course
3.2 Reasons for choosing citizen science as research methodology (2 min)	Going over reasons for choosing (and not choosing) citizen science as a research methodology	Demonstrating that there are many reasons for choosing citizen science
3.3 An overview of existing resources and partnerships (2 min)	Pre-existing resources and partnerships such as tools, protocols, associations, funds, etc.	Demonstrating that one does not start from scratch when embarking on citizen science
3.4 Build your team (2 min)	Stakeholder analysis of personnel needed for the project	Enabling participants to perform a stakeholder analysis of the organisation and its environment
3.5 Project design and data management plan (2 min)	Ensuring data quality by means of project design and data management	Enabling participants to design projects and data management plan
3.6 Prepare for volunteers (2 min)	Volunteer positions, recruitment and retainment strategies, and training/capacity development	Enabling participants to work reflectively with volunteer management
3.7 Develop evaluation criteria (2 min)	Planning evaluation of projects; defining evaluation criteria	Enabling participants to develop evaluations that can be used to adjust your project based on the evaluation's findings
3.8 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
3.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of research design and planning



Section 4: Data management and open science practices in citizen science projects (20 minutes)

What can we expect to learn from this section? This section enables participants to ensure compatibility with open-science standards in terms of publication, data management, and public outreach by working with elements of the Data Charter for Citizen Science (Scivil 2021).

What?	How?	Why?
4.1 Introduction to the section (2 min)	Text, explaining how we are going to cover open-science standards in relation to citizen science projects	Explaining to the learner why it is worth following the course
4.2 What is open science? (2 min)	The basics of open science and why it is important to (citizen) science	Demonstrating that there are many reasons for integrating open science and citizen science
4.3 What is FAIR data? (2 min)	FAIR data principles and why they are important to (citizen) science	Demonstrating that there are many reasons for implementing the FAIR data standards in citizen science projects
4.4 The 5-star open data and the open attitude (2 min)	Introducing the 5-star open data ladder and the open attitude	Enabling participants to place their data management plan on the 5-star open data ladder
4.5 The Data Charter for Citizen Science: Privacy and ethics (2 min)	Introducing the Data Charter for Citizen Science and issues pertaining to privacy and ethics	Enabling participants to incorporate reflections about privacy and ethics into their project planning
4.6 The Data Charter for Citizen Science: Data hygiene, standards, and formats (2 min)	The Data Charter for Citizen Science on data hygiene, standards, and formats	Enabling participants to incorporate relevant standards and formats into their data management plan
4.7 The Data Charter for Citizen Science: Metadata (2 min)	The Data Charter for Citizen Science on metadata	Enabling participants to develop metadata for their data
4.8 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
4.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of decisions needed to be made when designing the data management plan

Section 5: Communication, public engagement, and volunteer management in relation to citizen science projects (20 minutes)

What can we expect to learn from this section? This section enables participants to become acquainted with and reflect upon well-established community engagement techniques such as recruiting and retaining volunteers for citizen projects, and communicating with stakeholders and the general public.

What?	How?	Why?
5.1 Introduction to the section (2 min)	Text, explaining how we are going to cover open-science standards in relation to citizen science projects	Explaining to the learner why it is worth following the course
5.2 Volunteer management (2 min)	Introducing the notion of volunteer management and the volunteer literature	Demonstrating that there is already a lot of knowledge about how to engage with volunteers
5.3 Influences on participation (2 min)	The stages of volunteers' journey and ways to maximise volunteers' experience	Demonstrating that the volunteer experience has many stages with different concerns
5.4 Initial participation (2 min)	Types of motivations; demography and attributes of volunteers; recruitment techniques or awareness of opportunities	Enabling participants to describe their (potential) volunteers and plan the recruitment process
5.5 Sustained participation (2 min)	Retention techniques for different types of volunteers in different types of projects	Enabling participants to plan ahead for retention and sustained participation
5.6 Recommendations for project organisers (2 min)	Key recommendations for project organisers based on the journey diagram presented above in 5.3	Enabling participants to use the checklist for project organisers
5.7 Communication and public outreach (2 min)	Issues and tools for communication and public outreach in relation to citizen science projects	Encouraging participants to design and initiate outreach activities in relation to their project (before, during, after)
5.8 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
5.9 Quiz (3 min)	Multiple-choice test about the stages of volunteers' journeys and ways in which to attract and sustain their participation	Test the understanding of decisions and strategies that facilitate volunteer recruitment, retention, and management

Section 6: Developing institutional road maps for integration of citizen science in RPOs (20 minutes)

What can we expect to learn from this section? This section motivates participants to identify institutional norms, resources and infrastructure specifically needed for citizen science projects, and to design activities aimed at institutional change using the TIME4CS Reflection Tool.

What?	How?	Why?
6.1 Introduction to the section (2 min)	Text, explaining how we are going to cover institutional resources and plan institutional change using the TIME4CS Reflection Tool	Explaining to the learner why it is worth following the course
6.2 What are organisations? (2 min)	Introducing the institutional theory of organisations, which argue that organisations (incl. RPOs) are complex webs of social relations and structures (norms, resources, infrastructure)	Demonstrating the complexity of organisations and the need to contemplate change at the individual and institutional level
6.3 TIME4CS Reflection Tool Step One: Stocktaking exercise (3 min)	Identifying the current status of resources and needs, gaps and problems that your organisation has to support citizen science within these four areas: 1) research, 2) education & awareness, 3) support resources & infrastructures, and 4) policy & assessment	Enabling participants to perform a stock-taking exercise in their own organisation
6.4 TIME4CS Reflection Tool Step Two: Selecting grounding actions and describe plan of action for desired institutional change (3 min)	Introducing the grounding actions and related success criteria, step-by-step implementation plan, and obstacles/resources	Enabling participants to define grounding actions and describe a plan of action
6.5 TIME4CS Reflection Tool Step Three: Compiling the grounding actions into a roadmap (3 min)	Retention techniques for different types of volunteers in different types of projects	Enabling participants to plan ahead for retention and sustained participation
6.6 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
6.7 Quiz (4 min)	Multiple-choice quiz about the TIME4CS Reflection Tool	Test the understanding of decisions and strategies that facilitate volunteer recruitment, retention, and management



Summary and Self Assessment (7 minutes)

What can we expect to learn from this section? Summary of the course and end of the course quiz.

What?	How?	Why?
S.1 Summary of the issues that were covered, guidance to material in further information and in the acknowledgment and sources (2 min)	Summary of the issues that were covered in each section, with the main “take away” points	Helping the learner to identify the most critical content
S.2 Course quiz (5 min)	Final review of the course, and credit for successful completion, if relevant	Testing the knowledge in the course

Further information (5 minutes+)

What can we expect to learn from this section? Other sources of information and further learning on citizen science.

What?	How?	Why?
F.1 More sources of information that can expand the knowledge on the course through other training opportunities such as MOOCs (5 min)	Links and details of other online courses and places where more learning can be gained	Allow the learner to take the next step
F.2 Other sources of information (5 min)	Details of books, articles and other information that can be used to develop an understanding of the topic	Providing the learner with further information that is not linked to learning topic

• **Some of the supporting resources**

- Contributory, collaborative, and co-created CS
- Determining whether CS is right for your project (weighing pros and cons of CS)
 - [CH 1: Determine if Citizen Science is Right for Your Project | US Forest Service \(usda.gov\)](#)
- Planning your CS project
 - [Choosing, using, and evaluating CS \(Centre for Ecology and Hydrology\)](#) (it has a focus on ecology, so needs to be adapted for other disciplines, e.g. health)
 - [Project Planning Guide | US Forest Service \(usda.gov\)](#) (it has a focus on environmental projects, so needs to be adapted for other disciplines, e.g. health)
- Data management in CS projects
 - [Data charter and guide for citizen science | Scivil](#)
 - [DataONE-PPSR-DataManagementGuide.pdf](#)
 - [Data and Metadata Working Group: Resources - Citizen Science Association](#)



- Volunteer management in CS projects
 - [Recruiting and Retaining Participants in Citizen Science: What Can Be Learned from the Volunteering Literature? \(citizenscienceassociation.org\)](https://citizenscienceassociation.org/)
- OS basics (incl. CS)
 - [OLCreate: ORION MOOC ORION MOOC for Open Science in the Life Sciences](#) (this course has sections on the topics below)
 - Publishing and open access
 - Research data management (FAIR and Open Data)
 - Science communication and public engagement
- Exemplary CS cases
 - Case stories about successful (and persistent) CS projects (tailored to match the disciplinary background/interests of participants)
- Institutional theory of organisations (intro)
 - Organized patterns of actions (social norms) vs. formal structures
 - External and internal pressures on the organisation
- Training needs in the organisation
 - [Training needs and recommendations for Citizen Science participants, facilitators and designers \(openrepository.com\)](#)
- CS and libraries
 - [The Librarian's Guide to Citizen Science](#)
- CS policies and roadmaps
 - [Green Paper on Citizen Science \(ibercivis.es\)](#) and [White Paper on Citizen Science for Europe \(Ibercivis.es\)](#)
 - [D2.1: Compilation of roadmaps and Grounding Actions for the Implementers - First Version | Zenodo](#)

4.2 Intervention Area: Education and awareness

The TIME4CS GAs related to education and awareness include actions that raise awareness of CS amongst researchers, students, managers and other RPO staff, and members of the public (incl. communities of citizen scientists). This includes general information about CS for members of the organisation but also activities – courses, seminars, workshops, master classes, open days, and much more – that involves larger and more diverse audiences.

4.2.1 TC2: Citizen Science education and awareness-raising for research performing organisations

The aim of TC2 is to inspire participants to develop their own CS training programs for graduate students and/or researchers and other staff as well as other activities aimed at raising CS awareness inside RPOs. It is also to introduce issues relating to volunteer (community) training and management. Attention will also be



given to the introduction of CS into classrooms as part of STEM teaching. Finally, this TC2 aims to provide information about public engagement with CS and how to use CS as a tool for public engagement.

GAs covered

- Set up training programs for researchers and citizen scientists
- Set up training programs for students
- Set up information sessions specifically for management
- Set up informal occasions of interactions with researchers
- Find and nurture CS champions
- Develop easily accessible materials
- Organise debates or public events to promote CS

Intended audience(s)

- Researchers at all career stages
- Research-support, educational and outreach staff at research performing organisations (RPOs)
- Training providers for RPOs

Course description

This is a free 2-hour course providing participants with basic understanding of teaching and awareness-raising activities to support citizen science within RPOs. The course is designed for researchers, lecturers, research-support and outreach staff and training providers, and no prior knowledge is needed for this course. RPOs wishing to further embed and use citizen science as a research method in their organisations could benefit from expanding awareness-raising activities and internal training on citizen science within their RPO as well as outreach programs. This course will introduce you to a variety of awareness-raising activities (inreach and outreach) and outline important aspects of conducting citizen science training for RPO staff and students.

Course length

This course requires 2 hours.

Learning outcomes

By the end of this course, the learner should be able to:

- **Objective 1:** Describe learning goals, develop activities and create meaningful learning experiences for CS training programs for students, researchers, and other RPO staff
- **Objective 2:** Describe organisational objectives for CS awareness-raising activities inside and outside the RPO
- **Objective 3:** Develop meaningful interactions with (prospective) volunteers or groups of volunteers, including communities, schools, and NGOs

Main division - topics

- **How many topics (sections) are in the course?** 6 [+3 standard sections]
- **Provide a title and a short description (1-2 sentences) for each section:** [Note “Welcome and introduction”, “Conclusion and self-assessment”, “Further information and learning”, “Sources and acknowledgement” are mandatory and part of every module on EU-citizen.science]
 - **Welcome and introduction to the course** - introduction to the course from the course tutor. Overview of the content and the learning outcomes. Teaser and a sample story of citizen science achievements in research.
 - **Section 1 Training and awareness-raising for citizen science in RPOs (inreach vs. outreach):** providing examples of meaningful learning experiences and awareness raising activities in RPOs; making the distinction between inreach and outreach.
 - **Section 2 Setting up training sessions for researchers and others in the RPO (incl. Train-the-trainers methodology):** designing citizen science trainings or informal sessions for interaction and engagement between researchers and other RPO staff such as research-support staff, outreach officers, research librarians or management staff
 - **Section 3 Setting up training sessions and learning experiences for volunteers:** designing training sessions and meaningful learning experiences for volunteers and gatekeepers such as teachers and leaders in organisations are important for motivation and for ensuring research data validity
 - **Section 4 Engaging with schools to do citizen science:** involving school children in CS requires project managers to potentially differentiate activities to meet the abilities of the children, and at the same time ensure that activities are relevant to the underlying research
 - **Section 5 Signposting to or developing easily accessible materials:** many resources have already been developed and are freely available which will be signposted in this section. Context specific materials for individual institutions may be needed to be developed for staff trainings, and research-area specific materials for students
 - **Section 6: Communication and engagement for citizen science:** developing meaningful activities aimed at larger audiences in order to promote citizen science projects and build significant, lasting relationships with key stakeholders outside the RPO
 - **Summary and self-assessment** - summary of the course and end of the course quiz
 - **Further information, sources, and acknowledgments** - a list of sources that are used in the course and other sources of information and further learning on citizen science

Overview course plan

Welcome and introduction to the course (5 minutes)

What can we expect to learn from this section? Introduction to the course from the course tutor. Overview of the content and the learning outcomes. Provide teaser/story of CS.



What?	How?	Why?
I.1 Introduction from the course tutor (1 min)	A one minute video, introducing the course to the learner. Introduction of who made the course, and what is covered in it.	Welcome the student, and provide assurance about the credibility of the course
I.2 Course overview (2 min)	Overview of the course structure in text and a slides+audio - explaining the elements that will appear in each section	Familiarity with the mezz-structure of the course and the reason to learn in
I.3		Make the course interesting and worth exploring

Section 1: Training and awareness-raising for citizen science in RPOs (inreach vs. outreach) (18 minutes)

What can we expect to learn from this section? This section provides examples of meaningful training programs, mutual learning experiences, and awareness-raising activities for the promotion of citizen science in RPOs. The section enables participants to distinguish between inreach and outreach activities in terms of audiences, activity types, and content.

What?	How?	Why?
1.1 Introduction to the section (2 min)	Text, explaining how we are going to provide good examples (best practices) of training and awareness-raising activities to support citizen science	Explaining to the learner why it is worth following the course
1.2 Example one (2 min): Citizen Science and Scientific Crowdsourcing: an Introduction (MOOC run UCL's Extreme Citizen Science Group)	Describing one of the many available online courses for researchers and others that would like to know (more) about citizen science	Demonstration of what can be achieved with in introduction course on citizen science
1.3 Example two (2 min): Citizen Science Talent Program (a Master's level course run by the University of Southern Denmark)	Describing an on-site Master's level course for students (including group projects on citizen science)	Demonstration of what can be achieved with a course specifically designed for university students and involving researchers as supervisors
1.4 Example three (2 min): The EU-Citizen.Science Training Platform with one example (Storytelling for citizen science)	Describing the scope of the EU-Citizen.Science Training Platform and providing one example of a free 2,5-hour course designed to provide an introduction to storytelling and give practical tools to shape narratives to communicate about and engage with citizen science	Demonstration of free training resources already available and one example, which is also relevant to the topic of this training program



What?	How?	Why?
1.5 Example four (2 min): Volunteer training	Describing (some of) the activities aimed at engaging volunteers and providing training and supervision for specific tasks	Demonstrating the value of volunteer training
1.6 Example five (2 min): Open Citizen Day held at the Steno Museum in Aarhus, Denmark	Describing an open-day activity designed to promote a variety of citizen science projects to the general public	Demonstrating the potential of outreach awareness-raising activities outside the RPO
1.7 Overview of inreach and programs, etc. in terms of audience (2 min)	Bringing the stories together and elaborating on some key terms for citizen science education and awareness such as inreach program and initiatives (curriculum-based courses, capacity-building trainings, informal mutual learning events) and public outreach activities (open days, festivals, happenings, science cafes)	
1.8 Summary (1 min)	Explaining the learning from the session	
1.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of the type of events and activities that can be used to train, engage make people aware about citizen science (inside and outside the RPO)

Section 2: Setting up training sessions for researchers and others in the RPO (incl. Train-the-trainers methodology) (18 minutes)

What can we expect to learn from this section? The section aims to inform participants about the value and best practices of designing courses, training or informal sessions about citizen science. The participants will learn to reflect about training in the context of competence development in organisations and Participants interaction and engagement between researchers and other RPO staff such as research-support staff, outreach officers, research librarians or management staff.

What?	How?	Why?
2.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the topic of training (incl. courses, workshops, training programs, networks etc.)	Explaining to the learner why it is worth following the course
2.2 Competence development in RPOs (2 min)	Describing the basic model of competence development (development of employees' competences in the light of the organisation's strategic aims) and how to	Enabling the participants to situate their (planned) training in the overall, strategic framework of the RPO and

What?	How?	Why?
	use training audience analysis to inform training design	to perform audience analysis to inform their training designs
2.3 What researchers need to know about citizen science (2 min)	Describing the content of existing training courses aimed at researchers	Inspiring participants to design their own training programs for researchers
2.4 What students need to know about citizen science (2 min)	Describing the content of existing training courses aimed at students	Inspiring participants to design their own training programs for students
2.5 What administrative staff need to know about citizen science (2 min)	Describing the content of existing training courses aimed at administrative staff, e.g., research-support, educational and outreach staff	Inspiring participants to design their own training programs for administrative staff
2.6 Designing and teaching a course / designing and running a workshop (2 min)	Considering resources (timing and logistics), participants (incl. prior knowledge and skills), learning objectives and assessments, instructional strategies and pedagogy,	Guiding participants through the basic steps involved in course/training design
2.7 Train-the-trainer (TTT) (2 min)	Describing the TTT concept and the TTT workshops held in the course of the TIME4CS project	Demonstrating the value and practice of TTT
2.8 Summary (1 min)	Explaining the learning from the session	
2.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of aims, content, and methods for designing and running training sessions for researchers and others in RPOs

Section 3: Setting up training sessions and learning and development opportunities for volunteers (18 minutes)

What can we expect to learn from this section? This section introduces the participants to the design and implementation of training sessions and meaningful learning experiences for volunteers and gatekeepers such as teachers and community leaders. Training sessions for volunteers are important for recruitment and retention of volunteers, and for ensuring research data validity.

What?	How?	Why?
3.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the design and implementation of training for volunteers	Explaining to the learner why it is worth following the course



What?	How?	Why?
3.2 Stages of participation / engagement (2 min)	Describing the different stages of volunteers' participation / engagement in citizen science projects and how they require different types of training	Encouraging the participants to think about the variety of training needs of volunteers depending on their stage of participation
3.3 Orientation to organisation and citizen science research project (2 min)	Orientating volunteers to the organisation and the research project, for example, describing the mission and significance of the organisation/project, benefits to volunteering, and	Allowing participants to consider making orientation a condition of volunteering, rewarding those that participate and stressing the importance of participation
3.4 The volunteer handbook or protocol (2 min)	Creating the volunteer handbook or protocol that will explain the project's vision and management, job duties (incl. sampling protocols or other manuals, if applicable), and rights and benefits of being a volunteer	Enabling participants to organise and write the handbook or protocol for volunteers
3.5 Teach and educate your volunteers (2 min)	Using different training techniques to teach and educate your volunteers such as "Buzz groups" to promote exchange of ideas, prizes for attending training, utilising games and story-telling etc.	Allowing participants to reflect on the techniques used to train and educate their volunteers
3.6 Learning and development opportunities as a tool for the retention of volunteers (2 min)	Presenting learning and development opportunities (LDOs) as a way to enhance organisational commitment (commitment to the project) and intentions to stay in the project - LDOs range from allowing volunteers to affirm another's strengths through volunteers journaling their progress, and concerns, and to nurturing volunteer leaders and supervisors	Giving participants good reasons for introducing LDOs + a few specific examples of what LDOs might be
3.7 Facilitating the volunteer lifecycle (2 min)	Introducing the volunteer lifecycle (connect-train-support-assess-reflect-reengage) and what facilitating this lifecycle means for volunteers and other project members	Enabling participants to plan and manage the entire lifecycle of volunteer engagement
3.8 Summary (1 min)	Explaining the learning from the session	
3.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of the aspects involved in setting up training sessions and LDOs for volunteers

Section 4: Engaging with schools to do citizen science (18 minutes)

What can we expect to learn from this section? This section covers the challenges and opportunities involved in curriculum-based citizen science projects where project managers need to consider and possibly differentiate activities to meet the abilities of the pupils involved. The projects need to consider integration into the school curriculum and at the same time ensure that activities are relevant to the underlying research project.

What?	How?	Why?
4.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the engagement of schools in citizen science projects	Explaining to the learner why it is worth following the course
4.2 Example of a school-based project: The Mass Experiments in Denmark (2 min)	Describing the idea behind the Mass Experiment in Denmark and one of the specific experiments (e.g., 2021: indoor climate, 2020: plastic pollution) and ways in which to integrate citizen science in schools	Demonstrating that citizen science can successfully be integrated into schools and curricula
4.3 The value of citizen science in schools (2 min)	Describing the value of integrating citizen science into schools: authentic science experience, scientific literacy, inquiry-based learning	Demonstrating that citizen science holds great promise for school
4.4 Principles of citizen science projects in schools (2 min)	Describing four basic principles which are useful when developing or connecting a citizen science project for schools: empowerment, co-creation, change-making, openness	Encouraging the participants to reflect over basic principles for engaging with schools to do citizen science
4.5 Citizen science skills (2 min)	Describing the skills that pupils may require from participating in a citizen science project: observing, questioning, planning, analysing, communicating	Demonstrating that there are many different skills that pupil may acquire from citizen science projects
4.6 Citizen science and project-based learning (2 min)	Connecting citizen science to the idea of project-based learning (PBL); comparing similarities between citizen science and PBL, and connecting PBL to principles and skills described in sections 4.4 and 4.5.	Allowing participants to connect citizen science and PBL (a concept already familiar to schools)
4.7 Citizen science and school teachers (2 min)	Addressing some of the challenges that teachers may encounter as they adopt citizen science in their teaching, but also mentions some of the resources that are available	Encouraging reflection on challenges and opportunities for citizen science in schools with special attention given to the teacher perspective
4.8 Summary (1 min)	Explaining the learning from the session	



What?	How?	Why?
4.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of issues involved in incorporating citizen science into schools

Section 5: Signposting to or developing easily accessible materials (18 minutes)

What can we expect to learn from this section? This section will cover some of the many resources that have already been developed and are freely available. It is emphasised that context-specific materials for individual institutions may be needed to be developed, incl. research-area specific materials for students.

What?	How?	Why?
5.1 Introduction to the section (2 min)	Text, explaining how we are going to cover signposting to or developing easily accessible materials	Explaining to the learner why it is worth following the course
5.2 Example: The TIME4CS repository of citizen science training resources (2 min)	Describing the content of the TIME4CS dataset divided into training courses and non-training resources	Demonstrating that there are already a lot of easily accessible material covering both citizen science education and awareness-raising
5.3 Example: EU-Citizen.Science (2 min)	Describing the EU-Citizen.Science portal and the resources available there, incl. the moodle with available courses	Demonstrating the wealth of resources on EU-Citizen.Science with particular attention to online courses
5.4 Example: The EU-Citizen.Science template for online courses (2 min)	Going over the template used for online courses on the EU-Citizen.Science portal	Enabling participants to organise information if they have or want to develop a new course
5.5 Citizen science as a context for learning (2 min)	Introducing relevant contexts that need to be considered when developing material for education and learning opportunities in citizen science: the science context, the context of participation, and the project-specific context	Demonstrating the need for developing context-specific material
5.6 Citizen science as an opportunity for science learning and volunteer learning (2 min)	Stressing that volunteers may take away certain skills and capacities that will be distinctly different from the science learning outcomes, which are typically promoted by the coordinators of citizen science projects	Demonstrating that there are different science and volunteer learning outcomes to consider when developing new materials
5.7 Tips and tricks for signposting and developing materials (2 min)	Describing a few tips and tricks for developing materials: produce materials that has consistency, clarity, and relevance (address issues of current concern); use social media	Encouraging the participants to think very concretely about what to remember when developing new materials

	standards, get involved with local groups, media, and authorities, connect to existing networks and portals	
5.8 Summary (1 min)	Explaining the learning from the session	
5.9 Quiz (6 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of how to signpost and develop easily accessible materials

Section 6: Communication and engagement in citizen science (18 minutes)

What can we expect to learn from this section? This section introduces the participants to the design and implementation of communication and engagement activities for citizen science. Such material is important to promote citizen science as a concept and connect to volunteers and others around concrete citizen science projects in order to build significant, lasting relationships with key stakeholders outside the RPO.

What?	How?	Why?
6.1 Introduction to the section (2 min)	Text, explaining how we are going to cover public outreach and public relations for citizen science	Explaining to the learner why it is worth following the course
6.2 Building blocks of a communication plan, part 1 (2 min)	Describing the first two steps (out of six) in developing a communication plan for your citizen science project : defining your project objective and the level of engagement of your volunteers	Allowing participants to contemplate the first two steps in developing a communication plan
6.3 Building blocks of a communication plan, part 2 (2 min)	Describing the next steps (no. 3 and 4 out of six) in developing a communication plan for your citizen science project: specifying your target audience and understanding what motivates them	Allowing participants to contemplate steps no. 3 and 4 in developing a communication plan (six steps in total)
6.4 Building blocks of a communication plan, part 3 (2 min)	Describing the last two steps in developing a communication plan for your citizen science project: engagement and evaluation (particular focus on evaluation strategy)	Allowing participants to contemplate the final steps in developing a communication plan
6.5 How to use storytelling as a tool of communication (2 min)	Using storytelling (incl. Digital storytelling) to explain expectations, purpose, and skills in a project. Elements of a good story: Structure, character, setting, authenticity, accessible language and message	Enabling participants to use basic storytelling techniques to communicate their project
6.6 How to use gamification as a tool of communication (2 min)	Adding gaming elements to your citizen science project can benefit your research - basic game elements are: points, badges, and trophies; ranking (levels); missions or campaigns	Giving participants good reasons for use elements of gamification as tools of communication
6.7 Developing a public relations plan (2 min)	Going beyond communication plans and tools may be useful to develop long-term and sustainable relations with stakeholders - elements of PR are:	Encouraging participants to think strategically about their communication efforts and the

	defining goals and measurable objectives, identifying stakeholder and communication outlets, building evaluation plan, implement the plan and evaluate	need to build good relationships with stakeholders
6.8 Summary (1 min)	Explaining the learning from the session	
6.9 Quiz (X min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of public outreach and communication for citizen science

Summary and Self Assessment (10 minutes)

What can we expect to learn from this section? Summary of the course and end of the course quiz.

What?	How?	Why?
S.1 Summary of the issues that were covered, guidance to material in further information and in the acknowledgment and sources (5 min)	Summary of the issues that were covered in each section, with the main “take away” points	Helping the learner to identify the most critical content
S.2 Course quiz (5 min)	Final review of the course, and credit for successful completion, if relevant	Testing the knowledge in the section

Further information (5 minutes+)

What can we expect to learn from this section? Other sources of information and further learning on citizen science.

What?	How?	Why?
F.1 More sources of information that can expand the knowledge on the course through other training opportunities such as MOOCs (5 min)	Links and details of other online courses and places where more learning can be gained	Allow the learner to take the next step
F.2 Other sources of information (5 min)	Details of books, articles and other information that can be used to develop an understanding of the topic	Providing the learner with further information that is not linked to learning

- **Some of the supporting resources**

- Communication and dissemination in CS
 - [Communication and Dissemination in Citizen Science | SpringerLink](#)
 - [Scivil Communication Guide.pdf](#)



- Effective course design in university settings / learning through CS
 - [Design & Teach a Course - Eberly Center - Carnegie Mellon University \(cmu.edu\)](#)
 - [Learning* through Citizen Science: An Aspirational Vision and Ten Questions to Prompt Reflection on Practice - Citizen Science Association Blog |](#)
- Organisational communication
 - Formal vs. Informal communication
 - Internal vs. external communication
 - Communication strategy and evaluation
- Fostering capacities for collaborative innovation processes involving RPOs and civil society
 - [EU-Citizen.Science :: Training programs to build capacity for collaborative innovation processes](#)
- Best practices/existing CS courses
 - Examples from TIME4CS repository of existing CS course and training materials (in progress)
- Working with CS communities
 - [EU-Citizen.Science :: Volunteer engagement, management and care](#)
- Motivation, recruitment and retainment
 - [Recruiting and Retaining Participants in Citizen Science: What Can Be Learned from the Volunteering Literature? \(citizenscienceassociation.org\)](#)
- CS in schools
 - [EU-Citizen.Science :: Citizen Science in Schools: schools as agents of community well-being through science and research](#)
 - [EU-Citizen.Science :: Empowerment through co-designed Citizen Science in education](#)
 - [EU-Citizen.Science :: Enhancing youth learning through Community and Citizen Science: a guide for practitioners](#)
- Manual for CS community building
 - [INCENTIVE-D2.3 Manual-for-Citizen-Science-Community-Building-final.pdf \(incentive-project.eu\)](#)
- Modes and channels of communication; effective communication
 - [Public Engagement with Science - Open Science MOOC](#)
 - [Science Communication and Public Engagement Course - FutureLearn](#) (requires subscription)
 - [Science Communication \(EdX\)](#)
- Citizen science as a means for public engagement
 - [Citizen Science as a Means for Increasing Public Engagement in Science: Presumption or Possibility? - Victoria Y. Martin, 2017 \(sagepub.com\)](#) (requires subscription)
 - Citizen communicators: [Changing the conversation about science through citizen communicators | Research and Innovation \(europa.eu\)](#)
- Planning, designing and evaluating public engagement with science events and activities
 - [PES_guide_10_20r_HR.pdf \(mos.org\)](#)



4.3 Intervention Area: Support resources and infrastructure

RPOs need to support researchers in recognizing and adopting CS. Support systems and resources must be developed as GAs for CS adaptation.

4.3.1 TC3: Citizen Science Support Resources and Infrastructures

TC3 provides information about an institutional contact point for CS (CS-ICP) and the CS funding landscape. The aim of TC3 is to give participants an opportunity to reflect on the need for one or more CS-ICPs at the RPO. It also provides information about the funding landscape for CS at the organisational, national and international level. Participants should be able to see opportunities for targeted funding of CS projects and develop ideas for such projects. Finally, TC3 aims to introduce participants to specific ethical and legal requirements relating to CS and how to handle them.

GAs covered

- Identify an institutional contact point for CS
- Establish facilities to support CS activities
- Facilitate the set-up of pilots/tests for the methodology
- Make known and available open and free tools and/or existing tech solutions
- Foresee funds for CS activities
- Establish facilities to support CS activities
- Participate in national or international CS projects
- Provide ethical/legal protocols tailored to the institution/national requirements
- Develop protocols on implementation of CS activities

Intended audience(s)

- Researchers at all career stages, including researchers who are already running citizen science projects
- Research-support staff and other administrative staff groups in research performing organisations (RPOs) or non-governmental organisations (NGOs)

Course description

This is a free 1-hour course that provides participants with basic understanding of transformative change in support resources and infrastructures to support citizen science. The participant will learn about the need for institutional contact points, the funding landscape, and ethical and legal aspects of citizen science. The course is designed for researchers, including citizen science project leaders and initiators, and administrative staff and their managers employed in research performing organisations. Participants are expected to have some degree of familiarity with the notion of citizen science.

Course length

The course requires 1 hour. It has four individual sections, which takes approximately 12 minutes each, plus three standard sections, an introduction (4 min), a summary and self-assessment (5 min), and acknowledgments + further information (3 min)

Learning outcomes

By the end of this course, the learner will be able to:

- **Objective 1:** Identify support resources and infrastructures relevant for citizen science projects at research performing organisations
- **Objective 2:** Facilitate the development of support resources and infrastructures relevant for citizen science projects, such as institutional contact point
- **Objective 3:** Develop projects building ethical guidelines in citizen science

Main division - topics

- **How many topics (sections) are in the course?** 4 [+3 standard sections]
- **Provide a title and a short description (1-2 sentences) for each section:**
 - **Welcome and introduction to the course** - introduction to the course from the course tutor. Overview of the content and the learning outcomes. Teaser and a sample story of citizen science achievements in research.
 - **Section 1: Successful institutional promotion of resources and infrastructure to support citizen science:** providing examples of citizen science projects in RPOs that support citizen science institutionally (for example with funding opportunities and organisational infrastructure); and giving an introduction to the notion of cultural change in RPOs
 - **Section 2: The funding landscape for citizen science:** describing funding bodies that support citizen science and ways in which to match citizen science research portfolios to funding opportunities
 - **Section 3: Ethical and legal guidelines for citizen science:** giving an overview of ethical and legal issues for citizen science and discussing ethical governance and processes in citizen science guidelines
 - **Section 4: Institutional contact points for citizen science:** describing steps towards setting up an institutional contact point for citizen science: 1) online hub/portal, 2) service desk, 3) communication tool/platform, 4) knowledge and expertise (best practices)
 - **Summary and self-assessment** - summary of the course and end of the course quiz
 - **Further information** - other sources of information and further learning on citizen science
 - **Sources and acknowledgement** - a list of sources that are used in the course.



Overview course plan

Welcome and introduction to the course (4 minutes)

What can we expect to learn from this section? Introduction to the course from the course tutor. Overview of the content and the learning outcomes. Provide teaser/story of CS.

What?	How?	Why?
I.1 Introduction from the course tutor (1 min)	A one minute video, introducing the course to the learner. Introduction of who made the course, and what is covered in it.	Welcome the student, and provide assurance about the credibility of the course
I.2 Course overview (1 min)	Overview of the course structure in text and a slides+audio - explaining the elements that will appear in each section	Familiarity with the mezzo-structure of the course and the reason to learn about support resources and infrastructure for citizen science projects
I.3 What support resources and infrastructure means for citizen science (2 min)	Providing an example of a citizen science project with real benefits for researchers and participants that came out of a citizen science hub such as the Citizen Science Library Services - UCL – University College London , Citizen Science - SDU , or Citizen Science Center Zurich	Make the course interesting and worth exploring

Section 1: Successful institutional promotion of resources and infrastructure to support citizen science (12 minutes)

What can we expect to learn from this section? The section enables participants to understand and use the terminology that describes governance and operation of citizen science hubs/single points of contact.

What?	How?	Why?
1.1 Introduction to the section (2 min)	Text, explaining how we are going to introduce the topic of citizen science support resources and infrastructures with two examples of different types of citizen science projects that have been conducted by citizen science hubs (one situated in a research library and one as an individual entity affiliated with the university)	Explaining to the learner why this section is relevant to understanding support resources and infrastructure for citizen science
1.2 Example one (2 min) - A Healthier Southern Denmark (public participation in decision-making and prioritisation of research)	The story of A Healthier Southern Denmark and how it has enabled citizens to take part in making decisions about the prioritisation of research funding	Demonstration of what can be achieved if the RPO supports citizen science initiatives



What?	How?	Why?
1.3 Example two (2 min) - Project Wencker (crowdsourcing of transcriptions)	The app. 1700 Wencker sheets with different Swiss dialects were collected by the Swiss linguist Georg Wencker in the 1930's. They represent a valuable source of knowledge about the Swiss language. Citizen scientists assisted contemporary linguists in transcribing (digitising) the sheets.	Demonstration of what can be achieved with crowdsourcing of transcription (digitalisation) supported by a citizen science hub
1.4 Overview of citizen science resources and infrastructures, and how citizen science hubs or institutionally contact points can promote citizen science projects systematically (2 min)	Bridging the stories together and elaborating on key responsibilities of citizen science "single points of contact" (LERU 2016): Recognition of success criteria specifically relevant to citizen science; allocation of funding (or support for the development of funding proposals) for community management, platform development, and other non-research functions characteristic of citizen science; support ethical approval and legal assistance of citizen science projects	Helping participants to organise information about the two examples and enabling them to develop broad thinking about hubs and institutional points of contact
1.5 Summary (1 min)	Explaining the learning from the session	
1.6 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of the importance of support resources and infrastructure for citizen science projects and project development

Section 2: The funding landscape for citizen science and secrets to winning a grant (12 minutes)

What can we expect to learn from this section? This section introduces participants to funding opportunities and strategies for citizen science proposals. Participants should be able to foresee funds for citizen science activities and develop ideas for targeted funding of citizen science projects.

What?	How?	Why?
2.1 Introduction to the section (2 min)	Text, explaining how it is important to cover the funding landscape and research funding support	Explaining to the learner why this section is relevant to understanding support resources and infrastructure for citizen science
2.2 Examples of funding programs that support citizen science and the reasons why (2 min)	HorizonEurope, Sparkling Science 2.0, Earthwatch Research Funding, project-initiated seed funding (IMPETUS), ...	Demonstrating that there are several funding opportunities for citizen science projects, each with



What?	How?	Why?
		a different scope and different eligibility and evaluation criteria
2.3 Secrets to winning a grant (2 min)	Tips of the trade: Do extensive research of the available grants and noting differences in the types of project financed by various funding bodies; pitching your proposal; the write stuff; communicating your idea effectively; what not to do	Providing participants with tips on how to avoid application pitfalls
2.4 Communicating your citizen science idea effectively (2 min)	Using the The Message Box by Compass to communicate your idea effectively in the proposal	Guiding participants in identifying the essential “nuggets” in their proposal for their chosen audience
2.5 Summary (1 min)	Explaining the learning from the session by summarising the points above in a decision framework	
2.6 Quiz (3 min)	Multiple-choice test about the funding landscape and secret to winning a grant	Test the understanding of citizen science funding and grant proposals

Section 3: Ethical and legal guidelines for citizen science (12 minutes)

What can we expect to learn from this section? This section enables participants to identify ethical and legal issues in citizen science projects by looking at existing guidelines and codes of conduct. The concept of ethical and legal governance is introduced.

What?	How?	Why?
3.1 Introduction to the section (2 min)	Text, explaining how and why we are going to cover ethical and legal issues in citizen science projects	Explaining to the learner why this section is relevant to understanding support resources and infrastructure for citizen science
3.2 Ethical and legal issues in citizen science (2 min)	Two cases about ethical issues in citizen science, one with and one without human collaborators / research subjects (from the thematic Citizen Science: Theory and Practice Special Collection 2019 + upcoming special issue on legal issues in citizen science)	Demonstrating that ethical and legal issues are important in citizen science, perhaps even more so than in ordinary science
3.3 Codes of conduct and (ethical) principles	Going over ECSA’s ten principles (in particular 3, 5, 7, 8, 9, and 10) and the Community-Campus Partnerships for Health (CCPH)	Demonstrating that there are already ethical guidelines for citizen science - and what they say

of citizen science (2 min)		
3.4 Ethical and legal governance of citizen science projects (2 min)	Presenting the concept of ethical and legal governance and addressing the need for ethical approval by institutional review boards	Enabling participants to ensure ethical and legal governance in their citizen science projects
3.5 Summary (1 min)	Explaining the learning from the session by summarising the points above about ethical and legal issues/governance	
3.6 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of ethical/legal issues and governance

Section 4: Institutional contact points for citizen science (12 minutes)

What can we expect to learn from this section? This section enables participants to describe steps towards setting up an institutional contact point for citizen science: 1) online hub/portal, 2) service desk, 3) communication tool/platform, 4) knowledge and expertise (best practices)

What?	How?	Why?
4.1 Introduction to the section (2 min)	Text, explaining how we are going to cover the notion of institutional contact points or hubs for citizen science	Explaining to the learner why this section is relevant to understanding support resources and infrastructure for citizen science
4.2 Examples of citizen science hubs or institutional contacts points (2 min)	Describing types of citizen hubs or institutional contact points, for example libraries, research centres, and others: Citizen Science - SDU , Citizen Science Center Zurich , Citizen Science (zentrumfuercitizenscience.at) (maybe also consider an example of an individual)	Demonstrating that citizen science hubs already exist and showing that there is no one-size-fits-all
4.3 Designing a single point of contact for citizen science (2 min)	Elaboration on the BESPOC model: 1) online hub/portal, 2) service desk, 3) communication tool/platform (about citizen science in general, current events, and ongoing projects), 4) knowledge and expertise (best practices, protocols, evaluation forms etc.), 5) partnership frameworks between	Enabling participants to contemplate and design single points of contact for citizen science at their institution (according to the BESPOC model)
4.4 Designing a governance framework for citizen science hubs	Presenting the governance framework designed by the INCENTIVE project	Enabling participants to design a governance framework



/ signal point of contact (2 min)		
4.8 Summary (1 min)	Explaining the learning from the session by summarising the points made above about citizen science hubs / single-points-of-contact	
4.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of citizen science hubs / single-points-of-contact

Summary and Self Assessment (5 minutes)

What can we expect to learn from this section? Summary of the course and end of the course quiz.

What?	How?	Why?
S.1 Summary of the issues that were covered, guidance to material in further information and in the acknowledgment and sources (2 min)	Summary of the issues that were covered in each section, with the main “take away” points	Helping the learner to identify the most critical content
S.2 Course quiz (3 min)	Final review of the course, and credit for successful completion, if relevant	Testing the knowledge in the course

Acknowledgments and further information (3 minutes)

What can we expect to learn from this section? Other sources of information and further learning on citizen science.

What?	How?	Why?
F.1 More sources of information that can expand the knowledge on the section through other training opportunities such as MOOCs (1 min)	Links and details of other online courses and places where more learning can be gained	Allow the learner to take the next step
F.2 Acknowledgments and other sources of information (2 min)	Details of books, articles and other information that can be used to develop an understanding of the topic	Providing the learner with further information that is not linked to learning

- **Some of the supporting resources**

- Cultural change in RPOs (open science) and recommendations specifically for CS
 - [LERU-AP24-Open-Science-full-paper.pdf](#) (p. 59-60)
- Towards CS-ICP: 1) online hub/portal, 2) service desk, 3) communication tool/platform, 4) knowledge and expertise (best practices) + Setting up CS-ICP



- [\(13864\) Citizen Science 'Single point of contact'. - YouTube](#)
 - Exemplary cases
 - Libraries as CS-ICPs
 - [Citizen Science | Library Services - UCL – University College London](#)
 - [Citizen Science - University of Southern Denmark, SDU](#)
 - Research centres
 - [Citizen Science Center Zurich](#)
 - [Extreme Citizen Science \(ExCiteS\) — UCL Department of Geography](#)
 - Others
 - [Citizen Science \(zentrumfuercitizenscience.at\)](#)
 - [Citizen Science Hubs Governance Framework and Operating Models \(INCENTIVE EU\)](#)
 - Funding opportunities for CS projects in RPOs and with national and international funding bodies
 - [Horizon Europe | European Commission \(europa.eu\)](#)
 - [Sparkling Science 2.0](#)
 - [GreenpaperonCitizenScience.pdf \(ibercivis.es\)](#)
 - Writing a winning grant
 - [Secrets to writing a winning grant \(nature.com\)](#)
 - Overview of ethics guidelines for CS
 - [Ethics Guidelines in Citizen Science \(ETH Zürich / CCCS\)](#)
 - Research ethics for CS (working with volunteers and human research subjects)
 - [Ethics Working Group: Resources - Citizen Science Association](#)
 - [Code of Citizen Science Research Ethics | BTO - British Trust for Ornithology](#)
 - CS ethical framework related to the health sciences
 - [Ethics framework for citizen science and public and patient participation in research | BMC Medical Ethics | Full Text \(biomedcentral.com\)](#)
 - GDPR and data protection in citizen science projects
 - [Getting it right: implementing data protection in citizen science research \(uksg.org\)](#)
 - Ethics committees, Internal Review Boards and ethics approvals at RPOs
 - CS case study (to prepare participants for deliberations)
 - [Special Collection: Ethical Issues in Citizen Science](#)

4.4 Intervention Area: Policy and assessment

RPOs need to support researchers in recognizing and adopting CS. Strategies, policies, and assessments incorporating CS must be developed as GAs for CS implementation.



4.4.1 TC4: Citizen Science Policy and Assessment

The aim of TC4 is to embed CS in existing strategies and policies of the RPO and to envisage new ones. By the completion of the course, the participants will have a better understanding of strategy- and policymaking processes. TC4 will specifically address new institutional norms, regulations, policies or agreements, including reward mechanisms for CS implementation. It will provide an overview of the reward system of science, including the diversity of reward mechanisms and assessment criteria for researchers and RPOs. Based on analysis of existing reward mechanisms in their own RPO, the participants will develop a portfolio of assessment criteria relevant to CS. The final aim of TC4 is to connect CS to the wider aims of RRI which draws on more established agendas and processes. Several Horizon2020 projects such as [RRI Tools](#) and [Res-AGorA](#) have already built resources and tools for incorporating RRI in policy and institutions.

GAs covered

- Develop new institutional norms, regulations, policies or agreements
- Install reward mechanisms for doing CS
- Adopt evaluation criteria for researchers' evaluation that take into account CS
- Adopt explicit mission statements and strategies

Intended audience(s)

- Researchers at all career stages, including researchers who are already running citizen science projects
- Research-support staff and other administrative staff groups in research performing organisations (RPOs) or non-governmental organisations (NGOs)
- Managers in RPOs or NGOs

Course description

This is a free 1-hour course that provides participants with basic understanding of policy and assessment strategies in support of citizen science. The participants will learn about strategic planning, strategies particularly adopted for citizen science, quality and success criteria for citizen science, and tools for connecting citizen science to the wider aims of responsible research and innovation. The course is designed for researchers, including citizen science project leaders and initiators, and administrative staff and their managers employed in research performing organisations. Participants are expected to have some degree of familiarity with the notion of citizen science.

Course length

The course requires 1 hour. It has four individual sections, which takes approximately 12 minutes each, plus two standard sections, an introduction (5 min) and a summary (6 min).



Learning outcomes

By the end of this course, the learner will be able to:

- **Objective 1:** Describe existing strategies and reward systems for citizen science
- **Objective 2:** Facilitate strategic processes within RPOs that are particularly relevant for citizen science
- **Objective 3:** Adopt assessment criteria for evaluation of researchers and research projects that specifically target citizen science objectives
- **Objective 4:** Develop strategies and/or policies specifically targeting citizen science

Main division - topics

- **How many topics (sections) are in the course?** 4 [+3 standard sections]
- **Provide a title and a short description (1-2 sentences) for each section:**
 - **Welcome and introduction to the course** - introduction to the course from the course tutor. Overview of the content and the learning outcomes. Teaser and a sample story of citizen science achievements in research (including the special evaluation criteria adopted to assess the research).
 - **Section 1: Citizen science strategies and policies:** providing examples of citizen science strategies/policies in support of citizen science; and giving an introduction to the notion of strategic planning in RPOs
 - **Section 2: Assessment criteria for citizen science:** describing the reward system for science including broader assessment models, and discussing additional or supplementary assessment criteria for citizen science
 - **Section 3: Methodological approaches to developing an evaluation framework for citizen science:** describing the open framework for evaluating citizen science activities and arguing that strategies, assessment and evaluation for citizen science should be carried out in a transdisciplinary and bottom-up manner
 - **Section 4: Citizen science and responsible research and innovation (RRI):** connecting citizen science to the RRI agenda by aligning citizen science mission statements, strategies, norms, policies, and more with RRI aims and processes
 - **Summary and self-assessment** - summary of the course and end of the course quiz
 - **Further information** - other sources of information and further learning on citizen science
 - **Sources and acknowledgement** - a list of sources that are used in the course.

Overview course plan

Welcome and introduction to the course (5 minutes)

What can we expect to learn from this section? Introduction to the course from the course tutor. Overview of the content and the learning outcomes. Provide teaser/story of CS.

What?	How?	Why?
I.1 Introduction from the course tutor (1 min)	A one minute video, introducing the course to the learner. Introduction of who made the course, and what is covered in it.	Welcome the student, and provide assurance about the credibility of the course
I.2 Course overview (1 min)	Overview of the course structure in text and a slides+audio - explaining the elements that will appear in each section	Familiarity with the mezzo-structure of the course and the reason to learn about citizen science policy and assessment
I.3 What support resources and infrastructure means for citizen science (3 min)	Provide an example of a citizen science project, which is aligned with identified strategies and/or assessment criteria such as the Artificial Intelligence: Right Whale Photo Identification NOAA Fisheries or CrowdMag: Real-time crowdsourced magnetic data NCEI (noaa.gov) projects of NOAA	Make the course interesting and worth exploring

Section 1: Citizen science strategies and policies (12 minutes)

What can we expect to learn from this section? The section enables participants to understand the significance of adopting explicit strategies and policies for citizen science at the institutional level.

What?	How?	Why?
1.1 Introduction to the section (2 min)	Text, explaining how we are going to introduce the topic of citizen science strategies and policies, with two examples of different policy documents that were developed and enacted in two different contexts	Explaining to the learner why this section is relevant to understanding citizen science strategy and policy-making
1.2 Example one (2 min) - NOAA Citizen Science Strategy	Telling the story of the NOAA Citizen Science Strategy, which outlines a path for the agency to engage the public in support of key mission areas and aligns with the US Crowdsourcing and Citizen Science Act	Demonstration of an institutional policy that connects citizen science to key mission areas and national policy
1.3 Example two (2 min) - Citizen Science Strategy 2030 - Helmholtz-Centre for Environmental Research (ufz.de)	Telling the story of the German citizen science strategy, which contains 94 concrete recommendations for action to further develop citizen science in Germany and anchor it permanently in science, society and politics	Demonstration of a national policy that seeks to anchor citizen science permanently in scientific institutions and society
1.4 Strategic planning in RPOs with particular	Going over the three planning imperatives - leadership, communication, assessment -	Helping participants to develop their thinking about strategic processes in RPOs



attention to citizen science (2 min)	with special emphasis on linking assessment and planning	with special attention to assessment and planning
1.5 Summary (1 min)	Explaining the learning from the session	
1.6 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of strategic planning and assessment

Section 2: Assessment criteria for citizen science (12 minutes)

What can we expect to learn from this section? This section introduces participants to the traditional and expanded reward system of science and a co-creation approach to developing evaluation criteria for citizen science. Participants should be able to acknowledge the need for comprehensive evaluation frameworks that would allow for comparability across stakeholders, projects and programmes.

What?	How?	Why?
2.1 Introduction to the section (2 min)	Text explaining how it is important to contemplate assessment criteria for citizen science in relation to strategy and policy-making	Explaining to the learner why this section is relevant to link policy-making to assessment criteria
2.2 The reward system of science (2 min)	The traditional reward system of science based on Mertonian norms (publication, novelty, disinterestedness, and organised scepticism) compared to more inclusive assessment formats such as Read the Declaration DORA (sfdora.org) or Hong Kong Principles - World Conferences on Research Integrity (wcrif.org)	Demonstrating that there are currently several initiatives calling for the need to acknowledge a broad range of research practices, i.e. Research evaluation needs to change with the times (nature.com)
2.3 The co-creation approach to developing quality criteria for citizen science (2 min)	Describing the co-creation process that led to the quality criteria for “Österreich forscht”	Giving participants an understanding of what co-creation means in relation to quality criteria
2.4 Additional or supplementary quality criteria for citizen science (2 min)	The criteria catalogue developed for “Österreich forscht” (20 criteria for inclusion/exclusion)	Providing participants with a list of quality criteria (for inspiration) that have been developed in a co-creative process
2.5 Summary (1 min)	Explaining the learning from the session by summarising the key points about evaluation and assessment in science and citizen science	
2.6 Quiz (3 min)	Multiple-choice test about the methodological approach to developing an evaluation framework	Test the participants’ understanding of the methodological approach to



		developing an evaluation framework
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Section 3: Methodological approaches to developing an evaluation framework for citizen science (12 minutes)

What can we expect to learn from this section? This section enables participants to develop an evaluation framework for citizen science in a methodological and systematic way. The participants will get acquainted with the logic model of evaluation and the open framework for evaluating citizen science, which aims at assessing and evaluating citizen out in a transdisciplinary and bottom-up manner.

What?	How?	Why?
3.1 Introduction to the section (2 min)	Text, explaining how and why we are going to cover ethical and legal issues in citizen science projects	Explaining to the learner why this section is relevant to understanding support resources and infrastructure for citizen science
3.2 The logic model of evaluation applied to citizen science (2 min)	Presenting the logic model and how it applies to citizen science based on Evaluation in Citizen Science: The Art of Tracing a Moving Target SpringerLink	Demonstrating how a simple evaluation model applies to citizen science as a basic introduction to methodological approaches to evaluation
3.3 Tools for evaluation (2 min)	Describing basic tools of evaluation such as surveys, interviews, embedded assessment, participatory observation, and self-reflection processes	Providing an overview of simple assessment tools + their pros and cons
3.4 Methodological approach to developing an evaluation framework for citizen science projects (2 min)	Introducing the methodological evaluation framework developed in Citizen Science (ucl.ac.uk)	Guiding participants to think methodologically about evaluation and assessment criteria
3.5 Summary (1 min)	Explaining the learning from the session by summarising the points about methodological evaluation frameworks	
3.6 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of methodological evaluation frameworks



Section 4: Citizen science and responsible research and innovation (RRI) (12 minutes)

What can we expect to learn from this section? This section enables participants to make connections between citizen science and RRI agenda. They should be able to align citizen science mission statements, strategies, and evaluation framework with RRI aims and processes.

What?	How?	Why?
4.1 Introduction to the section (2 min)	Text, explaining how we are going to connect citizen science to RRI	Explaining to the learner why this section is relevant to understanding policy and assessment in relation to citizen science
4.2 Examples of initiatives that aim to connect citizen science to RRI (2 min)	Providing two examples of projects that in different ways make a connection between citizen science and RRI: Resbios – Responsible Research and Innovation and Challenge-driven innovation Vinnova	Demonstrating that the process of connecting citizen science with RRI is ongoing
4.3 Convergences (divergences) between citizen science and RRI (2 min)	Explaining overlaps between citizen science and RRI, but also their divergences, arguing that citizen science could learn lessons from RRI approaches and processes (based on Citizen Science (ucl.ac.uk))	Enabling participants to consider citizen science from an RRI perspective and learn from RRI approaches
4.4 How to incorporate RRI (and citizen science) into higher education institutions (HEIs) (2 min)	Describing how HEIs can help transform the research and innovation system by developing new normative frameworks, plans to foster dialogue and participatory approaches, policies of openness and inclusivity (based on How to incorporate RRI in higher education institutions - RRI Tools (rri-tools.eu))	Enabling participants to design a strategy for how to incorporate RRI into HEIs
4.8 Summary (1 min)	Explaining the learning from the session by summarising the points made above about citizen science and RRI	
4.9 Quiz (3 min)	Multiple-choice test about key terms and selected scenarios	Test the understanding of overlaps (and divergences) between citizen science and RRI

Summary and Self Assessment (7 minutes)

What can we expect to learn from this section? Summary of the course and end of the course quiz.

What?	How?	Why?
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S.1 Summary of the issues that were covered, guidance to material in further information and in the acknowledgment and sources (2 min)	Summary of the issues that were covered in each section, with the main “take away” points	Helping the learner to identify the most critical content
S.2 Course quiz (5 min)	Final review of the course, and credit for successful completion, if relevant	Testing the knowledge in the course

Further information (5 minutes+)

What can we expect to learn from this section? Other sources of information and further learning on citizen science.

What?	How?	Why?
F.1 More sources of information that can expand the knowledge on the course through other training opportunities such as MOOCs (5 min)	Links and details of other online courses and places where more learning can be gained	Allow the learner to take the next step
F.2 Other sources of information (5 min)	Details of books, articles and other information that can be used to develop an understanding of the topic	Providing the learner with further information that is not linked to learning

- **Some of the supporting resources**

- Strategic planning in RPOs for CS
 - [Strategic Planning in Higher Education: A Guide for Leaders](#)
 - Mission, vision and values
 - Collaborators and beneficiaries
 - Environmental scan
 - Goals
 - Strategies and action plans
 - Plan creation
 - Outcomes and achievements
 - [Strategic planning: time for a rethink? | Times Higher Education \(THE\)](#)
- Uptake of CS for policymaking in Europe
 - Critical factors that influence and determine the uptake of CS for policymaking
 - [Exploring citizen science strategies and initiatives in Europe \(2021\)](#)
- Exemplary cases
 - [NOAA Citizen Science Strategy](#)
 - [Green Paper Citizen Science Strategy 2020 for Germany](#)
- The reward system of science



- Scientific recognition: authorship, citations, acknowledgements, prizes
- Scientific careers and assessment criteria for advancements (research, teaching/outreach, industrial/public sector collaboration, other)
- Rankings of RPOs: national, regional and international
- Intended vs. unintended effects
- Reform proposals
 - Transition to open science standards
 - Identifying and removing incentives that discourage cooperation, encourage poor scientific practices, and deter new talent from entering the field
 - Promoting inclusive metrics of success and impact to dismantle a discriminatory reward system in science
 - [Research evaluation needs to change with the times \(nature.com\)](#)
- [Co-Creating and Implementing Quality Criteria for Citizen Science \(citizenscienceassociation.org\)](#)
- RRI goals, processes and tools
 - RRI goals: ethics, societal engagement, gender equality, open access/science and science education
 - RRI processes: diversity & inclusiveness, anticipation & reflexivity, openness & transparency, and responsiveness & adaptation
 - RRI tools: self-reflection and inspiration
 - [Home Page - RRI Tools \(rri-tools.eu\)](#)
- CS and RRI as overlapping approaches
 - [RRI and citizen science, how these approaches overlap – Eusea – European Science Engagement Association](#)
- How to incorporate RRI and CS in RPOs
 - [How to incorporate RRI in higher education institutions - RRI Tools \(rri-tools.eu\)](#)



5. Equality Impact Assessment

In the further development of the four TCs it will be important to consider issues relating to equality and participation. An Equality Impact Assessment (EIA) is designed to help institutions and trainers ensure that their training, courses and resources are fair and do not present barriers to participation or disadvantage any protected groups from participation. Performing an EIA for the four TCs will help to ensure that trainers and participants understand their potential effects. This will be done by assessing the TCs’ impact on different groups, identifying any adverse impacts and taking action to remove them, and ensuring that decisions behind the TCs are transparent and based on clear reasoning. EIAs for the TCs will be performed when the TCs have been developed fully. The table below include issues and mitigation for the six different categories, which form the basis of the EIA by looking for bias that can occur when there are significant differences (disproportionate difference) between groups of participants in the way the elements of the TCs might potentially impact on them.

Table 2 - Elements of the Equality Impact Assessment (EIA)

Characteristics	Issues and mitigation
Age	Ensure that material is inclusive for different age groups. This course is aimed at [insert intended audience], who will be within working ages (20-70) and therefore the material should be presented in a way that is suitable for this group. The font should be readable to older adults.
Disability	There is a need to ensure that a learner with disability can access the material. Care will be given for visually impaired learners.
Race	Citizen science have underrepresentation of people from black and minority backgrounds, and the material should include recognition of disparities and the potential for inclusiveness.
Religion and Belief	The text should be written in a way that it recognises differences in religious beliefs.
Gender	Gender issues in science are well established and the examples that will be used in the unit should balance gender and provide appropriate role models.
Sexual orientation	The material should not be prejudiced for people with different sexual orientation.



6. Conclusion

This deliverable presents the reworked results of task 4.1 regarding the development of training program content for the TIME4CS project. The task includes 1) mapping existing CS training programs and training resources, 2) analysis of best practices to define key concepts, capabilities, and infrastructures, 3) analysis of how institutions can support institutional change related to CS, and 4) developing training programs that incorporate relevant sections to target all four IAs and relevant GAs.

The mapping exercise has resulted in the identification of +65 training programs or resources (available on Zenodo). These programs have been analysed to extract key concepts (audiences, training types, and assessments), capabilities (content, skills, learning goals), and infrastructures (training format, publisher, and knowledge exchange). They are targeted at many different audiences and can be used by RPOs as part of their institutional change. Existing programs and resources that are available online and undergo continual development/maintenance can be used by many different RPOs to facilitate incremental changes that eventually may lead to broader inclusion of CS across faculties and disciplines.

The analysis included the comparison between existing training resources and lessons learned by the TIME4CS consortium about institutional support required for the implementation and adoption of CS in RPOs. Overlaps and gaps in existing training programs were identified in the analysis.

Based on the analysis, training demands were identified and implemented in the plan for training programs. To maintain flexibility in terms of actual training programs tailored to the different demands of Implementers, a total of 24 training sections (six for each of the IA courses) covering all the GAs that so far have been identified by the TIME4CS consortium are proposed. These sections can be combined at will depending on specific requirements. The actual training courses to be tested and assessed will be developed in collaboration with Implementers during task 4.2 (workshops for researchers and other members of staff) and task 4.3 (webinars for researchers and other members of staff).



7. Acknowledgements

We thank the EU-citizen.science team for sharing their list of training resources and their guidance document for development of training resources for their platform.

