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UNIVERSITÄT SALZBURG

Austrian Citizen Science Conference 2018

University of Salzburg, Austria
February 01–03, 2018

www.citizen-science.at

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Welcome to Austrian Citizen Science Conference 2018

Citizen Science has grown rapidly over the last years in Austria. Since 2015 the Citizen Science Network Austria and its associated online platform "Österreich forscht" (www.citizen-science.at) organizes an annual citizen science conference, where researches, practitioners and interested citizens exchange experiences, discuss new methods and connect to each other. Under the motto "Generation Citizen Science" the focus of the conference in 2018 was on how people can participate in projects and what is needed to increase participation. This years conference was organized at the University of Salzburg and included workshops, panel discussion and presentations addressing the questions above in various fields of research.

LIST OF ORGANIZERS

Florian Heigl
Daniel Dörler
Marlene Ernst

Keywords: citizen science, open innovation in science, public participation in research, interdisciplinarity, transdisciplinarity

The conference was transdisciplinary, so the chosen journal might not be appropriate for every abstract in our abstract book.

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Generation Citizen Science: Support for researchers on an institutional level

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Keywords: citizen scientists, research, Salzburg, university

Dealings with citizens take a great deal of effort. Sensitivities have to be considered and the communication can– depending on the topic – also be charged with emotions. Tactfulness and sensitivity are often just as important as the scientific foundation of the academic project.

At the end there stands the question: is it worth it? We say it is. There is more to it than generating data. By involving the public in our research we break down barriers and make professional science more approachable. It's not about doing research for the people alone anymore. It's about cooperation and mutual respect. As Peter Finke already stated, in order to really promote research, it has to break free from its chains. Citizen Science is a possible means to this end (see Finke, 2014, 52).

Therefore, as the contact point for citizen science at the University of Salzburg (established 2015) we offer support for researchers interested in the citizen science method on several levels in order to minimize the barriers and let the researchers concentrate on those core challenges. Seed funding, consultations, advice on legal, communication, and marketing matters as well as raising awareness for public engagement on both sides (researchers as well as general public) for the possibilities of citizen science are our tasks.

Through an established and still growing network of national as well as international partners from public institutions to commercial companies and registered associations, new trends and developments are gathered. What topics are of special interest for the public and how to combine those interests with research facilitated at the University of Salzburg is on our agenda as well.

Citizen Science at the University of Salzburg: Currently there are five active citizen science projects in progress at the University of Salzburg which are sponsored by

national research funding programmes specialised on citizen science[1]: Urban Trees as Climate Messengers (Urban Landscape Ecology/Department of Geography and Geology)[2], Nan-O-Style (Biosciences)[3], Together We Drive Better (Center for Human Computer Interaction)[4], Cooking up Salzburg (Centre for Gastrosophy/Department of History)[5], and citizenMorph (Department of Geoinformatics)[6]. Transdisciplinary exchange between those projects but also between other disciplines and working groups with affinity to citizen science is offered through individual meetings, workshops, and conferences. To use existing experiences makes it easier for new potential citizen science project leaders to navigate their way to a successful project start.

Apart from the support we offer for specialised citizen science projects, we also organise and act as intermediary for small as well as large scale events, workshops, public science days, lectures outside lecture halls, etc. – all as part of our agenda to promote public engagement.

Our main goal is to break down the barriers between the general public and the institution University and communication on different levels is a huge part in this process (see also Lehmann, 2015, 85–86). Through formats like the so called "citizen forum" we bring the university and its research(ers) to the public. Events take place outside the classic university atmosphere and buildings. Most of the time they are localised activities initiated through ideas coming from regional representatives. Recent examples are e.g. a series of interdisciplinary lectures at the giant museum ("Riesenmuseum") in Lengau, a baroque gala dinner in cooperation with the *Gesunde Gemeinde Waidhofen/Thaya* and the participation of a music ensemble consisting of members of the Vienna Philharmonic Orchestra as well as podium discussions as part of different events throughout the last two years.

With every event of this kind we reach all kinds of different citizens which allows us to promote the idea of participating in research to groups of people initially not interested or who did not know about those possibilities before.

In 2018 we also hosted the annual Austrian Citizen Science Conference. From the 1st to 3rd February the Unipark Nonntal[7] (as well as several non-university locations on the

[1]Top Citizen Science https://www.fwf.ac.at/en/research-funding/fwf-programmes/top-citizen-science-funding-initiative/ and Sparkling Science https://www.sparklingscience.at/ (last access: 22/06/2018).

[2]https://www.sparklingscience.at/en/projects/show.html?--typo3_neos_nodetypes-page%5Bid%5D=1000 (last access: 22/06/2018).

[3]https://www.sparklingscience.at/de/projects/show.html?--typo3_neos_nodetypes-page[id]=1218 (last access: 22/06/2018).

[4]https://www.zentrumfuercitizenscience.at/en/p/gemeinsam-fahren-wir-besser-gefabe (last access: 22/06/2018).

[5]https://www.zentrumfuercitizenscience.at/en/p/cooking-up-salzburg (last access: 22/06/2018).

[6]Project start is the 1st July 2018.

[7]Impressions as well as the original programme can be found online: https://citizen-science.sbg.ac.at/index.php/impressionen and https://citizen-science.sbg.ac.at/index.php/programm, respectively. (last access: 22/06/2018).

public science day) hosted over 200 participants who gathered together to exchange their experiences and ideas through lectures, workshops, and roundtable discussions. The public citizen science day included many different kinds of activities throughout the city of Salzburg – from a trolleybus with an on board microscope to discussions with researchers, experts, and citizens alike in a coffee house as well as an encounter between food and research with different culinary inspired topics presented in the Miele Experience Center.

The more traditional conference formats of the first two days offered a varied programme and ample opportunities for the citizen science peers to network and communicate. Challenges as well as the potential of the generation citizen science have been presented and discussed at the three-day conference in February. Additional potential for an exchange of ideas and experiences were provided through all kinds of different projects and research approaches which were presented there as well. Numerous of them you can find in the present proceedings. So be inspired by all the different ideas and projects in this volume.

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Generation Citizen Science: Modes of involvement of citizens in research

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Keywords: Austria, diversity, participation, classification, disciplines

Abstract: For several years we observe the trend in Citizen Science (CS) towards involving citizens in more phases of the scientific research process, than data collection. We classified all projects listed on the platform *Österreich forscht* according to the White paper on CS and compared projects from 2015 and 2018. Surprisingly, the subjective observation was confirmed as the diversity of involvement increased over time.

Introduction: Since the coining of the term "CS" in the mid 1990s (Bonney, 1996; Irwin, 1995) many attempts have been made to classify the involvement of people from outside academia in scientific research endeavours (Rowe and Frewer, 2005; Shirk et al. 2012; Bonney et al. 2009; Haklay, 2013; Sanz et al. 2014). The most well-known concepts are probably the classifications based on citizen involvement by Haklay (2013) and by Sanz et al. (2014).

Haklay's concept is built on the foundation of how much citizens are involved in the research process. Accordingly, the most basic form of CS is *crowdsourcing*, where people contribute resources, such as processing power of their computers. The next level is *distributed intelligence*, projects on this level involve people in the analyses of pictures or videos, which need to be classified. The third level is *participatory research*, where people are involved in the definition of research question or in data collection. The top level is *extreme CS* where citizens are involved during the whole research process.

As much as this concept is understandable and easy to apply, it also has its downside. On the one hand the concept is classifying projects, but on the other hand it also unconsciously assesses projects due to its hierarchy. It seems as the best projects are always the projects on top level (*extreme CS*), not taking into account that some people don't want to participate in every step but rather are happy by "merely" contributing resources or data. Sanz et al. (2014) solved this problem of hierarchical classification by depicting different classes of citizen involvement in a circle. The authors identified seven types of CS projects. *Pooling of resources* corresponds more or less to Haklay's *crowdsourcing*,

and *collective intelligence* to *distributed intelligence*. Where Haklay is combining data collection, analysis tasks and participatory experiments in *participatory research*, Sanz et al. split them up in categories of their own, and see *participatory experiments* as projects, where citizens and scientists are working together in the whole research process. *Serious games* are approaches that help scientists identify complex mechanisms by letting people play games. *Grassroots initiatives* are projects that often don't involve people from academia (or only at a later stage) and are coordinated by NGOs or communities.

The aim of our study is to examine the CS landscape in regard to citizen involvement in Austria from 2015, when the first Annual Austrian CS Conference took place, until February 2018, when the 4th conference was held at the University of Salzburg. We will analyse the types of CS projects based on the classification from Sanz et al. (2014) and discuss the reasons for these developments taking into account our personal experiences as coordinators of the CS Network Austria and organizers of the Annual Austrian CS Conference.

Methods: We classified projects that can be found on the Austrian CS platform *Österreich forscht* (www.citizen-science.at) in 2015 (10 projects) and 2018 (55 projects) according to the concept that is presented in the White Paper on CS (Sanz et al. 2014) into the following categories:

- Pooling of resources
- Collective Intelligence
- Data collection
- Analyses tasks
- Participatory experiments
- Serious games
- Grassroots Activities

We classified projects in more than one category based on the type of participation of citizens in the project, e.g. if citizens collect data and help analyse them, the corresponding project is classified in *data collection* and *analyses tasks*. Eight projects that were running in 2015 and in 2018 were taken into account in both years.

After categorization of all projects we calculated the percentages of each category and depicted them in a bar chart.

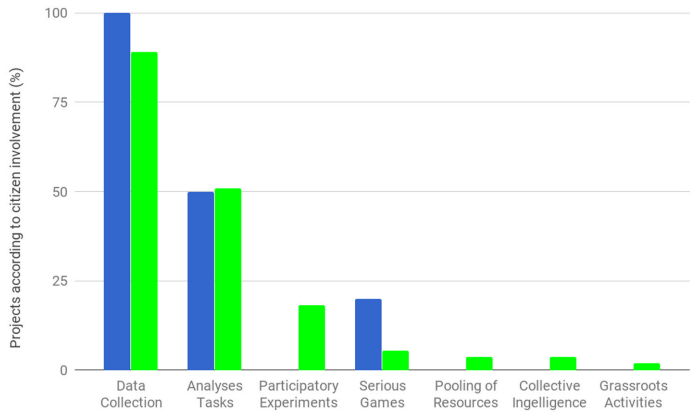

FIGURE 1: Classification of CS projects listed on *Österreich forscht* in 2015 (blue) and 2018 (green) based on the White Paper on CS by Sanz et al. (2014).

Results: Most of the projects involve citizens in the project phase of *data collection*, followed by the phase of *data analyses*. Only few projects are designed for *pooling of resources* or *collective intelligence*. Additionally, it seems that projects in 2018 are designed for a broader involvement of citizens in scientific projects, as back in 2015. So in 2015 citizen involvement is realized in three categories, whereas in 2018 projects of all seven classifications are listed on the platform *Österreich forscht* (Figure 1).

Discussion and Conclusion: The increase in diversity of involvement could be explained by the general increase of the number of projects on *Österreich forscht* and the according disciplines. In 2015 all CS projects listed on *Österreich forscht* stemmed from natural sciences. This bias could be explained by the fact, that the two coordinators of the platform are natural scientists and used their existing professional network to find CS projects, which could be listed on *Österreich forscht*, whereas in 2018 projects from the humanities and the social sciences are listed, too. In fact, these two disciplines are responsible for most of the variation in citizen involvement besides data collection and analyses tasks, while the focus of projects from the natural sciences is still on the two types of involvement (data collection and analyses tasks). The relationship of projects coming from different disciplines and the increase in the diversity of involvement may also be partly explained by the diversity of research questions stated in the projects and the according methods to answer these questions.

The principal theoretical implication of this study is that the increase in diversity of research questions leads to more diversity in citizen involvement in CS projects. Therefore, we expect a more evenly spread distribution of types of citizen involvement in future CS projects.

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Opportunities and limitations of citizen science in the humanities

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Keywords: citizen science, humanities, crowdsourcing, levels of participation, Brothers Grimm

Abstract: 1. The number of citizen science projects in the humanities is very small in comparison to the natural sciences. The analysis of the Austrian Top Citizen Science initiative, however, reveals a growing number of humanities related projects. 2. Projects from all disciplines mostly utilise the public for crowdsourcing and not for more advanced tasks. The article argues that the historic roots of citizen science lie not only in natural science, but also in the humanities, and that there is a high potential for more sophisticated forms of participation in citizen science projects from the humanities.

Introduction: Citizen science is a new name for an old concept: During the development of modern science, amateurs and "common people" contributed to the collection of data, while the sharp distinction between experts and laypersons was only introduced in the late 19th century (Mahr 2017). Charles Darwin who made crucial scientific contributions without being based at university, is often named as an ancestor of citizen science. With the humanities gradually taking part in citizen science activities – do they also have ancestors or is it a new concept? The Brothers Grimm come to mind as role models: The linguists and anthropologists Jakob (1785-1863) and Wilhelm Grimm (1786-1859) collected their classic "Children's and Household Tales" (*Kinder- und Hausmärchen*) while they were working at a library and only later became professors.

Example: Without water samples to collect and birds to count, how can the public participate in the humanities? The Bodleian Library of the University of Oxford, for instance, houses more than 4.000 scores from the 19th century in its collection. In the project "What's the Score at the Bodleian?", citizen scientists are asked to describe the illustrated covers to the following end: "By describing these images, you will not only be helping to provide access to this valuable but hitherto 'hidden' collection, you will also be facilitating future research into popular music of the period and the wider social function which it performed during the Victorian age."[8] It is a typical citizen

[8]https://scistarter.com/project/691-Whats-the-Score-at-the-Bodleian, selected from the topic "Archeology & Culture" (last access: 04/05/2018).

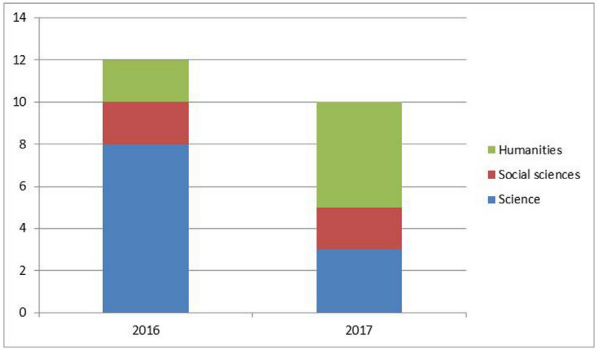

FIGURE 1: Top Citizen Science in Austria by disciplines.

science project from a library, museum or humanities research project possessing rich collections or large amounts of data.

Results

Share of Humanities in Citizen Science

In their international review, Dobreva and Azzopardi reached the following conclusion: "While citizen science grows in popularity in general, the majority of citizen science oriented projects take place in scientific areas." (Dobreva and Azzopardi 2014, 450) National data corroborate this international trend: In the Austrian database "Österreich forscht", there are only seven out of 54 projects under the heading of culture.[9] Top Citizen Science, an initiative supported by the Federal Ministry of Education, Science and Research (BMBWF), the Austrian Science Fund (FWF) and the Austrian Exchange Service (OeAD), sets a positive trend, nevertheless (Figure 1): In its first round in 2016, only two projects were connected to the humanities, while in the second round in 2017, it was already five out of ten projects![10]

Forms of Participation

Bonney distinguished three major forms of participation in citizen science: contributive, collaborative, and co-created (Bonney et al. 2009, 11). In a similar fashion,

[9]www.citizen-science.at (last access: 04/05/2018).
[10]www.zentrumfuercitizenscience.at (last access: 04/05/2018).

the Austrian FWF lists four categories in its application guidelines[11]: crowdsourcing, distributed intelligence, participatory science, and collaborative science. What the categories have in common is the gradual advance in scholarly and cognitive involvement of the citizens.

In her review of 1,691 citizen science projects, Heinisch demonstrated that in the majority of projects, the participation is contributive – citizen scientists basically collect data (crowdsourcing). According to Heinisch, a "possible explanation for this might be that participation in citizen science projects is often seen as a means (to achieve a project goal) and not as an end, i.e., giving control to members of a community. Not empowerment, but efficiency seems to be the goal of citizen participation." (Heinisch 2017, 19)

The example mentioned above is no exception: Describing cover images on scores is a typical crowdsourcing project with citizens gathering data while the analysis is reserved to the scholars.

Discussion: The small percentage of humanities projects in citizen science can be explained by a number of reasons: Some projects simply lack big data which can be analysed by the public. Instead, they re-evaluate a small pool of known material by means of refined methods, such as in literature or in Ancient History. Likewise, certain topics have too high demands in expertise, such as old languages or scripts, to be accessible to the public.[12] In other projects, scholars would find it difficult (or do not wish) to communicate their research problem to a wider public, others might refute citizen science based on a defensive stance against natural sciences (as opposed to humanities).

There is, nevertheless, a special affinity between the humanities and citizen science: In the words of sociologist Max Weber, research needs to have a "cultural meaning" (*Kulturbedeutung*) for the present while at the same time research questions are formulated from the perspective of present-day society (Weber 1988, 160). This results in a special appeal and relevance of these research topics to the public. At the same time, the Digital Humanities form a rather new trend utilising computer-based procedures and digital resources which are highly compatible to crowdsourcing in citizen science (Schreibman et al. 2016).[13]

[11]http://www.fwf.ac.at/fileadmin/files/Dokumente/Antragstellung/Top-Citizen-Science/tcs_application-guidelines.pdf (last access: 04/05/2018).

[12]In our own citizen science project "Cooking Up Salzburg", the participants start with the transcription of printed texts and are able to advance to more complicated sources; see the paper of Ernst in this volume.

[13]See the contribution of Hinkelmanns and Zeppezauer-Wachauer in this volume.

More collaborative and co-created citizen science projects are an important aim for the future. They would have three positive effects: First, scholars could reflect on their own subjectivity and embeddedness in the present, which might eventually put their role as experts into perspective. Second, the position of citizens could be strengthened if their practical knowledge would be taken into account. Third, a stronger engagement of citizens could help reduce the increasing mistrust of science in general (National Academy of Sciences 2017).

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Cooking up salzburg: How baroque food history is linked with digital humanities

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Keywords: food studies, digital humanities, regional history, historic recipes, baroque Salzburg

What did people eat and drink in the early modern period – and why? This question lies in the centre of the Top Citizen Science project "Cooking up Salzburg"[14] funded by the FWF Austrian Science Fund. This short report shall give insights into specific opportunities as well as challenges posed by integrating citizen science into historic research.

The Project So Far: Food related topics in general and food history in particular are of special interest for many. Therefore the public response for the project has been overwhelmingly positive. Half a dozen communication strategies were initially planned but only one half page article in the *Salzburger Nachrichten* at the end of August 2017 (see Portenkirchner, 2017) sufficed to find enough interested citizens to start with introductory workshops in October. And it is no wonder that the topic interests so many. As Anne Willan states in the introduction to *The Cookbook Library*: *"Old Cookbooks are captivating, and important too, leading us into the world beyond the hearth. Without them, we would not have tasted our way down the centuries to the dishes we embrace with such affection today."* (Willan et al., 2012, 1)

How the recipes became what we know of them today is also part of the overall research question. A specialised database for the analysis and comparison of handwritten as well as printed cookbooks (focusing on the early modern period) which is being developed at the Centre for Gastrosophy aids with the reconstruction of those lines of development. The database allows for comparisons of regional to supra-regional dishes, deduction of where and when certain dishes appeared, who copied recipes from whom, etc. The main goal of "Cooking up Salzburg" is to get a more thorough and complete notion of the cuisine of the baroque city of Salzburg by providing comparative data with the help of citizen scientists.

[14]Details on the project can be found on the homepage of the Centre for Gastrosophy https://bit.ly/2FGcLsr. (last access: 15/10/2018).

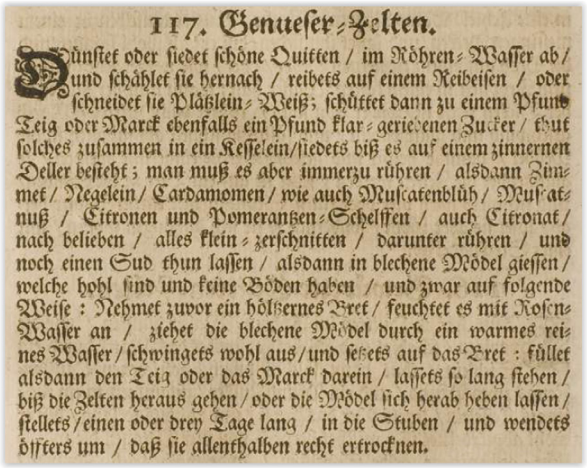
So Much More than Data Creation: Additionally to data creation, the involvement of citizens in the clarification of terms of ingredients, dishes, and kitchen utensils is of special interest as well. Cookbook manuscripts hold a particular store of terms of everyday language and are very close to the spoken regional dialect of the respective time. Finding the modern day expressions for certain words can therefore be quite the challenge. A challenge which can be met by involving as many people as possible and getting them to talk (preferably in their own accents). Take the word "khanußl" for example. It is only used one single time within a manuscript from 1654 in a recipe for a pear pasty. From the context we know that it has to be an ingredient but which one was a mystery for a long time. The word was used also as an example throughout all the introductory workshops with the citizen scientists and lo and behold: one day later there is an email in the inbox where a participant identified the elusive term as a cornel cherry.[15]

The Digital Challenge: Almost 6,500 recipes from three different sources[16] are planned to be transcribed and also inserted into the specialised database by the citizen scientists. After seven months of the two year project duration over half of the intended workload has been processed already – at least in the way of transcribing the texts. The next step is to insert those transcriptions into the specialised database for historic recipes. Figure 1 shows the recipe in its original source, whereas figure 2 depicts its representation in the database.

Therein lies also the greatest challenge for the project. A recent workshop on how to put the transcribed recipes into the online database showed the reluctance of many a citizen scientist already involved with "Cooking up Salzburg" to work with a digital medium. Most of them stated beforehand "Will I be capable of inserting data into the database?" or "I don't really use computers that often. Will I destroy something when clicking the wrong button?". It took quite some time to assuage those initial sentiments. The database itself is designed in the user-friendliest way possible: WordPress is the CMS of choice as it offers an easy to use and very intuitive user interface. The upcoming weeks and months will show how successful the careful premeditation of the digital part of the project will be.

In the meantime communication and sustaining participation motivation – in this case through regular personal contact – are key to keep the citizen scientists engaged with the project (see Wuketich and Griessler, 2017). Additional incentives are informal

[15]Andrea Sobieszek was the citizen scientist who came up with the solution by corrupting the Latin *cornus*.
[16]Conrad Hagger's *Neues Saltzburgisches Koch= Buch* (1718/19), Susanne Maria Endter's *Der aus dem Parnasso ehmals entlauffenen vortrefflichen Köchin […]* or *Vollständiges Nürnbergisches Kochbuch* (1691), Marx Rumpolt's *Ein new Kochbuch* (1581).



117. Genueser-Zelten.

Dünstet oder siedet schöne Quitten / im Röhren-Wasser ab / und schählet sie hernach / reibets auf einem Reibeisen / oder schneidet sie Plätzlein-Weiß; schüttet dann zu einem Pfund Teig oder Marck ebenfalls ein Pfund klar-geriebenen Zucker / thut solches zusammen in ein Kesselein/siedets biß es auf einem zinnernen Deller besteht; man muß es aber immerzu rühren / alsdann Zimmet / Negelein / Cardamomen / wie auch Muscatenblüh / Muscatnuß / Citronen und Pomerantzen-Schelffen / auch Citronat / nach belieben / alles klein-zerschnitten / darunter rühren / und noch einen Sud thun lassen / alsdann in blechene Mödel giessen / welche hohl sind und keine Böden haben / und zwar auf folgende Weise: Nehmet zuvor ein höltzernes Bret / feuchtet es mit Rosen-Wasser an / ziehet die blechene Mödel durch ein warmes reines Wasser / schwingets wohl aus / und setzets auf das Bret: füllet alsdann den Teig oder das Marck darein / lassets so lang stehen / biß die Zelten heraus gehen / oder die Mödel sich herab heben lassen / stellets / einen oder drey Tage lang / in die Stuben / und wendets öffters um / daß sie allenthalben recht ertrocknen.

FIGURE 1: Recipe for quince sweets. Digital Copy: © Herzog August Bibliothek Wolfenbüttel http://diglib.hab.de/drucke/6-oec/start.htm?image=00906

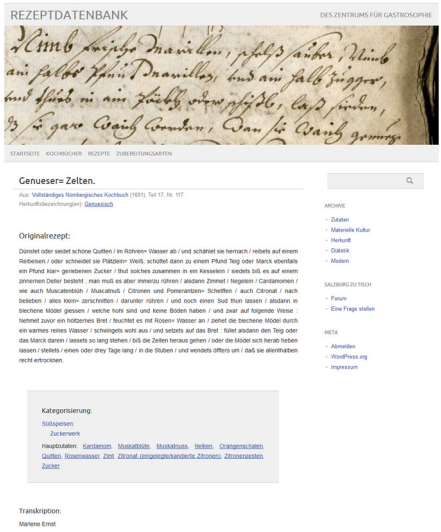


FIGURE 2: Representation of the same recipe in the database.

meetings as well as practical workshops which help to promote an exchange of ideas, difficult questions or peculiarities of the source material.

Conclusion: Citizen science offers great potential for historic research. More often than not the research topics interest many potential citizen scientists and discourse between as many people from different backgrounds as possible should be encouraged. At the same time the challenges lie in developing easy to use research tools and in the effort which has to be put in communication in order to maximize the output for all parties involved.

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Nan-O-Style: Nanotechnology ↔ Modern lifestyle

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Key words: nanotechnology perception, nanomaterial, consumer products, nanosafety, lifestyle products

Summary: Nanomaterials (NMs) are abundant in many every-day products and interactions with an ever-growing number of modern lifestyle products (MLPs) are becoming increasingly likely. Nanosafety assessment has so far not taken into consideration such new types of interactions. Nan-O-Style aims at investigation of modern lifestyle habits by adolescents and the associated new possibilities of combined exposure to NMs and MLPs. Moreover, NM-MLP interactions are determined using Nanoparticle Tracking Analysis (NTA) and the resulting biological effects on human cells are investigated. Ultimately, Nan-O-Style will generate knowledge of attitudes towards nanotechnology from adolescents and adults with diverse educational background.

Main Text: Nanotechnology has meanwhile reached our every-day life. A high number of all-day products either contain nanomaterials or have been processed by nanotechnological work flows (Bakant and Hayes, 2016; Cao *et al.*, 2016). New interactions with other all-day products, *i.e.* an ever-growing number of modern lifestyle products, become more and more likely and, moreover, the new generation has a high degree of creativity in using MLPs in many different ways potentially resulting in not foreseen interactions of NMs with MLPs during the marketing process. Therefore, an interdisciplinary research project termed **Nan-O-Style** has been established investigating interactions between nanomaterials (NMs) in consumer products with substances from daily life with a special focus on MLPs used by adolescents. Furthermore, Nan-O-Style aims at the compilation of an education initiative about nanotechnology including teaching resources and international peer-teaching. The position of the Nan-O-Style project at the intersection between academia, education at Austrian schools and society is visualized in Figure 1.

In order to achieve a high variety of perspectives, students from different types of Austrian higher schools (technical/scientific *vs.* economic *vs.* artistic) work in close contact with scientists from academia. Due to the within Nan-O-Style acquired competences and the established network between academic scientists, students

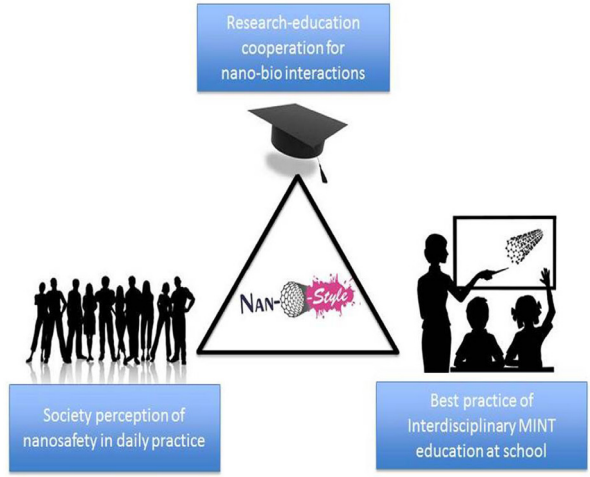

FIGURE 1: Scheme of the stakeholders' interactions within the Nan-O-Style project.

and educational institutions, the students develop new models for interdisciplinary teaching in mathematical/scientific/technical (MINT) subjects and apply them as best practice examples. We particularly focus on schools with an economic or fashion background which typically have a higher share of girls. A number of pre-scientific projects in nano-technological, nano-biological or nano-educational topics are carried out. This approach towards interdisciplinary MINT education thus strengthens the profile formation of the Paris Lodron University of Salzburg and further extends to the education of teachers. Previously, the educational EU framework projects www.NanoTOES.eu and www.NanoEIS.eu had been coordinated by Prof. Duschl and his group. Nan-O-Style is based on this background and therefore internationally well-connected including educational partners in Israel (ORT Moshinsky R&D Center in Tel Aviv, http://en.ort.org.il/), Spain (Nanoeduca in Barcelona, http://nanoeduca.cat/es/inicio/), and Germany (cc-NanoBioNet e.V in Saarbrücken, http://www.nanobionet.de/).

An important activity of the Nan-O-Style project is a series of *Mobile Nano Labs*, which take place at each of the seven partner schools. The *Mobile Nano Lab* starts with a 90 min presentation on nanotechnology from the technical, biotechnological and medical perspectives reaching approximately 80 students per school (in total thus >500). Thereafter, three workshops are offered consecutively to 15-18 students per school

(in total thus approximately 100), *i.e.* on (a) selected nano experiments and novel developed interactive teaching materials, (b) specific nanoparticle tracking analyses of NM-MLP interaction candidates using the Malvern NanoSight instrument, and (c) nano-structured surface experiments using the Keyence VHX-5000 digital microscope. The students, in return, contribute to the project results by distributing the nano questionnaire to a wider range of participants (for statistical significance we aim at >1000) and by conducting an in depth ingredient analysis of MLPs that emerged from the first survey. These in depth MLP ingredient analyses shall result in a hit list of candidate interaction partners (ordered by potential health-compromising effects and grouped for exposure scenarios) to be investigated further in dedicated physicochemical and biological assays.

Within Nan-O-Style an open science conference, the Open NanoScience Congress (www.uni-salzburg.at/ONSC), will be organized in February 2019 where school students will present their project contributions in a chaired poster session and an exhibition open to the general public. These school student presentations will cover (i) selected topics of their pre-scientific work theses, (ii) results from the online MLP survey, (iii) the students' in-depth MLP ingredient survey, (iv) the most attractive peer teaching modules, and (v) interactive multidisciplinary educational materials.

Furthermore, Nan-O-Style currently conducts a survey on nanotechnology knowledge and nanosafety perception within the Austrian society (Figure 2). Due to the

FIGURE 2: Weblink and QR code to the Nan-O-Style questionnaire.

involvement of school students responsible for dissemination of the questionnaire to different age groups a high outreach to the general public shall be achieved.

During the interactions with school students initial rounds of the intended survey on MLPs and possible new/creative/unintended modes of use have been conducted: as MLPs currently highest in trend *Do-it-yourself Slime, Henna tatoos, Concealer, Black Mask, Edding, Light pens,* and *Highlighter* emerged. Following rounds of the survey question possible strange ways of use of these products as well as their potential interactions with nanomaterials from consumer products: as unintended ways of application the administration of tooth paste onto inflamed acne wounds or nail polish as permanent lipstick or deodorant as air freshener have been mentioned. In parallel, experiments are currently performed investigating putative incidental bio-nano interactions of black henna or its ingredient *p*-phenylendiamine, which has been reported to cause harmful hypersensitivity reactions (Hausen *et al.,* 2001). The physical interactions of the Henna dye and PPD with SiO_2 and TiO_2 nanoparticles, the functional ingredients of sun screen, are determined using NTA. Combinatorial biological effects are being studied *in vitro* using human skin cells. TiO_2 NPs in combination with the Henna dye 2-hydroxy-1,4-naphthoquinone and PPD induced an increase in reactive oxygen species (ROS) production and apoptosis in human NHDF cells. This could be a hint of a potential carrier effect of the NM to deliver the toxic PPD into the cells.

Taken together, these studies will gain valuable results of potential aggravating/protective effects of NMs towards Henna/PPD-induced hypersensitivity reactions and might come up with further NM-MLP combinations and, hence, potential combinatorial adverse/protective effects thereof. In parallel, societal awareness on nanotechnology and nanosafety issues will be raised through highly effective outreach activities and the involvement of Austrian citizens in nano-related science within Nan-O-Style.

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Time and project management in citizen science projects: The example of the TheoPrax project "Nesting Boxes made of Biofoams" involving scientists, industrial employees and pupils

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Keywords: pupil scientists, TheoPrax projects, industrial orders, biofoams, nesting boxes

Summary: TheoPrax projects seek solutions to industrial and social issues within the school curriculum. The pupils are the citizen scientists. In the project "Nesting Boxes made of Biofoams", the workshop focus was time management in citizen science projects.

The participants' differing requirements are reflected in the time management and the project success. When the participants are pupils (working in 45-minute lessons, aiming for good grades), researchers (focused on innovative ideas) and industrial employees (under financial pressure), successful collaboration is only possible if each is aware of the other's specific situation. Our contribution covers this issue.

Introduction: Projects using the TheoPrax method (Eyerer 2000, Krause and Eyerer 2008) form part of the curriculum at schools in Germany (since 1996), Brazil (2006), Upper Austria (2014) and France (2018). External partners from research institutes and industry suggest topics which pupils develop on an offer-order basis. The pupils are supervised by their teachers and by TheoPrax staff. Solving real-life problems motivates pupils to learn theory (figure 1). The TheoPrax project "Nesting Boxes made of Biofoams" (2016) for bats and wild bees in a quarry and in recesses in walls, is a cooperation between a company producing the biobased cellulose acetobutyrate (CAB), researchers at Fraunhofer ICT who developed the CAB to a biofoam, Friends of the Earth Germany (BUND) and the citizen scientists, i.e. 11th grade pupils (16 years old) from the Markgrafen Gymnasium, Karlsruhe and their teachers (figure 2).

The project aim was the design, construction, mounting and long-term observation of biofoam nesting boxes. Besides introducing pupils to topics in a "real-life context", the goal of TheoPrax citizen science projects is to increase young peoples' awareness of their responsibilities as future consumers in society.

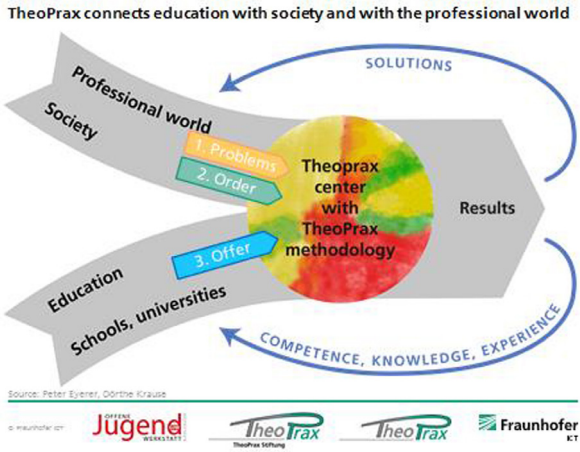

FIGURE 1: TheoPrax Methodology.

FIGURE 2: Types of Participation in Citizen Science Projects.

Experiences with Young People as Citizen Scientists

Content and Challenges in the Project "Nesting Boxes Made of Biofoams" (Example Selected from Over 4.000 completed TheoPrax Projects):

- Finding out more about the habits of bats and wild bees
- Developing the synthesis of bio-CAB and bio-CAB foam
- Taking account of construction possibilities
- Long-term observation with measurements of the nesting boxes

When working on such issues, pupils must be supervised by professionals (teachers, experts), as they otherwise become overwhelmed and unable to generate new knowledge.

Time and (Basic) Project Management

Citizen science projects involving pupils (citizens), researchers and industry often almost fail.

Participants in Projects with Young Citizen Scientists

Content

When the project starts, the obstacle of the unknown is equally important for the project content and the management. However, pupils are curious about the content, and thus strongly motivated. They choose the project based on its content.

Time and Project Management

Project management is an unknown concept to pupils, and they find it burdensome. To them, it means abiding by rules they consider restrictive. They lack the experience to see how rules save time and improve results. For example, pupils write emails with addresses that end up in the industrial partners' spam filters, and wonder why after several weeks they still have not received an answer. Or: pupils only offer appointments during the weekly project class. It takes a few disappointing weeks for them to realize that collaboration with industrial partners requires flexibility towards others. This is a waste of time for all parties.

Every project partner has different ways of working and a different experience of time management.

Students and Teachers

For thousands of years, schools have been a place for reproducing knowledge. The syllabus is prescribed by teaching authorities. Exam questions relate specifically to this content and the pupils' grades are determined accordingly. Pupils have only minimal contact with stakeholders in society and industry (e.g. through internships). The resource of time is only considered relevant in the classroom. Pupils and teachers have 45-minute lessons and 37 hours of classes per week during the school year, with frequent vacations. This is the framework into which project work, including citizen science projects, is forced.

Researchers/Scientists

All researchers work in projects with limited budgets, defined goals and fixed end dates. This is most common for industrial researchers, then institutions with partially independent financing. These professional situations (obligations like funding acquisition, applications, commissioned projects, reports, publications, dissertations, presentations, patents) are relevant to citizen science projects because they influence time management.

Industrial Employees

Competitive pressure has increased over the past decades. Citizen science projects with industrial partners are therefore only carried out where the results have a direct impact on sales (e.g. food products/ agriculture).

Time management in industry is targeted toward company benefit. Employees in the middle/upper management have little freedom to pursue projects.

Insights for Citizen Science Project with Pupils, Researchers and Industrial Employees

Collaborative projects only succeed if all partners are aware of the advantages. The win-win situation must be established as attainable from the beginning.

In projects involving external partners, joint time management is essential. Changes in school scheduling are necessary, requiring more profound changes to the school as a didactic concept(Comenius 1657, Montessori 1926).

Suggestions for Improved Time Management in Projects with Young Citizen Scientists: To avoid time management problems, partners should meet at the beginning

of the project to increase mutual awareness of the different sectors involved. This should be facilitated by a moderator. If each person explains their own working environment, this leads to a joint learning process.

By improving time management, and practicing project management with important success factors - like communication, creativity, research, planning, conflict resolution, monitoring and presenting - citizen science projects can be completed with few conflicts and without wasting resources. This prepares young citizen scientists for their responsibility within society.

The time management skills are beneficial to their future careers.

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We see, we sense, we say

Intergenerational picture talks as a visual-sensory approach to citizen science

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Keywords: visual and sensory ethnography, intergenerational research, nostalgia, future promises, cultural narratives

Abstract: Departing from the photography collection of the Austrian Museum of Folk Life and Folk Art the research project "Stadt-Land-Kind" investigates the myth of a better life on the countryside from an intergenerational perspective. In a dialogue with (grand-)parent generations, pupils research prevalent constructions of longing. The objective is to deconstruct stereotype notions of authenticity, used today in images of the countryside by touristic, product, and political branding. Through intergenerational picture talks the project aims for a critical analysis and update of oral, visual and material manifestations in relation to an open conception of *Heimat* as antonym to the foreign.

Introduction: In this time of digital revolution, worldwide crises and subjective insecurities there is a simultaneous tendency to look back. This phenomenon—called "Retrotopia" by sociologist Zygmunt Baumann (2017)—is accompanied by a longing for authenticity, simplicity and safety. It depends on a glorification of conservative values of family, work and community, accompanied by a renewed nostalgia of the countryside. Amongst others, related visual material includes happy looking families in traditional costumes and healthy farm animals, both contributing to the production of goods, and often set in front of vernacular architecture and impressive mountain sceneries. Asking about the social constructs and the (future) promises negotiated in such images sheds light on different ideas of the rural which are constantly re-mediated, re-visualized and re-materialized.

The project, carried out within the program Sparkling Science by the Austrian Federal Ministry of Education, Science and Research, emphasizes the active involvement of young citizen scientists (CS). It includes pupils from schools in three different Austrian regions: the primary school in Rastenfeld (Waldviertel), the secondary school in Kals am

Großglockner (Osttirol), and the Werkraumschule Bregenzerwald (vocational school). The research process is based on the belief that political education (here visual literacies) is best practiced in collaborative research.

Material and Methods: The project's transdisciplinary approach weaves together strands of visual and sensory ethnography, research into design and everyday life, as well as museology, exemplified in its main method—the intergenerational picture talks. In intergenerational picture talks, pupils and representatives of (grand-)parent generations analyze photographs they personally select from the project's sample collection. To a large extent, the selected photos originate from the ethnographic photography collection of the Austrian Museum of Folk Art and Folk Life. They relate to the three regions involved and were mostly made between 1900 and 1950 but are also complemented with more recent images.

The objective of these intergenerational picture talks, based on the method's focus groups and picture interviews, is the collective analysis and a multisensory enrichment of the data. The photographs serve as sensual aesthetic impulses in order to enhance the sensory-aesthetic dimension of the conversation. Concretely, each intergenerational picture talk involves 3 to 4 pupils (9 to 18 years), 3 to 4 adults/parents and 3 to 4 senior citizens/grandparents [see figure. 1, 2]. The group of approximately ten people sits around a squared table and discusses the impulses given by the photographs.

FIGURE 1: Intergenerational picture talk (pictures used with informed consent of participants), 2017 © Iris Ranzinger, Stadt-Land-Kind.

FIGURE 2: Intergenerational picture talk (pictures used with informed consent of participants), 2017 © Iris Ranzinger, Stadt-Land-Kind.

Two researchers form part of the group and give discreet verbal instructions. The talk begins with a joint picture selection and discussion in phase 1, continues with close picture description with the help of a magnifying glass in phase 2, and concludes with an imaginary journey into an individually chosen landscape of longing in phase 3. A sensory image elicitation (Pink 2015) is especially triggered with questions about experienced or imagined physical-sensual experiences. The talk is video-recorded for subsequent visual and sensory analysis and later exhibits.

Preliminary Results and Discussion: Collaborative research offers the opportunity to actively reflect and transform socially, culturally and historically constructed narratives. Instead of only searching for symbolic representations *in* images, the CS are united in an analyzing and doing culture approach (Hörning & Reuter 2004) through sharing different memories, knowledge and future perspectives while talking *about* the images. Each intergenerational picture talk, depending on the group of CS, opens up other fields of discourse, whether religious, economic, or gender-specific. In addition, the mix of photos from the three different regions supports the CS in comparing practices and objects from elsewhere with regional characteristics. Perceptions such as "This is

not one of our stoves […] It must have come from somewhere else."[17] provoke a gentle exoticisation of one's own culture (Hirschauer & Amann 1997).

While the project started with the assumption of an urban-rural dichotomy, it soon accepted that **ideas of a good life on the countryside** are not simply related to specific geographical regions or locations. As preliminary findings reveal, these ideas are **linked to emotionally charged concepts** such as deceleration, retreat and conviviality. Depending on the life situation from which one longs for idyllic places, the corresponding sites of longing are relationally connected and located proportionately away, in geographic as well as temporal terms. The rural is imagined elsewhere, off the everyday life and the current present – a phenomenon also well known to the researchers of the changing and conflicting cultural conceptions of nature (Franklin et al. 2000).

The findings also reveal that **people with different life experience refer and contribute to different narratives**: While, for instance, some of the CS from the grandparent generation with personal memories of prior times full of privation use the photographs to clarify imaginations of the "good old days", CS from the parent generation with multiple burdens at work and in everyday life often use the photographs to express longing for tranquility and coziness. Meanwhile pupils take the pictures as starting points for explorations into their family's past but also into their own future when for instance imagining job opportunities. These empirical findings present the longing for the country as both, promising future prospects as well as projections into an idealized past which can carry reactionary trends. By bringing together such different points of views and narrations, intergenerational picture talks not only strengthen visual literacies but also help to develop different perspectives in relation to *Heimat*.

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Involving pupils/citizens in long-term behavioural biology research: Lessons learnt and future perspectives

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Keywords: education, behaviour, citizen science, reliability, greylag geese

Summary: Since 2010 the Konrad Lorenz Research Station in Upper Austria actively involves pupils in research in the field of behavioural biology. The main focus is to investigate the relationships between social behaviour, physiology, and environmental cues by using free flying and individually marked greylag geese as a model. In the present project, the visitors of a game park were involved in the data collection on the spatio-temporal behavioural patterns of greylag goose families during the breeding season. Our results showed that reliable data could be obtained by well-trained citizens, thus contributing to a win-win situation for science and society.

Introduction: Long-term records of biological data are important for generating new testable working hypotheses. However, due to manifold constraints, such records are generally not common (Wolfe et al. 1987).

Citizen science (CS) has evolved over the past decades as a research format involving interested volunteers in science (Bonn et al. 2016; Ceccaroni and Piera 2017). This has a long tradition in the field of ornithology (Irwin 1995) and meteorology (Vose et al. 1992; Mitchell et al. 2017).

In the present study, citizen scientists have been involved in the long-term monitoring and data collection of bird behaviour. The studied non-migratory flock of greylag geese (*Anser anser*) was introduced into the valley of the Alm River in Upper Austria by Konrad Lorenz and co-workers in 1973 (Lorenz 1979). At the time of data collection, the flock consisted of approximately 160 free-flying birds. All individuals are marked with a unique combination of coloured leg rings and habituated to the close presence of humans. Life history data and social backgrounds of each individual have been

monitored continuously (Hemetsberger et al. 2013). Especially during the breeding season (March to July), the birds spend their time on the meadows of the Cumberland game park (47°48′ 24,6″ N, 13° 57′ 2,4″ O) adjacent to the Konrad Lorenz Research Station (KLF). The longstanding and close cooperation between the two institutions offers an excellent opportunity to involve visitors in long-term research. Adults, children and local school classes were invited to participate.

The following questions were addressed:

- How reliable is CS as a working method for long-term monitoring at the KLF?
- What is the feedback of the visitors?
- How is the available area of the game park used by greylag goose families?

Material and Methods: On their walk through the game park (approx. 2km), visitors recorded ring combinations, time and location (marked with pegs from "a" to "m") of sighted greylag geese. Data were collected with pen and paper between April, 21 and July, 3rd 2017 (Figure 1). A total of 455 participants provided a total number of 2227 sightings. Among the participants, there were ten regional school classes (pupils between 6 and 13 years of age). Each participant (school class or single person) was

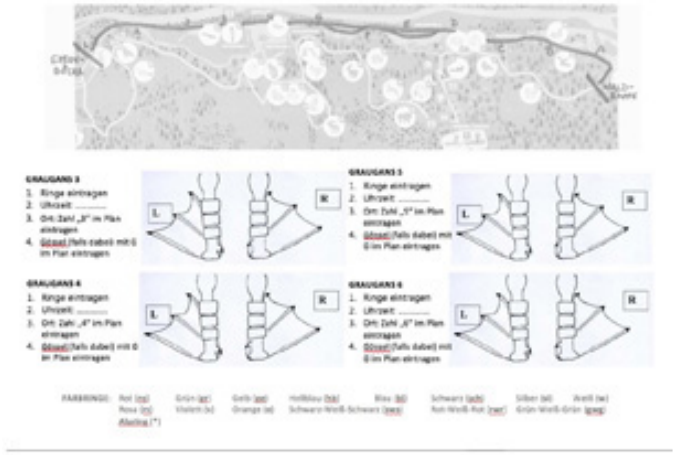

FIGURE 1: Protocol for the data collection.

given a short but detailed introduction into the aims and methods of data collection. School classes were accompanied by one or two master students during data collection.

Data Analysis: To test for reliability, the collected data was entered manually in Microsoft Access and subsequently checked automatically for correctness by comparing the recorded ring combinations with the available ones in our data base and by calculating the percentage of correct observations. Double-counted families (i.e. recorded simultaneously by several observers) were deleted, and only one sighting either from the female or male pair partner remained in the final data set. To ensure independence of data points for each individual and to avoid pseudoreplication, only recordings with an interval of half an hour between data points were used. The sum of sightings for each family was calculated for each location.

A generalized linear mixed-effects model (GLMM) with a negative binomial distribution was calculated to assess the spatial distribution and preferences for specific locations of the sighted geese with R version 3.4.0 (R Core Team, 2017) using the package 'lme4' (Bates et al. 2015). The sum of sightings was defined as response variable and location was used as a fixed factor. Family identities and the total number of observations per family were included as random factors in the GLMM to control for between-subject variation and an unbalanced design.

Results: The reliability of the data ranged from 64% for the adults to 71% for the pupils.

Greylag goose families were significantly more often sighted at location "b" (estimate =1.376, z=2.021, p=0.043), whereas location "m" (estimate=-3.112, z=-2.507, p=0.012) seemed to be less preferred than other locations (Figure 2). Furthermore, location "j" tended to be less frequented compared to other locations (estimate=-1.517, z=-1.815, p=0.070).

Discussion and Conclusions: Our results suggest that the involvement of citizens in research is a suitable method to acquire long-term data. An extensive training of the participants is mandatory to obtain reliable information (Frigerio et al. 2018). This results in a win-win situation for all institutions involved: the researchers gain useful data and the game park can offer special leisure activities bound to knowledge acquisition; a unique offer in the region. Furthermore, the schools benefit from informal education, as pupils retained the acquired knowledge over the summer holidays (Hirschenhauser et al. 2016). According to the feedback of the teachers involved, the pupils were able to improve and train several additional aspects: social skills,

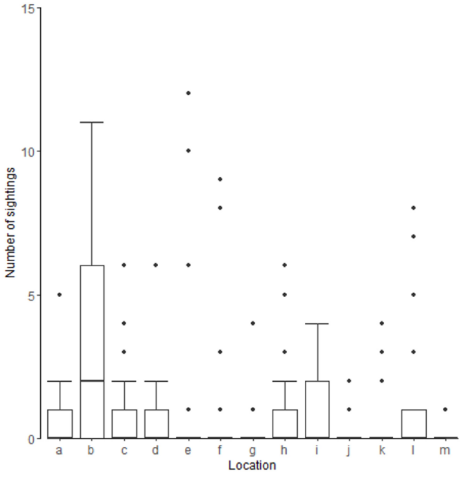

FIGURE 2: Spatial distribution of greylag goose families. Total number of sightings in relation to the locations "a" to "m". $N_{families}$=17, $N_{sightings}$=232.

exercising accurate observation, learning the correct behaviour towards wildlife, training right-left, memory skills, and reading locations on a map. All in all, young and adult participants were highly motivated and enjoyed participating; 96% of the participants would further recommend the project. The scientific results point at the role of traditions and alliances between the greylag geese in their habitat choice and confirm the social complexity this species is known for (Scheiber et al. 2013). Taken together, our findings confirm that an involvement of trained citizens in research projects might be of great relevance for science as well as for the society, as large data sets contributing to long-term monitoring are acquired and participants enhance their knowledge and awareness towards nature and science. This complies with the general conclusions of the Austrian Citizen Science Conference 2018 on Generation Citizen Science.

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“Generation citizen sciences – tools, routes and ventures” – Ideen Mining workshop

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Keywords: creativity, community outreach, participatory research, Ideen Mining, co-creation

The Innovation Office of the University of Münster pursues a socially committed knowledge transfer since three decades. To foster the vivid exchange between university and citizens, the WWU has made a clear commitment in its recent university development plan: A commitment to citizen science as an integral part of the universities knowledge transfer strategy, implemented by the AFO. To reach the aim to form a generation citizen science, the workshop sought to focus on the following question: Which will be future roads, tools and ventures from a universities perspective?

To bring together numerous citizens and scientists the Innovation Office (AFO) has invented two successful instruments in the past years: The ‘Expedition Münsterland’ and the ‘Ideas Mining’. Both initiatives seek to build bridges between the university and its region to foster exchange and cooperation between science and society. The present contribution will focus on the format of an Ideas Mining workshop. The AFO developed the concept of Ideas Mining in 2003 as an innovative and unconventional tool for creative problem-solving. Over the course of one day, an interdisciplinary team devotes their entire synaptic energy to tackling a problem from various angles. Professional moderators and specially trained creative technicians engage in a creative brainstorming process. The Ideas Mining is often used to kick-off citizen science projects within the Expedition Münsterland.

During the 4th Austrian Citizen Science conference Wilhelm Bauhus, Anne Harnack and Lennart Bohmann from the AFO and approximately 25 participants from various institutions being actively involved in numerous citizen science projects all over German speaking countries performed an Ideas Mining light: two intensive hours were dedicated to a specific scenario. The workshop started with a partner interview session under the topic “When was your first contact with citizen science?” which was followed by brief presentations of each team. Subsequently participants could choose amongst four tables, each equipped with pencils, large brown papers and with one of the following symbols: a dumb-bell, a walking stick, colored light bulbs and a picture of a skull and crossbones. The only condition was that all groups should be of a similar size.

Once the groups were formed, each group immediately started arguing about possible significances of the objects on their tables. At this point the moderators introduced the scenario of the workshop: "Which would be, from a universities perspective the strengths, weaknesses, opportunities and threats to incorporate citizen science in the universities outreach strategy?" In a first round, each group was given 15 minutes to brainstorm and write down their ideas directly on the brown paper. After 15 minutes, a first rotation was done, so that each group moved one table forward to the next topic and brainstormed again. In total four rotations were done, so that each group had worked on each aspect of the scenario. Subsequent to the brainstorming-activity, moderators distributed four adhesive dots to each person and invited participant to a gallery walk: Participants walked around all tables, went through all arguments and should choose their personal top arguments by distributing the dots. Those top arguments were: Strengths: diversity, reduce prejudices, increase research relevant for society, heterogeneous approaches / Weaknesses: expectation management, label misuse of CS, quality of data / Opportunities: create a sense for common identity, sensibilisation for the importance of science and research / Threats: self-abolition of science due to dependence on financial support, copyright issues, underestimation of complexity of science and research.

To open the final discussion Wilhelm Bauhus and Anne Harnack introduced the approach of the AFO to citizen science, to actively involve citizens already at very early stages when drafting new projects, during the ongoing project, as well as when communicating the results of the projects. As successful examples were mentioned the project "Expedition on peace", a cooperation with the historical department of the WWU in 2014 - 2017 and "Life during the cold war in the Münsterland", another cooperation with the historical department which has just started. During both projects, citizens were involved in the agenda setting, in source research, as well as in writing texts and developing concepts and contributions for public presentations. Moreover, another well-known WWU citizen science project, the SENSE-Box of Thomas Bartoschek was briefly introduced. Experiences made during all three projects incorporate numerous of the mentioned top arguments chosen by participants and thus a vivid and solution-oriented discussion took place.

Lower fears of contact between science and society, foster mutual acceptance and to raise sustainable awareness for science and research are strong arguments to incorporate citizen science in a universities strategy, which has recently be done by the WWU. Some of the challenges ahead, according to the discussion, will be to improve acceptance of citizen science at the research funding landscape, to work on quality measures for generated data and ensure copyrights.

To cooperate, or not to cooperate, that is the question: How can collaboration and exchange between citizen science projects work? – A workshop report from the Austrian Citizen Science Conference 2018

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Abstract: When we talk about collaboration in citizen science, we usually refer to the collaboration between citizens and researchers and not to the collaboration between different citizen science projects. A workshop during the Austrian Citizen Science Conference 2018 showed that cooperation in the form of (informal) exchange of knowledge, experience and good practice is important. The workshop aimed at revealing cooperation schemes and detecting barriers to collaboration between citizen science projects. The participants advocate the creation of a platform for exchange (of ideas, good practice, lessons learned) and networking (to find potential collaboration partners).

Introduction: Collaboration in citizen science usually encompasses the collaboration between citizens and researchers, and not the collaboration between citizen science projects (Heinisch 2017b). Therefore, a workshop during the Austrian Citizen Science Conference 2018 addressed this topic.

Method

Topics

During a world café session (TWC 2018), participants discussed topics related to the cooperation between citizen science projects:

- Which forms of cooperation do exist?
- What are potential interfaces between projects?

- What are the (dis)advantages of cooperation?
- Which (technical) infrastructures would allow for exchange between projects?
- Which framework conditions can promote cooperation?

The workshop examined needs for cooperation among citizen science projects as well as barriers to collaboration. This article may serve as a basis for stakeholders to take strategic action to encourage collaboration.

Participants

The 20 workshop participants were primarily researchers who were partly also citizen scientists from German-speaking areas in Europe. Natural sciences, social sciences, interdisciplinary projects and one humanities project were represented. In this paper, citizen scientists are people who voluntarily participate in academic research (Shirk et al. 2012; Bowser & Shanley 2013, p. 45). The degree of citizen participation may differ (Heinisch 2017a).

Results

Types of Cooperation

Cooperation starts with the exchange of good practice. Successful projects can serve as showcases for data collection and data analysis together with citizens, as well as recruitment of and communication with citizens. Furthermore, cooperation may include the exchange of data or joint use of software or digital infrastructures.

Projects may cover similar topics. Thematic overlaps allow for data and user exchange (Heinisch & Seltmann 2018; Seltmann & Heinisch 2018). Projects may advertise other projects in their newsletter or on their website. Furthermore, researchers may support each other, apply for funding together and learn from each other. A hub for knowledge transfer and experience exchange, such as a platform providing recommendations for dos and don'ts when starting and implementing citizen science projects was mentioned.

Interfaces

Interfaces between projects are shared staff, resources and infrastructures, including APIs. Administrative units at research institutions which have an overview of projects may see interfaces, overlaps and opportunities for cooperation.

Networking events for both researchers and citizens allow them to exchange ideas. Citizen exchange may encompass a regulars' table for citizens or citizen representatives who co-decide on funding applications in universities or projects. These citizen representatives in universities would facilitate participation and communication on an equal footing with academics. Researchers' nights or similar events are crucial for mutual exchange between researchers and the public.

Moreover, collaboration does not end with cooperation between citizen science projects but may entail non-university sectors such as politics, business and society.

Advantages and Disadvantages

Advantages of cooperation include different competences that complement each other, jointly used infrastructures, resources and more data for all. Different perspectives and different backgrounds may result in new approaches, ideas and unexpected results. Cooperation may lead to democratic decision-making, more outreach and visibility. Projects that are combined or collaborate with others may have a higher impact and more relevance in society. Projects can advise each other and allow for capacity building. Multilingualism in teams facilitates communication with the audience.

Drawbacks of cooperation include different motivations and thus diverging aims, competences, educational backgrounds, project cultures and terminology that may render collaboration and communication difficult. Moreover, collaboration between projects requires more coordination and administration as well as equal resource allocation. Disadvantages are also competition, e.g. for publications or participants as well as stealing the ideas of others. One fear voiced in the discussions was the job risk for researchers, i.e. if projects addressing the same topic are merged to increase efficiency, researchers might lose their jobs.

Infrastructures and Platforms

Infrastructures that may enable exchange are national citizen science project directories and their networks as well as umbrella organizations such as the European Citizen Science Association. (Virtual) meetings for researchers and brokers for information exchange were mentioned too. Networking events, conferences, a virtual market place or "partner search" would pool a plethora of perspectives and experience.

Framework Conditions

Legal aspects are often not clarified, including handling of data provided by citizens, exchange (of data, participants, etc.) and ownership of data, software and methods.

Moreover, interpersonal relationships should not be neglected since cooperation requires sympathy, trust, openness, responsibility and common values.

Discussion and Conclusion: Citizen science is often based on projects, i.e. there is no long-term perspective that encourages cooperation. Discussions of the (dis)advantages revealed that each benefit can also be a drawback. Sometimes, the benefits of cooperating do not outweigh the disadvantages.

One aspect hardly covered was the role of stakeholders in citizen science (Göbel et al. 2016) including citizen science associations, or citizen science project directories (Heinisch 2018; Heinisch & Seltmann 2018) who already aim at networking and exchange (of best practice).

This workshop showed that the first step of cooperation is the exchange of knowledge, experience and good practice as well as clarification of open questions, e.g. legal issues in participatory research. Here, networking events, such as regular's tables, mentors at conferences or (virtual) notice boards or platforms help get to know each other, exchange experiences and resources, e.g. "I am looking for app…, I am offering method…" and learn from (each other's) mistakes. The creation of this platform for exchange (of ideas, good practice, lessons learned) and networking (to find potential collaboration partners) would be a fruitful area for further work.

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Cooperation between citizen science projects: An overview of joint initiatives

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Keywords: citizen science, participatory research, collaboration, cooperation, exchange

Abstract: Collaboration within the citizen science movement usually means collaboration between researchers and citizens. Much less is known about the collaboration between citizen science projects. Based on a literature review, this paper provides an overview of measures and initiatives intended to enable (global) collaboration. These measures include the establishment of and exchange between citizen science associations and related working groups addressing cooperation among communities of practice. Moreover, directories listing citizen science projects and websites presenting good practice, toolkits and guidelines for launching and implementing projects as well as working groups promote the sharing of knowledge and (interoperability of) data.

Introduction: The cooperation with citizens, their motivations and their behavior are a continuing concern in citizen science (Rotman et al. 2014; Curtis 2015; Yadav & Darlington 2016). However, little is known about the cooperation between citizen science projects, especially about the exchange of data, methods, tools, participants or results.

Although cooperation has benefits, citizen science projects are rarely combined or merged. They are rather isolated activities. Nevertheless, researchers appreciate networking opportunities and a hub to share good practice, experience and guidelines (Heinisch & Seltmann 2018).

Based on a literature review, this paper studies initiatives and networks that aim at making information on participatory research projects centrally available, at fostering collaboration and exchange among stakeholders and projects.

Results

Associations and Networks

Different communities, associations and working groups advance the work (and networking) of practitioners in the field of participatory research. Associations in the USA, Europe and Australia have formed to create a shared understanding of practices, opportunities and standards in the field of citizen science. They are institutionalized hubs for sharing knowledge and practices to increase the impact, quality and reputation of citizen science. This should also help avoid duplication of effort. These associations play a key role in building a community (of practice), providing guidelines and advancing and (re-thinking) scholarship. They aim at collaboration, cooperation and shared efforts as well as fostering exchange on a global level and at providing support for local communities. They define three areas of collaboration, i.e. scholarship, conferences and online resources to share good practice and enable networking. They may facilitate collaboration across disciplines and geographical boundaries. Moreover, inter-association collaborations should combine isolated work. Furthermore, these associations provide online platforms to share and evaluate resources and discuss issues related to citizen science (Storksdieck et al. 2016).

Sharing of Knowledge, Good Practice, Data and Users

Platforms for exchanging ideas, good practice and experiences, for finding cooperation partners as well as networking are important means to promote cooperation between (participatory) projects. Researchers adopting a citizen science approach may require meta-information on citizen science projects, including information on starting a project, important aspects to consider when implementing a project or mistakes to avoid. Therefore, exchange of experience between researchers (and citizens) in participatory projects is crucial (Heinisch 2018).

Citizen science projects often collect or analyze large amounts of data and may involve a large group of volunteers. Therefore, the exchange or joint use of data, methods, applications, infrastructures as well as participants or results would be logical.

Guidelines for starting and implementing projects are provided by citizen science associations and stakeholders (Tweddle et al. 2012; Pocock et al. 2014; Scassa & Chung 2015). Different initiatives aim at sharing knowledge and good practice (citizenscience.gov 2018; citizenscience.org 2018; CitSci.org 2018; ESCA 2018; Wilson Center 2018). A list of resources, also relevant to the data lifecycle is available in Wiggins et al. (2013, p. 11). Furthermore, several working groups address collaboration and (interoperability of) data and repositories.

For example, the Data and Metadata Working Group intends to develop international standards for data and metadata in citizen science. These should facilitate data sharing and data interoperability. The first step is data interoperability between data repositories, such as citizen science project directories in the USA and Australia. Moreover, data interoperability between different citizen science projects should promote collaboration and data sharing. Currently, this working group develops the PPSR_CORE (public participation in scientific research) core metadata standards (data sharing protocol) that should result in an ontology. These standards cover two data categories: Project metadata that describe activities and citizen science projects on the one hand, and observational metadata that describe the collected data, on the other. They consider the needs of both data providers and data users. Data referring to citizen science projects in project repositories should become interoperable through the use of common metadata and keeping shared information (project metadata and observational metadata) up to date through application programming interfaces (APIs) (Bowser 2016).

Overlaps

Projects may overlap in different aspects, including spatial, temporal or thematic overlaps. Citizen science projects that cover the same or similar topics may also be attractive for the same or similar participants. This means that data and users may be exchanged or shared. For example, people who hike may collect data for several projects at the same time, e.g. information on specific animals or plants, vegetation and geology for science or written signs for humanities research along their path. Moreover, researchers working for more than one citizen science project may facilitate cooperation. This also holds true for citizens participating in more than one project. To promote cooperation, projects may recommend other projects to their participants (Heinisch 2018).

Discussion: Different infrastructures, platforms or measures for fostering collaboration between citizen science projects have already been established. However, researchers using citizen science as a method sometimes seem not to be aware of all the resources that are available (Heinisch 2018). These resources can either be re-used in different projects or adapted to individual needs (Heinisch 2017).

Conclusion: The collaboration measures listed in this article are not exhaustive. Nevertheless, these initiatives are an important step towards the collaboration between (participatory) projects in different stages. Especially, metadata standards, information on good practice and exchange of experience help promote a globally connected citizen

science community. Further research might explore other cooperation schemes and opportunities for as well as barriers to collaboration in citizen science.

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Citizen science and OpenStreetMap: Potential and challenges

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Today, many citizen science projects make use of crowd-mapping. Apart from specially designed web map applications, the crowd-mapping application OpenStreetMap provides several advantages to citizen science projects. But, to improve quantity and quality of the data hold in OSM several challenges must be addressed: rise awareness on OSM across society, address volunteers' motivations and build volunteers' literacy skills.

Introduction: The advances in information and communication technologies (ICT) open new possibilities and modes of participation. This refers, among others, to crowdsourcing applications which allow citizens to contribute data and media on a voluntarily base (Newman et al., 2012). A growing number of citizen science projects takes advantage of crowd-mapping applications where citizens voluntarily add spatial data on features of interest (i.e. volunteered geographic information). For this many citizen science projects use specially designed web map applications.

Another example of crowd-mapped data refers to OpenStreetMap OSM (www.osm.org). OSM is an online platform aiming at to collect spatial data on real world features by the help of the general public. Among existing crowd-mapping platforms OSM currently is the largest public collection of spatial data (Schneider, 2011). A growing number of initiatives spanning from research, spatial planning, and disaster management is making use of OSM data. But, how can and/ or is OSM used in the context of citizen science projects? Which challenges are related to its use? And how can these challenges be addressed?

Background on OSM: The OSM project is based on Wikipedia's collaborative crowdsourcing model. Registered users can voluntarily contribute new data to the OSM

database or edit existing data. The result is a living, free editable map of the world. Since having launched in 2004, the number of registered users to OSM as well as active contributors has been steadily grown. The current statistic shows about 4.3 Million registered OSM users and the number of not registered users is many times higher. Apart from the map itself, the data generated by the users is considered the primary output of OSM. The data is freely available under the Open Database License (ODbL). It can be used by everyone free of charge and for all kinds of purposes, also for commercial ones (OSM, n.d.).

To store the data OSM uses a topological data structure with three data element types: nodes, ways, and relations. For attributization, tags are used to describe the data elements (nodes, ways, relations). Tags consist of a key and a value (form "key=value"). Schools, for instance, are described as "amenity=school". Users can assign to a feature as many tags as they want.

Potential For Citizen Science: Different definitions on citizen science can be found in the literature. Apart from other activities, the participation of citizens in data collection is considered an important aspect (Hakley, 2013). Since citizens are the ones building the OSM map and database by their contributions, OSM per-se falls under the concept of citizen science (Byrne, 2016). Furthermore, OSM gives opportunities for citizen science projects in many more ways:

- using the OSM map (static map; jpg, png, svg, pdf; dynamic map: link, html embedding, geo-uri,) embedded in applications and web sites to inform volunteers about an area
- using the OSM map as a base map (visual reference; orientation) in specially designed crowd- mapping applications (e.g. http://roadkill.at/)
- using the OSM infrastructure/framework for own data collection initiatives (e.g. Wheelmap.org)

In addition, OSM data has the advantage to provide an insight into people's individual perception, and local knowledge. This relies on the fact that volunteers are free to map and describe (i.e. tag) real world features as they please, depending on their point of view (Hennig, 2017). Such information is usually gathered by empirical social science research methods like questionnaires, interviews, and observation. An example regarding this potential is presented in Figure. 1.

Challenges: The value of OSM depends on the quality and quantity of the data contributed by the society. However, the data is mainly added by middle-aged men with higher

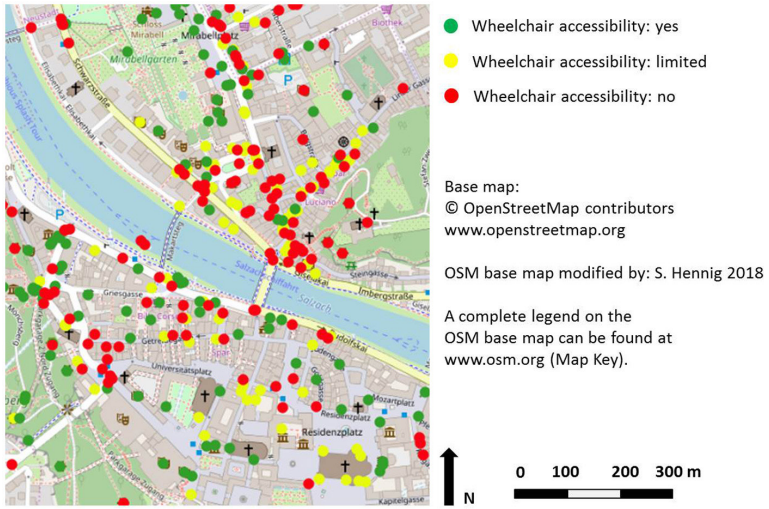

FIGURE 1: Potential of OSM in terms of providing insight into people's individual point of view and perception regarding wheelchair accessibility of infrastructure in Salzburg. Accessibility of infrastructure as considered as such by planers often varies from accessibility as it is received by the target group.

education level (Vogler et al., 2017). Here, to have a more heterogeneous community contributing to OSM and, thus, expanding the OSM map and database the following (selected) aspects – as also stressed in the context of other crowd mapping applications must be considered (see, e.g., Gryl and Jekel; King and Brown, 2007; Nov et al., 2014):

- publicity on OSM and its editing tools (e.g. ID, Potlach, JOSM, Vespucci, OSMand) across society must be increased
- people' intrinsic and extrinsic motivation why contributing on a voluntary base must be considered and addressed
- spatial literacy skills regarding the use of spatial data products including OSM (e.g. tagging system, editing tools) must be imparted
- provision of OSM editing applications incl. appropriate material (tutorials, manuals etc.) to support users who are not trained in the use of spatial data (products) with the aim to contribute data and tags in a competent and capable manner

Conclusion: OSM can support citizen science projects in different ways. This refers to different possibilities to use the map and the data. For citizens to add data to OSM still several challenges exist which must be addressed. This refers to the knowledge on OSM across society, the need to motivate users and to build the required skills among people to enable them to use OSM in a competent capable way.

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Wunderspil – Citizen science at the Middle High German Concept Database (MHDBDB)

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Keywords: Middle High German, dictionary, linguistics, metadata, corpus

Summary: Citizen Science is an opportunity for large corpus based projects to control and improve their own annotations. The MHDBDB, a project for the study of the German-speaking vocabulary of the Middle Ages, is currently being fundamentally revised. By the participation of the users we would like to improve the quality of the provided data as well as awaken the interest in Middle High German language.

Since the 1970th the Middle High German Concept Database (University of Salzburg: MHDBDB, Zeppezauer-Wachauer et al. 1992–2018) aims to provide an onomasiological dictionary for Middle High German. In the MHDBDB, the vocabulary of a language is made accessible through concepts. For example, the Middle High German word for house *hûs* is connected to a meaning consisting of the concepts 'living' and 'building'. The project is based on more than 650 digitised scholarly editions of Middle High German literature and other texts. The Thesaurus and the annotations allow users to make complex search queries on the texts. The latest technological revision dates back to 1992, so there is a growing demand for a more contemporary infrastructure and usability. The current Version of the database doesn't follow standards for text encoding like the TEI guidelines (Text Encoding Initiative 2014) or standards for lexicographical data like Ontolex (Cimiano et al. 2016). This prevents the data of the MHDBDB from being used by other research projects. In 2019 we hope to fulfil those demands with a complete revision of the database. A Key aspect will be the integration of Linked Open Data (LOD), which will connect the MHDBDB to other projects on the Middle High German language and improve the quality of the metadata for entities like persons, works, places or events. The integration of citizen science is an additional feature of our relaunch and will help us to improve the data quality in areas which are not available as semantic web resources yet or require some manual correction of automatically generated annotations.

The remoteness to the subject of research 'Middle High German' is initially a barrier for the integration of user participation and the use of MHDBDB can differ greatly

between usage scenarios. To determine user groups, we have evaluated the logs of the current website. Statistically in 2017 we could register more than 25.000 individual visitors who stayed for more than 9 minutes on the webpage. For the MHDBDB roughly three main user types can be described. 'Beginners' visit the MHDBDB once in a while and perform only a few actions. They do not stay on the page for longer and may not return after a few visits. 'Regular visitors' visit the MHDBDB in the context of university seminars, carry out many actions and stay longer. Finally, the logs show that some 'expert users' keep returning over long periods of time, performing numerous actions with complex search queries.

Our Citizen Science strategy will take account on those different backgrounds and aims to involve all user groups.

Furthermore, we would like to support school and university teaching by adding virtual class rooms with custom text selections and surveys. An automatic system will generate questions for all users of the website, for users of our proposed companion app *wunderspil* for mobile devices and for scholars of virtual classrooms. All annotations made or corrected on those three platforms will help to improve the quality and the usability of the MHDBDB.

A reCaptcha-like system (Google LLC 2009–2018) will ask the users of the MHDBDB website once in a while to answer simple yes-or-no questions like:

- Is that Part of Speech-Tag correct?
- Is the word connected to the correct dictionary article?
- Does that word in context refer to this meaning?

Those questions simply try to evaluate automatically content and focus on the texts and passages a user is currently examining. In addition, users will be able to correct annotations directly on the webpage, if they spot an error.

More complex types of question will be integrated in our mobile app *wunderspil*:

- Which Part of Speech-Tag is correct for that word in context?
- Analyse a word form morphologically
- Which meaning is the correct one for the word in context?
- Translate a verse

Those questions take more time and require more knowledge on Middle High German than the questions generated for the website. By using a mobile app (Figure 1: Mockup of 'wunderspil' by Daniel Schlager), we try to motivate users to help us by competition,

FIGURE 1: Mockup of 'wunderspil' by Daniel Schlager

a mechanic wildly used in citizen science (i.e. by ARTigo; Kohle and Bry 2010–2018). Users can decide for themselves which level of difficulty they want to answer and compete with other users.

The last pillar of our strategy is the integration of virtual class rooms. Lectures or teachers in schools and universities may select texts of our corpus and add them to a classroom. Scholars of this classroom can explore the texts and their vocabulary. We assist the teachers in creating questionnaires from generated questions on specific passages of the selected texts. We promote the pupil-oriented teaching of Middle High German in partnership with the 'Grazer didaktisches Textportal zur Literatur des Mittelalters' (http://gams.uni-graz.at/context:lima).

The task of exploring the German texts and vocabulary of the Middle Ages can only be accomplished in the community. Up to the current date, only prototypes exist for the new MHDBDB Citizen Science components. Our biggest challenge is to make the MHDBDB fit for another 50 years.

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Facilitating citizen science in the classroom: Learning with and about urban trees

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Keywords: web app, beacons, microclimate, sensors, environmental education

Abstract: The 2018 Austrian Citizen Science Conference presented projects, their plans and results with a special focus on challenges and potentials under the motto 'Generation Citizen Science'. This article describes work in progress in the Project *Urban Trees as Climate Messengers* (http://stadt-baum-klima.sbg.ac.at/) that started in September 2017. We focus on the modes of engagement chosen and implemented to facilitate citizen science involvement and inspiration for the next generation of citizen scientists.

Introduction: Urban trees are pivotal elements of urban green space and provide a range of ecosystem services, with climate regulation being amongst the most important to citizens and most relevant at the local scale (Endreny 2018). Strengthening the awareness for the interdependence of urban trees and urban climate could ultimately empower citizens to speak up for urban trees and urban greening. This empowerment is timely, given the competing land uses and priorities for using urban space.

Simple and straightforward, the main research question is: how does urban climate influence urban trees and vice versa? To observe and analyze these effects, the young citizen scientists carry out a phenological monitoring supported by a web app. The monitored trees are equipped with microclimate sensors that measure air temperature and relative humidity in the tree crown. The onset and speed of leaf development indicates the reaction of different tree species to urban weather and climate. At full foliage stage, cooling and shading are measured and compared to reference measurements to quantify microclimate benefits of urban trees. All these data are collected and analyzed together with the young citizen scientists. Finally, the sensors (beacons) are used to broadcast visualizations of the ecosystem services in a format that is accessible and understandable for citizens.

The workflow of the implementation phase has to tackle multiple challenges of winning our next generation for science: Including 194 students in seven cities in Austria,

Germany and Hungary, aged between 10 to 20, from diverse school types: new secondary, secondary academic, secondary technical and vocational schools. In accordance with the Austrian objectives of environmental education the project allows students to "explore the complex interdependencies and action mechanisms of our environment" (BMBWF 2014, p. 3). The following modes of data collection and communication provide an innovative setting for environmental science and education in the classroom. Moreover, they are solution strategies to handle the challenges for citizen science partnerships with schools that have been identified by Feldbacher et al. (2017, pp. 31): 'project suitability', 'data quality', 'sustainability' and 'project logistics'.

Modes Of Engagement: From Paper and Pencil to New Technologies

Folder for Young Citizen Scientists

Each participating young citizen scientist is provided with a project folder (Figure 1). The content is structured around the main research question and gives students hands-on instructions for intelligible methods and protocols (Feldbacher et al. 2017). This folder addresses the challenges of 'project suitability' and 'data quality' and helps the students with their research activities. These include guidance for the observations

FIGURE 1: Project folder for the young citizen scientists – front and backside of the A4 size lever arch ring binder file folder provided to each participating student. The table of contents is symbolized by pictograms on the front page: phenology, data & web-app, microclimate, geocommunication, art.

and measurements as well as important background information on topics such as e.g. ecosystem services and urban climate. Additionally, it serves as a tool for internal differentiation and individualization to accommodate the different age groups and school types. The folders are filled with content tailored to the age and background knowledge of the students. This is achieved by jointly selecting the content we provide together with the teachers and in some cases with the students. In the course of the project the folder is growing like trees grow in girth, containing additional material that is being developed by the students.

Web-App

We address the challenges of 'data quality', 'sustainability' and 'project logistics' by providing the students with a web-app that supports their data collection and ensures data integrity. The web-app is tailor-made and entirely based on open source project software. The front-end is an easy-to-use interface for data collection on phenology and microclimate with mobile devices. Behind that is a database interface that is designed to 1) deliver data on individual urban trees in defined time intervals, 2) collect data from microclimate sensors (beacons) in the trees via Bluetooth and to send it to the database over the internet connection of the mobile end device on which the app is running. The app (currently for Android OS) scans for beacons in the environment, transfers sensor data to the database and calls websites with content on project results, e.g. diagrams, photos or maps created and designed by the young citizen scientists. The app and the database support joint resource management and sharing of the raw data among the researchers and young citizen scientists. The whole bundle (app, database and beacons) creates an innovative learning environment in which urban trees become smart, equipped with sensors that measure their microclimate benefits and broadcast information on these ecosystem services for display in the app. Phenology and climate data are analyzed across the seven project cities and urban trees become messengers of the urban climate they grow in. Locally and in each city, urban trees are producers and messengers of cooling and shading effects at the individual tree location.

Conclusions and Outlook: At the time of writing, 1,600 phenology observations have been collected by our young citizen scientists for 26 tree species. One third of the monitored trees are already equipped with microclimate sensors and the students read out the data with the beacon manufacturer app. From July 2018, the web-app will operationally collect the sensor data and have the functionality to send content developed by the young citizen scientists to the app. Beyond constantly logging measurements of air temperature and relative humidity, the sensors will broadcast visualizations of the trees' microclimate benefits in a format that is accessible and understandable for citizens.

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Transforming images: Creating alternatives

Young Citizen Science at the Intersection with Critical Art Education

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Keywords: young citizen science, critical art education, visual culture, participatory research, participatory art

Abstract: Which are the potentials of participatory research and critical art education with young people? How is the relationship between research and artistic and cultural production? And which might be the role of visual culture in this context regarding the questioning of mainstream forms of representation and creating alternative imagery? And how can in this context processes of empowerment be initiated? This paper wants to show how young citizen science at the intersection to critical art education may open up an interstice between academia, artistic and every-day cultural production which provides for young people a space for reflexion, empowerment and self-representation.

Introduction[18]**:** Young citizen science is about involving young people into research activities, inviting them to become co-researchers, and participate in joined knowledge production with professional researchers from academia. But what is the aim of such endeavours? Not surprisingly there is a diversity of interests and stakeholders at play, and so there is a diversity of aims. In this article the focus lies on participatory research in social and cultural science with young people at the intersection of critical art education. In the tradition of critical pedagogy (Freire 1978; Hooks 1994) and action research (Reason/Bradbury 2001) I understand education and research as fields of action for processes of politicisation: starting with the questioning of the status quo of societies power relations and reflecting as well as imagining alternatives, followed by developing strategies for action. Critical art education aims at sensitizing

[18]The reflexions in this paper build on my experience within the Sparkling-Science-Project "Making Art – Taking Part" (www.takingpart.at) - a collaboration between University and schools with a participatory research approach at the intersection with critical art education. The project was carried out in cooperation with two schools in Salzburg, Austria, over a period of two years (Zobl/Huber 2016). In this paper I aim to deepen considerations on participatory ethnographic research and the approach of visual culture in the setting of collaborations between university and art education in schools. The teachers' role in this context is equally on of co-researcher and co-producer.

young people for power relations underlying the production of artistic and cultural representations and providing the tools for self-representation. In this context the perception and questioning of mainstream-image-politics (in media, public discourse, etc.) and the production of alternative images are crucial for developing strategies of socially transformative action.

Participatory Ethnographic Research in the Context of Art Education: The potentials of participatory research in the context of critical art education are closely linked to the transformation of artistic practice itself toward participatory social processes and artistic research practices (Jokela 2018). Participatory research and participatory art share the (new) orientation away from individual authorship towards collaborative knowledge production. While participatory research in social science aims at involving the former research object as an equally apt co-researcher (von Unger 2014), participatory art most often aims at intervening in social contexts and negotiating a sense of community with participants (Bishop 2012; Kester 2011). Both approaches embrace participation at its core and create social space for reflexion and action. Participatory research in social science aims not solely at understanding the social world but also at intervening and taking transformative action. It can therefore be understood as a tool for empowerment within educational contexts. The aspect of research and self-reflexion becomes equally important within processes of participatory art – most often by adopting ethnographic methodologies (such as field work with participant observation or interviews). That is why Dipti Desai argues for an ethnographic turn in art education and points to the politicising potentials: *"Doing ethnography as an integral component of the artistic process in schools is an effective way of connecting curriculum to community."* (Desai 2002: 320) Building on the potentials of participatory ethnographic research for critical art education I will further focus on the visual culture approach in art education to draw attention to the linkage between questioning forms of representation and creating alternatives.

Critical Art Education and the Approach of Visual Culture: If we look at art education informed by a cultural studies approach, then visual culture results as a crucial lens for reflection and action. The starting point here is every-day cultural practice of the pupils and their knowledge about mainstream visual representations; the aim is developing skills for reflecting mainstream visual representations as well as skills for creating alternative imagery for self-representation. According to Kevin Tavin *"visual culture embraces the study of popular culture in order to understand and challenge the way subjectivities are constituted through images and imagining."* (Tavin 2003: 210) A visual culture approach in art education offers a possibility for addressing the power and politics of making imagery. Similarly, Paul Duncum (2002) sees in this approach potentials for developing critical consciousness and transformative action as well as making imagery with young people (ib.: 20).

Conclusion and Outlook: "*From what political perspective do we dream, look, create, and take action?*" (hooks 1992: 4) – with this question bell hooks points out very well the crucial elements of a critical art education informed by a participatory research approach in visual culture: There is a threefold attention to perception, imagination and action: More precisely it includes the imagining of the social world, the perception and questioning as well as the shaping and transforming of the social world. The aim of young citizen science (as participatory ethnographic research) at the intersection to critical art education must include the development of reflexive tools for the questioning and deconstruction of power relations as well as creative tools for the purpose of intervention and self-representation. For the participatory research of visual culture it is crucial to implement ethnographic methods to draw the attention to power-relations in the every-day- culture and promote creative strategies and tools for self-representation. Possibilities for reflexion and transformative action can be opened up by following the triad 1) deconstructing power-relations, 2) imagining alternatives, 3) developing and testing strategies for action. bell hooks aims correspondingly at the strategies of intervention, representation and action: "*It is (…) about transforming the image, creating alternatives.*" (ib.: 4)

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Don't walk alone: Synergy effects for citizen science created through adaptive platform design in SPOTTERON

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Keywords: citizen science, design, citizen science apps, synergy effects, citizen observatory

Abstract: In his talk about Citizen Science Apps and Synergy Effects the designer, citizen scientist and creator of the Citizen Science platform SPOTTERON Philipp Hummer shares his experience and important factors in designing Citizen Science apps. He mentions some basic requirements for Citizen Science apps and explains why he considers a platform approach a very useful tool to create synergies for citizen observatories. The synergy effects in this case are created by various citizen science projects that collectively add up to further develop one platform which none of them would've been able to create for themselves alone.

Main Text: As people increasingly lose touch with their environment and nature becomes a background factor(Hartig et al, 2014), Citizen Science Apps offer a chance, to use something which is often blamed for a loss of connection for the opposite: Including smartphones as our everyday tools can be a way to reconnect people with their surroundings through interactive science.

To make use of this potential, a list of basic requirements, which we will outline in the first part of this text, need to be met. Since this list is always extending in today's modern online world, a sole project's funding hardly succeeds at meeting all these demands, therefore we want to present the platform approach of SPOTTERON as a solution to this issue in the second part.

The design of a project, is among the first and most crucial factors in an app's success (Wong et al, 2012). Therefore a high standard when it comes to the "Look & Feel" of the whole project (Norman, 2002) is a basic requirement and the interface design always needs to be optimized for the users (Holzblatt et al, 2004) and their use cases in practical conditions.

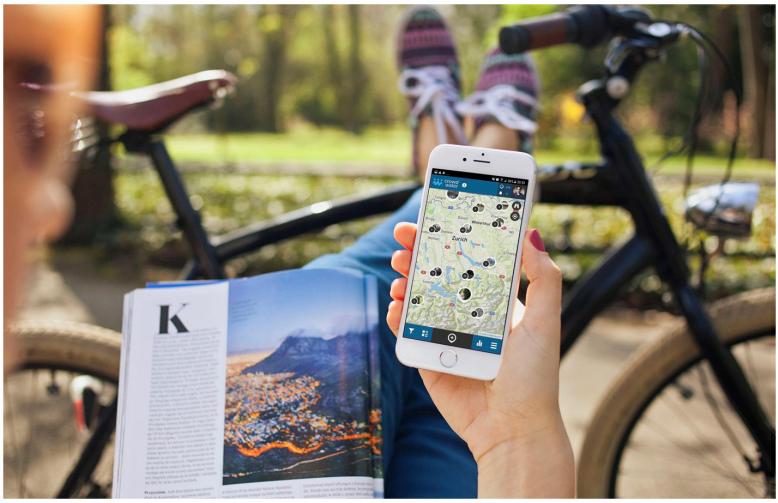

FIGURE 1: Example of user-friendly app design in the SPOTTERON App Crowdwater.

But if an app can't provide fast performance and adaption to modern smartphone technology and its fast changing standards as some of the most basic requirements for apps in general (Wong et al, 2012), it can easily lead to a lack of success of Citizen Science app data collection overall (Inukollu et al, 2014). Due to a market of many different phone models with various characteristics, different software versions or operating systems and fast life-cycles of mobile phones, constant adaptions, updates or fixes are needed in order to facilitate this.

Further, Citizen Science Apps need to create excitement and motivation to engage users over longterm periods(Kim & Baek, 2018). Citizen Scientists, but also newbies to the field, should easily become interested and involved emotionally to be engaged on a level, that's not only contributive but also feels like being part of something bigger.

Another key factor supporting this feeling and long-term motivation lies in the inclusion of social features, which have become an almost basic requirement of modern interactive apps (Zhao & Balagué 2015, Kim & Baek 2018). Such social features include liking, comments, news-feeds to stay up to date on what is going on in one's own community and more communication tools.

Taking in these factors and adding all features projects might additionally need, it adds up to an endless list of requirements for a single project to meet and it's hardly anything that can be paid for by the funding available to one project alone.

This is why designer and longtime Citizen Scientist Philipp Hummer came up with the idea of a platform based on components that build up on one another and allow for projects to cooperate and share features. Since 2015 the platform called SPOTTERON enables non-scientists to collect GEO-related scientific data and creates strong synergies that allow various projects to support and advance each other in collaborative ways (figure 1). Every project on the platform has its own apps available for Android and iOS and an interactive map application for browsers (web-app), running on a common base.

The Platform Itself & Synergy Effects Created: Through this platform approach, all apps share a basic system. Still, every app is designed individually, adapted to the custom needs of the project, because every project has individual aspects based on coming from different fields, being directed at different audiences or project topics making custom functionalities necessary.

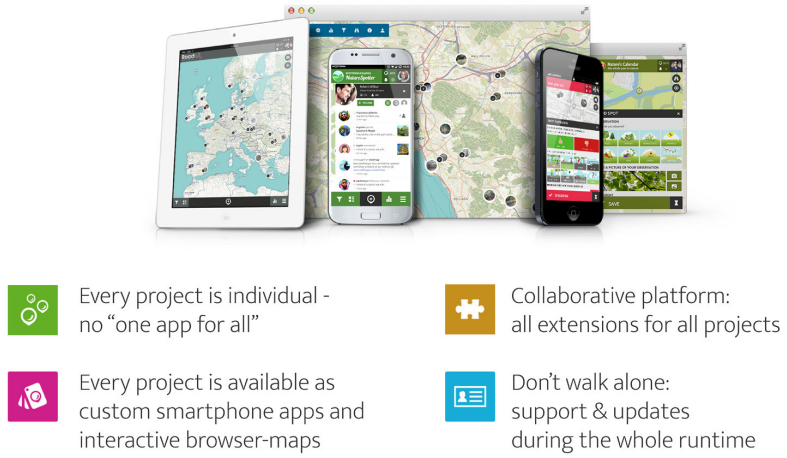

FIGURE 2: Practical aspects of adaptive platform design in SPOTTERON.

Consequently SPOTTERON was created as a modular system. While built on a basic design, every new feature developed is designed with interchangeability and common use in mind. After the roll-out of an extension for one project, it becomes automatically available to all other projects on the platform without additional costs.

Another core concept of the platform is the ongoing care and support for projects during their run-time. Hence, it's part of the service to constantly update and care for all Citizen Science apps on the platform during their entire run-time.

And with the help of several projects, SPOTTERON was able to release it's community package to enable topic-related communities in citizen observatories, with the drive to grow, generate knowledge and to support science by the end of 2017.

All in all, Citizen Science is much more than the sum of its parts. Through a platform approach, projects can shape a platform like SPOTTERON together in a synergy approach, according to their practical needs while improving the impact and value of Citizen Science in society with up-to-date tools at hand (see figure 2).

For all reasons mentioned above we consider this kind of model the one that makes most sense in simple practical terms, because only together Citizen Science projects are able to build on the collective know-how and are able to provide a high quality user experience for Citizen Scientists in a modern mobile environment.

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How to handle and evaluate dozens of free text-based observations from an explorative citizen science approach

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Keywords: natural language understanding, computer linguistics, text mining, citizen science, urban wildlife

Abstract: In contrast to wildlife monitoring tasks realized by filling and evaluating forms, complex or unanticipated behavior must be assessed by more open and explorative formats like natural language, video etc. However, the evaluation of free text is very time-consuming. In order to reduce the effort for processing and cleaning free text from e-mails, we present a tool that automatically detects information on the following questions: *What? Where? When? Who?* It exemplifies how methods from the field of natural language understanding can support explorative citizen science approaches.

Introduction: Whereas wildlife monitoring and tracking tasks like birds counting or tracking wolf movement can best be accomplished with a form-based approach, or tracker respectively, complex or emerging behavior that has not been anticipated, is better assessed by an open and explorative research approach. In the course of the research project "Füchse in der Stadt" the Leibniz Institute for Zoo and Wildlife Research (IZW) encouraged citizens to send them any kind of observation regarding wildlife in Berlin by e-mail (Frigerio et al., 2018). The project's goal was to get new insights into how wild animals adapt to urban environments. Given the dynamic and complex nature of the research subject, a form-based approach would not have sufficed. That is why IZW opted for this qualitative and explorative approach and received a very heterogeneous mixture of free text and pictures or videos from approximately 1300 e-mails.

Instead of reading mails one-by-one to copy and paste relevant information into tabular sheets, we suggested implementing a software tool that would partially automate the extraction of information, and hence tremendously facilitate and fasten the time needed for processing and cleaning data. Inspired by IZW requirements, the goal of the presented and accompanying project CS.RECANA was to automatically detect

information on the following questions: *What? Where? When? Who?* It exemplifies how methods from the field of natural language understanding (Jurafsky and Martin, 2008) can support explorative citizen science approaches. Results were presented at the 4th Austrian Citizen Science Conference 2018 in Salzburg.

Method

Data

We compiled a set of data from free text sent by e-mail or entered via a web platform (s. Portal Beee). The texts (N = 78) featured a word count of 41 tokens on average. They were manually annotated for relevant information on the questions *what? where? when?* and separated into development (55% of the data) and test (45% of the data) set. Information on the question *who?* was directly extracted from the e-mail header. A total of 83% contained information relevant to the CS-topic (*what?*), 89% contained information on the place of an occurrence (*where?*) and 54% contained temporal information (*when?*). Five percent was spam or off-topic. Methods were implemented for the development set and tested on unseen data of the test set.

Where? When? and What?

Every street address is matched against entries from GeoFabrik (2017), a dictionary of street addresses, and geocoded into longitude and latitude for visualization in OpenStreetMap (2017). In order to refine geolocating, information on house coordinates from the Berlin Senatsverwaltung für Stadtentwicklung und Umwelt (2017) are included. Temporal information (when?) was detected in different formats and standardized by conversion into the formats DD.MM.YYYY (date) and HH:MM (time). Whereas *where?* and *when?* are universal for any citizen science observation, the question of *what?* is specific to the research subject. Interesting information on *what?* was enclosed via a pre-defined ontology (see Corcho, 2006) from IZW that can be adapted in case of unanticipated events. All methods were integrated into our SKIMSON tool. It allows fetching text from different sources (mail server, tabular sheet, mbox-file) and visualizes all results for quality assurance. Results can be edited and be exported to a csv-file or relational database. Figure 1 shows a screenshot of the software Skimson (www.skimson.de) developed as part of the CS.RECANA research project.

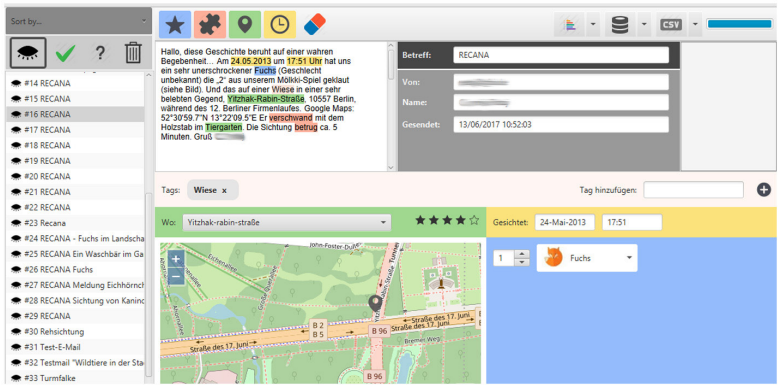

FIGURE 1: Screenshot of SKIMSON Tool.

Results: Table 1 shows the results for the extracted information. The best f1-score[19] is achieved for the detection of temporal (when?) information, followed by geo information (where?) and information on the subject of the observation (what?).

Table 1: Results of text information retrieval on the questions what?, where? and when?

	F1 (Development Set)	F1 (Test Set)
What?	0.86	0.71
Where?	0.84	0.88
When?	0.82	0.85

Discussion and Conclusions: Our first results show that the effort to extract relevant information from text can be sped up notably by applying methods from natural language processing. The quality of texts and the writing style varied highly among citizen scientists. That is why, we are planning to further improve the detection of *what?* by coping with synonyms and colloquial writing style. Thus, we want to encourage explorative CS approaches and are eager to cooperate with different CS projects in order to evaluate how the methods scale to other subjects.

[19]F1-score is a measure from information retrieval. It is the harmonic mean between precision (how many of the retrieved information was correct?) and recall (how many of the relevant information was retrieved?).

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Open and participatory citizen social science for evidence-based decision making

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Keywords: social science, participation, empowerment, co-design, open science

Abstract: How can we best combine citizen science and participatory social research to produce benefits for involved citizens and communities, researchers, and society at large? Open and participatory citizen social science enables citizens to co-design and intervene in evidence-based decision-making by combining diverse modes of participation in many phases of research, from research agenda setting, contributing e.g. to the design of indicators, policy measures, and community action, to evaluating outcomes. We are working in an international partnership on a citizen social science framework that combines approaches from open science, citizen science, participatory social research and data activism.

Introduction: In the last years we have witnessed a boom of citizen involvement in decision making. Furthermore, socio-technological innovations in digital interaction have paved the way for new opportunities for participation and methods of intervening into social behaviour (Mayer 2015b). At a time of deep-set social challenges, government spending reductions, falling trust in democracy, and growing scepticism towards "expertise", new ways of conducting research to deliver demonstrable social impact are needed. By introducing citizen science strategies into social research and combining them with existing, long standing experimental and participatory methodologies pressing societal challenges can be more effectively addressed.

Towards Citizen Social Science: In this contribution to OECSK2018 we apply a working definition for "citizen social science" as a form of open and participatory social research that directly involves citizens and communities in research processes, including research design and evaluation, with the aim of creating (1) knowledge valid for every participant for decision making and (2) data and tools to intervene in- and monitor decision making processes. This entails decisions on individual-, group-, organisational- or societal level to tackle social challenges in a truly transdisciplinary setting. Thus, citizens become co-researchers and competent stakeholders in policy making.

Creating robust evidence for decision making builds on multi-perspectival approaches embracing open, participatory and empowering methods.

Many initiatives not yet labelled as citizen social science have already gone beyond the concept of the citizen as data collector or social sensor and have developed approaches for civic mobilisation, aiming at legal or political influence of civic activism and citizen generated data (Milan & van der Velden 2016).

Citizen Science: Citizen science (CS) builds on several traditions, from crowdsourcing data collection in environmental research, computational social science to participatory action research (Purdam 2014, Heiss & Matthes 2017). To date, most citizen science projects follow scientific agendas: scientists are the drivers and creators of knowledge, citizens execute well-defined tasks. These projects are positioned in the left, lower corner of Figure 1 (Schäfer & Kieslinger, 2016). In the upper right corner, projects involve citizens in both, agenda setting and knowledge production – this is where citizen social science is positioned, as we believe it adds important dimensions to the democratisation of science (Serrano-Sanz et al. 2014).

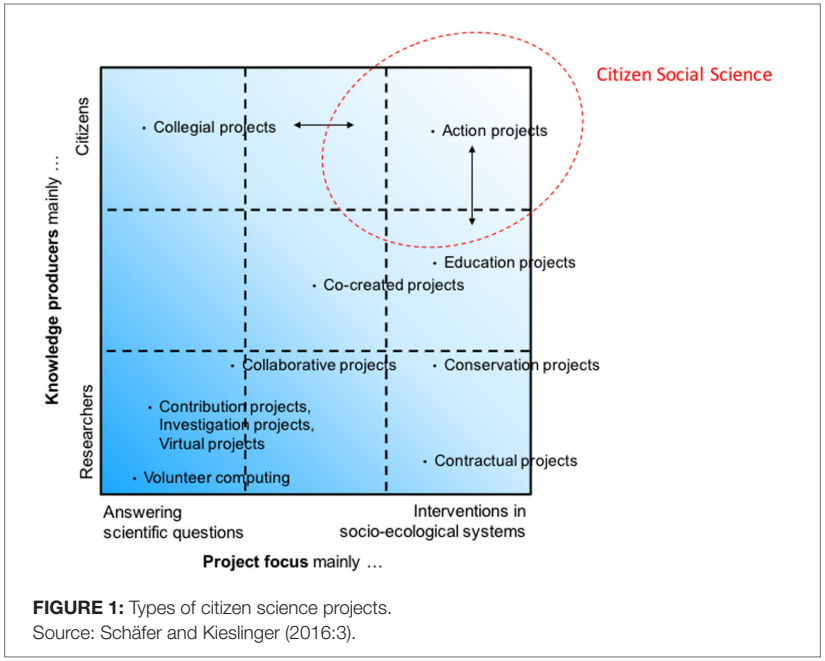

FIGURE 1: Types of citizen science projects.
Source: Schäfer and Kieslinger (2016:3).

There is broad consensus that participatory approaches could foster active engagement instead of passive audiences and co-shape social innovation. Our approach aims at integrating citizens and communities in the research process by fully acknowledging ethical issues for transparent decision making and citizen involvement in policy making.

Participatory Social Research: Before there was the label citizen science (Irwin 2002, Bonney 1996), a widespread movement aiming at opening the research process to non-scientists and democratizing the scientific research process already existed. In the social sciences participatory approaches such as participatory action research (PAR) paved the way for our contemporary understanding of participation in citizen science. PAR consists of a set of approaches that are emphasising the involvement of the research subjects on equal footing into the research process as co-researchers (Whyte 1990, Fals-Borda & Rahman 1991). The methods developed in PAR are interventional, seeking to collaboratively understand the social phenomena by changing them and reflecting the interventions. These common principles of PAR are part of our understanding of citizen social science and enrich it with their reflexive capacity for co-evaluation.

Open Science: Whereas the open science movement commonly strives to increase reproducibility, accountability, re-usability, collaboration and societal participation in science (Mayer 2015a), the suggested citizen social science approach proposes to widen these objectives to participatory settings of data-driven decision making beyond academic realms. Open data, open method, open evaluation and open education need to be reconsidered in the context of citizen social science. What does it mean to make data and methods re-usable and assessable for all stakeholders taking part in the creation of those data? Principles of open and collaborative evaluation need to be defined to empower participants while respecting stakeholder's rights.

Data Activism: Data literacy, participatory datafication and data analysis based on Critical Data Studies (Kitchin and Lauriault 2014) can intervene into social policy making and improve participation in open governance processes. Data activism can be regarded as answer to the all-encompassing datafication going on today and its inherent politics of representation (Milan and Velden 2016). Citizens can become "data activists" (Baack 2015) opening up policies, regulations and indicators in order to see how they affect their daily lives, but also to co-create new evidence to inform policy makers. The "data-producers" themselves should be able to use their data for empowering their position. Central questions for citizen social science practice in relation to data activism are: How can we best turn data into evidence? How can we combine data activism resting on open social data with the protection of the personal rights of the citizens involved?

Conclusion: Citizen social science allows to bring together the best of citizen science and participatory social research and learn about benefits and challenges of openness in participatory decision making. There is great potential for strengthening citizen social science for active social policy making. Different traditions feed into our understanding of how innovative social scientific practices can contribute to address social challenges in a participatory way. We suggest a new citizen social science concept combining elements from citizen science, participatory methods, open science, and data activism, leading to new ways of conducting research to deliver demonstrable social impact and benefits to involved citizens, researchers, and society.

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Citizen science in nature conservation: Motivational and organisational factors for volunteering

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key words: volunteering, motives, questionnaire, citizen science, nature conservation

In order to explore the motivational and organisational factors which promote volunteers to participate in a citizen science project, a system of scales was developed: MORFEN-CS 1. The scales contribute to the standardisation of empirical data collection in this field and facilitate the comparability between projects and different formats of participation. The findings of this studies are not only relevant for researchers but also for the planning and implementation of citizen science projects as discussed at the Austrian Citizen Science Conference in Salzburg (2018, Feb.)

Volunteering is defined as a planned pro-social action which runs over a period of time, mostly in an organisational context and which is not or only to a small extent financially compensated (Clary et al., 1998). To perform such complex actions it is assumed that not only one, but several motives play a role. Motives serve different functions. The same voluntary activity can serve different functions for different people. Very little empirical data is available on the motivational structures of citizen scientists and the organisational framework that promotes engagement. Due to the use of different survey instruments, the findings are difficult to compare with each other.

Based on the theoretical model of influencing factors for participation in citizen science (Geoghegan et al., 2016; Penner, 2002), a scale system MORFEN-CS 1 (*Motives and Framework for Volunteering in Citizen Science*) was developed. It is partly based on the Volunteer Functions Inventory (VFI; Clary et al., 1998) and the Scales of the Attitude Structure of Volunteers (SEEH; Bierhoff et al. 2007). The version includes eight motivational functions (four prosocial/serving the public good and four self-serving; 22 items), as well as four organisational functions (12 items). These were derived theoretically and reviewed in four focus group discussions (study 1; N = 38).

This scale system MORFEN-CS 1 was tested via an online survey of N = 209 citizen scientists (study 2). This volunteers had collected hair samples of the European wildcat, which were genetically analysed and transferred to a nationwide gene database.

The model fit (four prosocial and four self-serving, as well as four organisational functions) was confirmed by confirmatory factor analysis (CFA), the results show an acceptable to good fit (Moczek, 2018).

Table 1: Motivational and organisational factors for participation in citizen science (MORFEN-CS 1)

		M	SD	alpha
	Prosocial Functions			
M1	**Nature Conservation Values:** to do something for a cause that is personally important, to actively contribute to nature conservation, and to support wild life	3.65	.60	.688
M2	**Socio-political Responsibility:** to remedy deficits in nature conservation, to fulfill a socially meaningful task, to initiate political changes in nature conservation	3.08	.88	.824
M3	**Citizen Science:** to contribute to species identification and monitoring, to support a scientific research project, to engage in knowledge exchange with scientists	3.03	.67	.689
M4	**Social Motives:** being part of a community, engaging with others and meeting people with similar interests	2.78	.86	.923
	Self-Serving Functions			
M5	**Qualification/Training:** to learn and apply new knowledge and methods, to learn new things through practical experience and to gain new perspectives on nature	3.09	.74	.792
M6	**Recognition:** to have the impression of being needed, to receive recognition for the contribution, to self-actualise	2.35	.77	.738
M7	**Work Life Balance**: to do something different than in job, to find a meaningful balance to the professional demands	2.10	1.07	.912
M8	**Career:** Establish and cultivate contacts that can be beneficial for career, to get into a job	1.28	0.57	.734

(*Continued*)

Table 1: (*Continued*)

		M	SD	alpha
	Organisational Framework			
R1	**Project Organisation:** the organisation of the whole project, the provision of essential working materials	3.46	.70	.643
R2	**Project Coordination:** the offering of different tasks and volunteer activities, the matching between the time frame of the tasks and the everyday life of the volunteers, the support and supervision by and the regular contact with the project staff	2.73	.84	.623
R3	**Training for Scientific Work:** the detailed task description, the extensive introduction to the scientific method and the application of the method	3.24	.82	.683
R4	**Feedback/Communicating the Impact of the Engagement:** the feedback that the engagement was or is helpful for the project, the promptly feedback on the results of the volunteer's work, the information about successes in the overall project	3.36	.70	.626

Note: M = mean; SD = standard deviation; alpha = Cronbach alphas as indication for the internal consistency of the functions

The degree of agreement (or rejection) was quantified on a four-level scale (table 1; 1 = not relevant, 2 = less relevant, 3 = quite relevant, 4 = completely relevant). The highest consents were given to the nature conservation values (M1), followed by the motive of being qualified in scientific methods (M5), taking social responsibility (M2) and participating in a citizen science project (M3). Social motives (M4), recognition (M6), work life balance (M7) and career (M8) played a rather subordinate role in the target group. Under the framework conditions, three of the four dimensions proved to be very significant: project organisation (R1), communication (R4) and qualification (R3). Project coordination was rated slightly less relevant (R2).

High approval of nature conservation values and social responsibility reflects the congruency between the values of the organisation or project and the values of the volunteers. But it is no surprise that people interested in nature and wildlife volunteer in such projects. The higher the effort for the task, the higher the consent of these values

among the participants (Kaiser et al., 2011). So, these two functions do not help to differentiate between the volunteers – they are too similar regarding these variables. For everyone involved in the planning and implementation of CS projects, it is therefore much more interesting to focus on the other motivational functions and to attract new target groups for participation through appropriate offers. For example, it could be a worthwhile attempt to cooperate with companies whose employees mainly doing desk work and to draw their attention to the stress-relieving and balancing effects of work in nature and thus to attract new target groups.

MORFEN-CS 1 wants to contribute to a standardisation of the empirical data collection in this area and to facilitate the comparability between projects and participation formats. The scale system should not be used for individual diagnostics. It is not about measuring a person's individual motivational profile, for example, to check whether he or she is suitable for a certain citizen science task to predict whether he or she would successfully complete a task. The use of the instrument is intended for collective diagnostics, i.e. for empirical research on groups engaged in citizen science projects and for project evaluation. The scales should be validated on further samples. They should also be checked whether they may need to be completed by other functions. A comprehensive publication of a German and an English version is in preparation. Colleagues are explicitly invited to further develop MORFEN-CS 1 and may contact the author for more details.

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How to speak German in Austria. Collaboration between two linguistic citizen science projects: "On everyone's mind and lips – German in Austria" and "Lingscape" found each other

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Keywords: citizen science, collaboration, linguistics, linguistic landscaping, variationist linguistics, digital humanities

Abstract: Citizen science in linguistics requires scholars to re-think their roles as researchers because speakers of (variants of) languages may become research partners. The project *On everyone's mind and lips – German in Austria (In aller Munde und aller Köpfe – Deutsch in Österreich*, IamDiÖ) is a co-created citizen science project addressing German language in Austria. In cooperation with the *Lingscape* project, citizens' photographs of signs in public space help map the Austrian linguistic landscape. Collaboration between IamDiÖ and Lingscape not only encompasses the collection, analysis and publication of data, but also joint use of technical infrastructure and exchange of experience and participants.

Introduction: The idea of citizen science or participatory research in linguistics is not new. *On everyone's mind and lips – German in Austria* (IamDiÖ) does not see citizen science as crowdsourcing (Heinisch 2017). IamDiÖ intends to involve citizens in the whole research process: Citizens raise research questions, collect data (e.g. with the Lingscape app) and answer their questions. IamDiÖ supports participants in doing their own analyses. This paper concentrates on activities related to a linguistic scavenger hunt in cooperation with the *Lingscape – Citizen science meets linguistic landscaping* project which has developed an app for mapping linguistic landscapes (Purschke 2017). In the following sections, both projects IamDiÖ and Lingscape and benefits gained from the cooperation between both projects are described.

IamDiÖ: IamDiÖ (*On everyone's mind and lips – German in Austria*) is a satellite project of the special research program *German in Austria. Variation – Contact – Perception* based in Austria. Its objective is to raise awareness of language use and perception among the public. Citizens should reflect on the use and perception of their language(s).

IamDiÖ asks citizens to raise their questions about (German) language and linguistics on its website. Depending on the current state of research, either the academics provide answers to the questions raised by the citizens or they try to find an answer on their own in a dialogue with and supported by academics (IamDiÖ 2018). The main goals are community building and testing the co-created project approach by Bonney et al. (2009, p. 18) in citizen science for linguistics. This means that IamDiÖ intends to spark interest in linguistic questions among the public, facilitate interaction between citizens and academics and provide an insight into humanities research. Means to this end are the project's social media channels and face-to-face events, e.g. researchers' nights. Building a community and involving citizens in research steps means the generation of additional data for academics (e.g. Lingscape data), on the one hand, and the use of academic research results to answer questions raised by citizens (e.g. blog posts), on the other.

The IamDiÖ project consists of three hands-on activities and a final event, which will be planned together with the participants. These hands-on activities encompass the question of the month, a linguistic scavenger hunt and a meme contest available on the IamDiÖ website. However, this paper focuses on the scavenger hunt since this activity is a joint endeavor involving another citizen science project. This scavenger hunt invites citizens to search for written information in public spaces with a focus on material written in German and its varieties. After having found appropriate signs (e.g. stickers or posters), participants can upload their pictures to the Lingscape app.

Lingscape: Lingscape is a linguistic landscaping app developed at the University of Luxembourg to collect and map the use of written language in public spaces (Purschke 2018). In the IamDiÖ scavenger hunt, citizens search for signs and lettering in public spaces. For this purpose, IamDiÖ uses the Lingscape linguistic landscaping app to collect and analyse data.

Users can upload their photos of signs and lettering found in public space, add geocoordinates and additional information such as the languages or language varieties (e.g. German or Viennese) people detect. Uploaded pictures are displayed immediately in a map within the app. However, citizens do not only collect data, but can also analyze data. On the Lingscape website, citizens may analyse the available images of the uploaded signs and lettering by using filters, such as language, the number of languages in one picture or certain data creators. The Lingscape data can be analysed with regard to the diversity and dynamics of public writing, multilingualism and variation.

Cooperation: IamDiÖ and Lingscape have various aspects in common. Both projects are citizen science projects in the field of linguistics. They have a similar approach to citizen science, i.e. they do not only focus on crowdsourcing, but help citizens participate in research. This common understanding of citizen science forms the basis of collaboration.

In addition, successful collaboration requires that the partners enjoy mutual benefits (Heinisch & Seltmann 2018). In the case of IamDiÖ and Lingscape, these advantages are that IamDiÖ can use the already existing (technical) infrastructure and developments provided by Lingscape without having to create an app on its own. Lingscape, on the other hand, benefits from the data collected through IamDiÖ in the Lingscape app. Moreover, both projects may recruit additional participants. Lingscape users may become also aware of the IamDiÖ project and may contribute to it beyond the scavenger hunt. Participants in the IamDiÖ scavenger hunt using the Lingscape app may get to know the app and use it for other projects.

Challenges of collaboration are, among others, the geographical distance between the two teams since IamDiÖ is based in Austria and Lingscape in Luxembourg. Therefore, regular communication and clear task distribution among the cooperation partners are necessary when working across national borders. Furthermore, the application for (further) funding and the distribution of financial means need to be clarified in advance. For example, the IamDiÖ project requires special features in the Lingscape app that need to be implemented so that citizens cannot only annotate languages but also language varieties.

Conclusion: Both projects *On everyone's mind and lips – German in Austria and Lingscape* adopt a citizen science approach that goes beyond crowdsourcing in research. Thematic overlaps allow for cooperation and exchange of knowledge, recruitment of participants and further development of technology.

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Political engagement for global citizenship: Raising research interest among the next generation through citizen science

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Keywords: Sustainable Development Goals (SDGs), Global Citizen Education, high school students, transformative research, civic engagement

Summary: In 2015, the C3-Centre for International Development started a project for high school students to conduct a pre-research project within the framework of their final exam. Support measures include lectures, workshops, individual coaching, information materials, and a competition for innovative research papers. The goal is to build capacity for innovative and critical research on sustainable development among the students as well as to draw their attention on epistemic differences and existing power relations. Results show the potential for transformative processes of knowledge production and political engagement. We argue, that citizen science could play an important role in realising this potential.

Introduction: *Winning our next generation* – the motto of the Austrian Citizen Science Conference 2018 – is one of the main ideas of the C3 project for school students[20]. The purpose of this project is to raise awareness about sustainable development in Austrian high schools.

The UN 2030 Agenda on Sustainable Development is conceptualised as a universal framework applicable to all countries and societies. It demands a socioecological transformation at global level (Koehler 2016). In terms of education, Goal 4 calls for inclusive and equitable quality education and life-long learning opportunities for all by 2030. In Target 4.7, it claims that all learners should have acquired the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development, human rights, gender equality and global citizenship. For Austria, this entails the integration of (new) approaches of transformative education in national curricula (Langthaler et al. 2018: 11).

One is the concept of global citizen education (GCE), which aims to empower learners and educators to critically reflect on power relations and epistemic positions in

mainstream discourses and to develop strategies to actively engage in socio-political transformation processes (Tawil 2013: 4). In addition, it is connected to an alternative notion of social policy, one that is broadened to combine ecological and social goals (Wintersteiner et al. 2014: 32). However, to our understanding, GCE must also deal with colonialism and its ongoing continuities perpetuating ideas of Western superiority. This perspective requires attention to epistemic differences arising from the colonial past. It allows for a sophisticated understanding of what GCE could mean in contexts where minorities who are "*…marginalized by prevalent schooling systems, need new learning decolonizations that endow their possibilities vis-à-vis dominant members of their societies*" (Abdi et al. 2015: 2).

Citizen Science at the Intersection of Education for Sustainable Development: Young Citizen Science is about involving young people into research activities, inviting them to become co-researchers, to get into contact with scientists from academia participating in joint knowledge production (Pettibone et al. 2016). Such research processes bear a potential to create a participatory citizenship education space that enables high school students for critical reflection and for developing political demands as well as strategies for their enactment. In the following, we will argue that these approaches can be integrated in the Austrian high school system.

Since 2015, all Austrian high school and VET-college students mandatorily have to design and implement a research project and write a final research paper. OEFSE, in cooperation with other partners[20], has built up a project supporting students who deal with both conceptual and applied issues of sustainable development, with a particular thematic focus on the Sustainable Development Goals (SDGs). The project consists of (i) support measures for students (lectures, workshops, individual coaching, information materials) in elaborating their research papers, and (ii) awarding a prize for high-quality and innovative projects. Out of a total of 270 submissions throughout the last three years, many conformed to academic standards and dealt with the full range of SDGs, such as questions of social equity, environment, gender, fair trade, human rights and migration. Some impressively show how they investigate their role as citizens within a complex network of global power relations. They critically reflect on how mainstream discourses shape their subjectivity.

Critical Elements of GCE Embedded in Research Experience: An outstanding example is provided by the interdisciplinary project "An increasingly unequal world"[21] in

[20]www.centrum3.at/aktuelles/vorwissenschaftliches-arbeiten-im-c3/

[21]http://www.centrum3.at/fileadmin/downloads/VWA/2017/DA_Langer_u.a._Globalisierung_2016_2017.

which its three authors linked questions of inequality to market deregulations, wealth and climate change. Importantly, they integrate historical and global dimensions, which are analysed against dominant discourses in mainstream media. The example highlights the importance of critical media literacy for development research. It illustrates the challenge in continuously dealing with the disjuncture between the authors' limited knowledge about the developing world and their learning experience embedded in dominant knowledge categories. It is therefore crucial to raise students' (and their teachers') awareness for citizens' on-going *"anticolonial struggles and efforts to live viable, sustainable lives that should not be categorized or fixed by actors who cannot fully understand them."*(Abdi et al. 2015: 5)

Consequently, the project team has developed a workshop concept for students, which combines scientific input taking into account the history of colonialism while opening a space to critically reflect on power relations and epistemic positions.[22] In interactive role games and critical media work for citizen radio, students discuss benefits from and control over unjust and violent systems. They develop strategies to engage actively in socio-political transformation processes and acquire tools for critical media review and information competence on a scientific level (Wintersteiner et al. 2014: 32). The evaluation of 6 workshops (30–40 students each) gives evidence on transformative processes in terms of rising awareness about asymmetrical globalisation processes, unequal power relations, assumption on and controversial definitions of development. Concurrently, students develop ideas how to increase attention for citizens globally that are systematically underrepresented and marginalised in mainstream discourse.

Conclusion: Our experience shows the great potential of early research activities at high school level for critical GCE. Interdisciplinary scientific examination in the field of development research opens up a space in which contradictions and questions on sustainable development can be addressed. In order to win our next generation for science, measures should be oriented towards learners' interests and provide additional knowledge on the prevalence of neo-colonial positions in development research. A transformative element is the collaborative process of knowledge production on notions of global citizenship in which students (and teachers) engage in.

pdf by Sarah Lošek/Katrin Langer/Carina Windbrechtinger, "Hertha Firnberg Schulen für Wirtschaft und Tourismus". *Höhere Lehranstalt für wirtschaftliche Berufe* (Wien).

[22]https://www.oefse.at/veranstaltungen/rueckblick/veranstaltung/event/show/Event/umstrittene-bodenschaetze-welche-auswirkungen-hat-die-globale-rohstoffpolitik-auf-umwelt-und-gesell/

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Multi-criteria decision analysis as citizen science process

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Keywords: multi-criteria decision analysis, utility analysis, problem structuring, participatory design, process model

Abstract: Multicriteria Decision Analysis (MCDA) is a set of decision support approaches, which enable assessment of multi-objective problems. MCDA approaches are valuable for improving decision quality. However, complex development processes of MCDA tools require considerable effort. In consequence, the application of MCDA is restricted due to extensive experts and modelers resource requirements. This article introduces a process model of MCDA tool development, which can be implemented as citizen science process. The process model is based on *Elementary Interactions* (EI), which request information from participants and impact the MCDA tool. A user model controls the effect of EIs on the MCDA tool.

Introduction: Multicriteria Decision Analysis (MCDA) is a subdiscipline of Operations Research and supports decision making for multi-objective problems. MCDA is an appropriate method for many decision-making contexts, such as the selection of a sustainable travel type due to one's preferences regarding the criteria costs, time and environmental impact (see Figure 1). An example of significant impact for societies is choosing a sustainable waterinfrastructure system, i.e. not only taking into account the costs of a waterinfrastructure system, but also considering aspects like the ability of resource recovery and the satisfaction of users. Since the development of reliable MCDA tools is effort-intensive, there is a lack of MCDA tools. Citizen Science provides tools essential to carry out the following approach, which was discussed and advanced at the 4th Austrian Citizen Science Conference in Salzburg.

Some MCDA approaches are based on a set of objectives (SOO), which consists of hierarchically structured objectives, criteria and indicators. The utility analysis (UA) is an MCDA approach, which requires a SOO.

However, the creation of set of objectives (SOO) is complex and effort-prone (e.g. Lück und Nyga, 2017). To our knowledge, there is so far no software capable of developing a

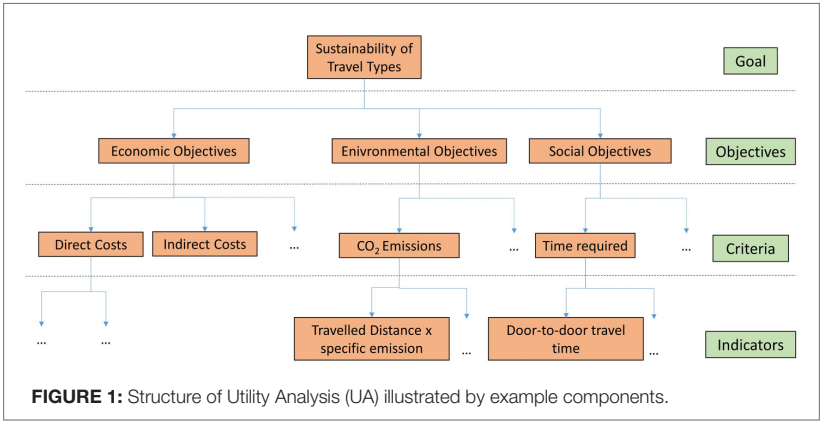

FIGURE 1: Structure of Utility Analysis (UA) illustrated by example components.

SOO starting from just defining the assessment goal. Instead experienced participants and formally structured processes are prerequisites of SOO creation supported by software (Mustajoki and Marttunen, 2017). The request to reduce the efforts of experts and modelers led to the idea of utilizing citizen science principles for SOO creation. In the following, important characteristics of the envisioned development process and its platform are outlined.

Idea and Requirements: The basic idea is the employment of large numbers of short and self-contained information requests to the participants, such as "Which criteria is more important – A or B?". These short information requests – called *Elementary Interactions* (EI) – should keep the demanded cognitive complexity for participants low and allow the development of SOOs en-passant without huge effort demand. A great number of EIs forms an EI stream. Participants process EI streams and can interrupt at any time, as EIs do not depend on each other. Thus, the possibility of arbitrary effort should open the process to citizen scientists who are subject to restricted time budgets. The answer to each EI changes the SOO due to predefined rules. When an overall validity measure threshold is reached, the SOO is applicable to real world processes.

Solution Characteristics: A potential solution requires a **web platform** to provide a high accessibility for different stakeholder groups (see Figure 2). The web platform contains an **EI stream generator** and a **model aggregator**. The model aggregator integrates answers to EIs into the SOO model. Each model component (at objective, criteria and indicator level) is characterized by a **validity measure**. Validity measures

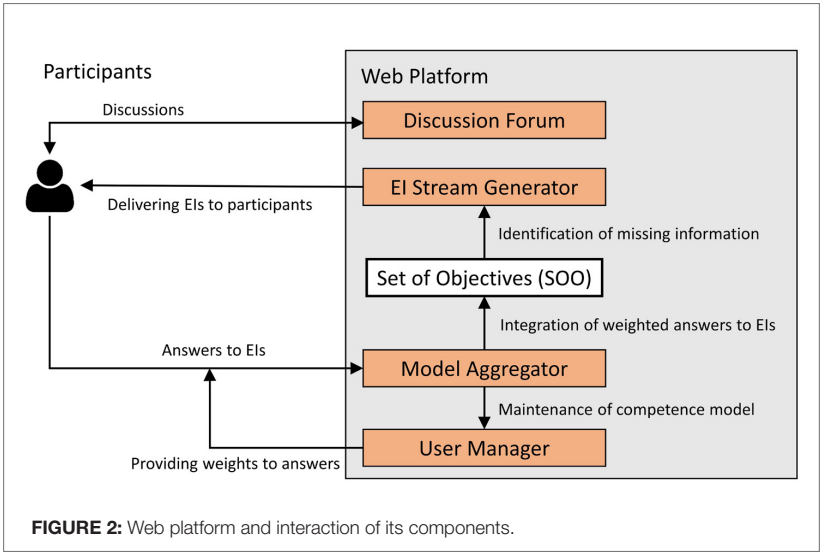

FIGURE 2: Web platform and interaction of its components.

are maintained by the model aggregator and are exploited by the EI stream generator to control the generation of EIs. For example, if the answer to an EI acknowledges a criterion positively, the model aggregator adds the acknowledgement to the criteria validity measure and checks if a threshold of acknowledgements in comparison to rejections is reached. If this is the case, the model aggregator changes the state of the criterion to "validated". This state change causes the EI stream generator to generate EIs asking for indicators for the criteria newly validated. The **user manager** keeps track of the activities of each participant. A competence model, derived from answers to well-known questions and the participant's answers in comparison to the answers of co-participants, helps to detect vandalism and to identify the competence level of each participant. By maintaining the competence level of each participant, the effect of answers to EIs can be weighted. Thus, high quality of knowledge leading to SOO elements should be elicited. Furthermore, the user manager is responsible for performance accounting of the participants. Motivation of participants can be enhanced by providing a gamification layer. A **discussion forum** fosters communication of participants.

Discussion and Conclusions: The outlined process model allows continuing development of SOOs as core element of MCDA. Further, the approach supports developing SOOs in informal settings and by en-passant approaches, which lowers the entry barrier to initiate development processes. Participation of all stakeholders possibly ensures the

acceptance of developed SOOs. So far, the approach has been validated successfully by paper prototypes, in workshop sessions and by a turn-based and manually controlled digital prototype (implemented in the learning management system software Moodle). Future activities include the implementation of the platform. Main challenges comprise ensuring the convergence of the process (the process has to deliver reliable SOOs) as well as balancing the curation of objective knowledge (which relies on domain experts) versus the collection of subjective preferences (which requires citizens as stakeholders). For citizen science processes, developing SOOs is a new and remarkable abstract form of outcome. In summary, the approach shows potential for developing valuable SOOs, for simplifying the development process of SOOs, for fostering the inclusion of larger factions of all stakeholder groups and for lowering required development efforts. These expected characteristics justify further research efforts to develop and balance the required platform.

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Talking borders: From local expertise to global exchange

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Keywords: citizen science, borders, global history, Austro-Hungarian Empire, e-Learning

On July 10-14, 2018, the Association for Borderlands Studies (ABS) held its Second World Conference in Vienna and Budapest. The meeting was attended by around 450 participants from 54 countries, including renowned experts and practitioners, spanning all fields of the humanities and the social sciences. The ABS is the world's largest academic organization dedicated to the systematic study and exchange of ideas, information and analysis of international border, and the processes and communities engendered by such borders. The Second ABS World Conference had as its central topic Border-Making and its Consequences: Interpreting Evidence from the "post-Colonial" and "post-Imperial" 20th Century and was co-organized by the University of Vienna and the Central European University on the occasion of the 100th anniversary of the dissolution of the Austro-Hungarian Empire.

The world academic conference of the Association for Borderlands Studies is turned into a site of scientific investigation itself, where 100 citizen scientists meet 100 border scholars as equals for a cross-disciplinary (border/citizen science) experiment. In turning the 2018 ABS World Conference into a platform for a Citizen Science experiment, the Talking Borders project brings us to the applied dimension of border research.

The citizen scientists are bachelor students in the humanities recruited from various universities situated in border regions throughout the ex-Habsburg area, including Triest, Ljubljana, Zagreb, Zadar, Herzegovina, Novi Sad, Cluj, Lviv, Rzeszów, Vienna, Budapest and, additionally, from the Comenius Secondary School in Vienna, visited by pupils speaking German as well as Czech and/or Slovak. In order to recruit the citizen scientists, we asked the assistance of scholars teaching bachelor students at local universities. The border scholars were asked to volunteer to participate while registering for the Association for Borderland Studies World Conference 2018. (see: www.abs2018world.com).

This Citizen Science project asks:

1. What do borders mean to border scholars?
2. What do borders mean to young adults from the (ex-) Habsburg area?
3. What new knowledge does a global encounter between citizen scientists and border scholars reveal?

The Experiment consists of two aspects:

a. It will gather 100 face-to-face dialogues about the meaning of borders.
b. It will also host a global digital café for 100 working days, where extracts from the 100 talks will be posted so that people can comment on them. The online page will demonstrate how scientific knowledge on the global meaning(s) of borders is generated by means of an e-learning experiment.

The project runs from April to December 2018 and is financed through the Top Citizen Science Initiative of the Austrian Science Fund. During the Spring Semester of 2018, the Principal Investigator taught a course for Bachelor Students in Education at the University of Vienna. Nineteen students were engaged in preparing the experiment. They co-created the website of the citizen science project: http://www.univie.ac.at/talkingborders/. They also acted as citizen science ambassadors for the other citizen scientists prior to their arrival to Vienna, mainly through emailing. The main data for the project are collected during the 100 face-to-face dialogues on 10 July 2018, consisting of 20 minutes of free speech for the citizen scientist, 20 minutes of free speech for the border scholar, and 20 minutes of conversation between the two. Afterwards, the citizen scientists are asked to select three small fragments from the dialogues, transcribe these and upload them on the project website.

Later, the digital café is prepared. The project team selects 100 fragments from the pool of uploaded fragments, and lists them in a specific order. The project team composes a report detailing out their selection procedure. The fragments are posted one by one over the course of 100 days in a specially created digital café accessible for participants through the project website. The participants receive the possibility to comment on these posts, and engage in a written online conversation about the content of the posts with other participants. The grant enables to conduct the scientific experiment and run the digital café. In case of successful data gathering, the project team may consider applying for follow up funding. During a future analysis, it could be asked how the border is verbally drawn during the face-to-face dialogue and how it evolved during the further global conversation. The project may also come to draw attention to limits of public expertise in the knowledge and

information society of the 21st century, as well as the limits of the production and consumption of science.

The project was presented at the Citizen Science conference in Salzburg in February 2018, as well as on the Round Table Border Studies Meets Citizen Studies, organised by the Principal Organiser on 11 July 2018 on the Association for Borderlands Studies World Conference, where the project was first presented to the public by citizen scientist Cristina Debu, and later situated in the field of border studies by Jussie Laine (University of Eastern Finland) and in the field of citizen science by Nadja Kerschhofer-Puhalo (University of Vienna). Participants also watched a video presentation of Virpi Kaisto (University of Eastern Finland), especially made for the event: https://www.youtube.com/watch?v=hy6NPD7x0Is&feature=youtu.be

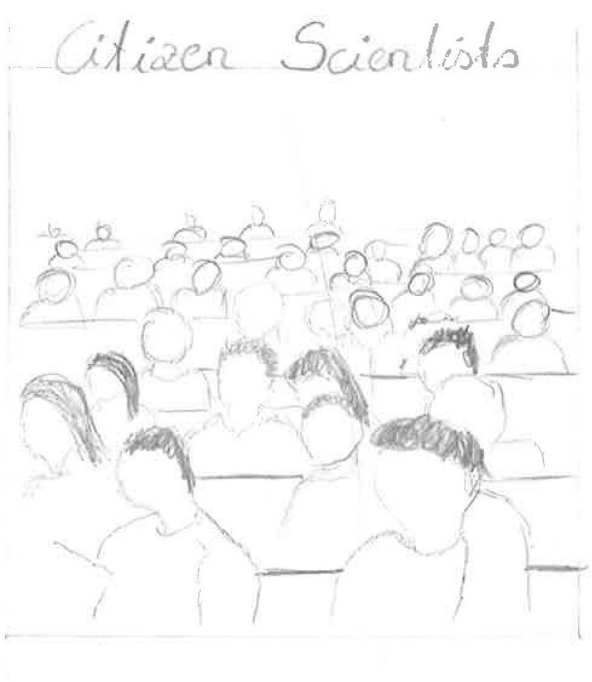

FIGURE 1: A cartoon made by citizens Christopher Pommerenke and Selina Ehrenhöfer.

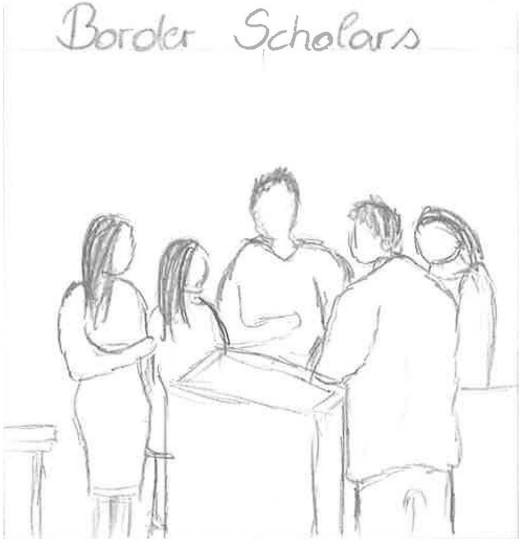

FIGURE 2: A cartoon made by citizens Christopher Pommerenke and Selina Ehrenhöfer.

FIGURE 3: A cartoon made by citizens Christopher Pommerenke and Selina Ehrenhöfer.
Citation: TalkingBorders

Evaluating citizen science in practice

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Keywords: quality criteria, evaluation, ethics, citizen science platforms, citizen science networks

Abstract: We reviewed the usability, practicality and wording of the recently published quality criteria for citizen science (Heigl et al. 2018). The workshop's participants generally approved the criteria. However, the wording and effects of certain criteria were critically discussed. The question remains if quality criteria might diminish the diversity of citizen science, especially in respect to bottom-up projects. Citizen science platforms could play a core role in supporting projects and ensuring a high level of quality. We recommend continuing the discussion if quality criteria can also improve a definition of citizen science or should mainly be used as an evaluation tool.

Introduction: Evaluating citizen science (CS) activities has become a core question both within the CS community and for funding institutions. Several publications focus on specific aspects of quality and impact of CS (e.g. Brossard et al. 2005, Cronje et al. 2011, Kieslinger et al. 2015, Ziegler et al. 2015).

Quality criteria for CS were recently published by the Austrian Citizen Science Network's working group on quality criteria (Heigl et al. 2018). These have a twofold aim: a) giving projects the possibility to improve their activities and b) contributing to a more holistic and widely accepted definition of CS (Heigl & Dörler 2017). However, it still needs to be clarified how useable the criteria will be in practice. Therefore we tested the criteria and discussed possible side-effects in a workshop at the Austrian Citizen Science Conference 2018.

Methods: The workshop's participants were given the task of applying the quality criteria to CS projects and critically reviewing the criteria's wording, usability and practicality. The projects were selected from the Austrian (www.citizen-science.at) and German (www.buergerschaffenwissen.de) CS platforms and covered a diverse spectrum of disciplines, goals and institutionalization. The findings were then discussed in the plenary session.

Results

Scientific standards (criteria 1–3)

Criterion 1 states that there must be a: "(…) stated scientific question, hypothesis or goal (…)". The participants argued that some CS projects, especially bottom-up projects organized by citizens, focus on collecting data and building up a database. These projects might not have a fixed scientific question or hypothesis, yet. Instead, they aim to provide a scientific infrastructure and a collection of valuable data. This aspect of CS was considered very valuable and might fall short of the quality criteria in their current form. Also, it was discussed how the term "knowledge" (criterion 3) should be defined and framed.

Collaboration (criteria 4–8)

Criterion 4 states that: "There must be an added value for all participants (…)". The participants agreed that a clear definition of the term "value" is necessary, since values have a highly subjective component that may prove very difficult to monitor in practice.

Open science (criteria 9–11)

The workshop's participants criticized that the definition of "results" in criteria 10 and 11 was not clear enough. Several possible ambivalences within this term were discussed, e.g. data vs. compiled results or scientific results vs. societal impact. As with criterion 1, it was argued that infrastructure-type CS projects may have problems matching this requirement.

Ethics (criteria 16–19)

The participants argued different aspects of the criteria dealing with projects' ethics. First, it was recommended to link the criteria to existing ethical guidelines such as the ISO 26000 guidance on social responsibility (ISO 2010). Second, the term "informed consent" (criterion 17) was critically discussed; it might be very difficult to inform participants to the full extent of a project's impacts and influences. It was also criticized that the ethical criteria are formulated in a very formalistic and strict way. It was questioned if it benefits the discourse on quality in CS if projects that have not yet reached the "inclusiveness" required by the quality criteria, are not admitted to CS platforms and excluded from the community. Instead, it was recommended to support the projects in reaching this inclusiveness. It was also argued that some projects call for certain prerequisites for participation (e.g. knowledge of species, diving certificate), thus, unrestricted inclusiveness may pose an unattainable, or perhaps undesirable goal

for these projects. It was recommended to consider ethical criteria as a guideline supporting projects and not to develop stronger criteria than for "normal" research projects.

Discussion: As stated above, the participants recognized the need for a more precise definition of some of the terms used in the criteria, such as "value" or "results". It was recommended to develop a user guideline which explains the use and background of certain terms and criteria, in order to improve the usability and practicality of the quality criteria.

Also, it was discussed if and how the criteria should be weighed and prioritized against each other. Should it e.g. be possible to neglect a certain criterion for the benefit of another? The participants disagreed on this question; some supported the individual setting of priorities within CS projects while others emphasized the necessity of applying all criteria equally.

In general, most participants approved of the criteria and encouraged the working group on quality criteria to keep up their work. However, some participants warned that general criteria might diminish the diversity and heterogeneity of projects which they emphasized as one of the core strengths of CS. Especially citizen organized bottom-up projects with little resources and experience in dealing with quality procedures might be discouraged by a high level of requirements in the early stages of a project. This might effectively exclude them from the CS community. Here, CS platforms could play a core role in encouraging and supporting different approaches to CS while still ensuring a high level of quality through guidelines and direct assistance.

Conclusion: Criteria have a very strong normative impetus. Therefore, quality criteria for CS should be used very carefully, especially when considering their impact. We recommend continuing the discussion within the CS community if quality criteria can improve the definition of CS in general and how they are best used as a tool to ensure a high quality of CS projects on CS platforms.

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