Edited by Željko Trezner

The application of citizen science in mapping tourist attractions:

manual with tools for practical application in vocational education and professional studies in tourism

Erasmus+ InnoVet

Turistička zajednica Karlovačke županije


KARLOVAČKA
ŽUPANJIA
In medias res

Maribor

Ericsson Nikola Tesla


SREDNJA ŠOLA ZA GOSTINSTVO
IN TURIZEM MARIBOR


GOSTUR

ferial

Edited by Željko Trezner

The application of citizen science in mapping tourist attractions:

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Project associates: Silvio Adilović, Biljana Aksentijević, Hrvoje Bek, Dijana Berber, Željko Blagović, Emanuel Cipurić, Dragana Davidović, Željko Fanjak, Vesna Horvat, Željko Jerečić, Monika Jurišič Hlevnjak, Lucia Jurković, Milena Knežević Kovač, Goran Kopčak, Nada Lončar, Andrej Purgaj, Tatjana Trezner

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Table of contents

About the project

There is no doubt that strong structural changes have impacted contemporary tourism. The question that arises is how to make tourism more sustainable and resilient. That is why the focus of the InnoVET Tourism project is on the digital and green transition as tools for the transformation of contemporary tourism. During the project, possibilities for using information technologies and citizen science in vocational tourism education have been explored. The project put special emphasis on practical solutions and challenges that stakeholders in education and tourism business cannot manage on their own.

The project is innovative in the paradigm shift where vocational education is not just following the world of work, but acts within a new relationship as a full partner in defining new trends and needs. During the project innovative InnoVET digital tools and methodology have been developed, to apply quadruple helix and citizen science in mapping tourist attractions and monitoring the environment. InnoVET solutions have been tested and implemented through several perspectives. Focus groups included tourism vocational schools, tourism colleges, tourist boards, tourism and IT companies, associations and various interest groups, as well as the local community.

The impact of the application of digital and green concept on innovations in vocational education and training was determined by following results during the project. This primarily refers to the development of IT tools and methodology for including vocational students into sustainable tourism development. Also, the applied digital solutions, which are simple to use in vocational education and training, have a clear purpose in the educational process and match well with the need for digital and green skills. Finally, the application of the quadruple helix approach in the project made vocational students and teachers equal partners with the stakeholders from the public and private sector and local community in the innovation process.

Tested and finished InnoVET solution includes a digital tool for mapping tourist attractions and three complementary manuals. The complete solution enables educational institutions, tourist boards, tourist companies, associations or local self-governing authorities an easy initiation of their own project with negligible expenses. The use of crowdsourcing concept and InnoVET solutions enables the creation of a tourist attractions database, developing innovative tourist products, monitoring the state of tourist attractions and reporting damage or pollution done to them. For the purpose of additional information on using InnoVET solutions, disseminating activity results after the end of the project, and promoting InnoVET on a national and EU level as an example of good practice all partners are available.

1. Citizen science in vocational education

Fotografija: Zavod za turizem Maribor

Introduction

Including citizen science in the process of formal education comes with both benefits and challenges. Also, motivation for participating in citizen science projects is various and layered, and usually includes some form of learning. That is why it is only logical to research the opportunities for incorporating citizen science projects into the education process. That is why the first part of this chapter deals with motivation, benefits, challenges and particularities of applying citizen science in formal education. It also shows the special role and importance of teacher competences.

Vocational education and specialized studies, especially in tourism and hospitality, are characterized by specific aims, methods and forms of learning. Considering the demanding and specific occupations that students are preparing for, this is to be expected. That is why the second part of this chapter shows the particularities of occupations and challenges in vocational education and specialized studies in general, and in tourism and hospitality in particular. The focus is given to the possibilities of initiating and implementing citizen science projects.

The need to discover the new and unknown is the basis of tourist motivation. The same motivation applies to the participants in citizen science projects. It is not therefore surprising that scientific tourism appeared as a specific form of volunteer tourism (voluntourism). Moreover, tourism itself is the subject of research in many fields of science. That is why the final part of this chapter deals with the reasons, the most important stakeholders, motivations and particularities of starting citizen science projects involving tourists and related to tourism.

1.1. Citizen science in the education process

The aim of this chapter is to present readers with the motivation, benefits and challenges of including citizen science into formal education, especially in terms of its specific application and teachers' competences.

After mastering the content of this chapter, reader will be able to:

- describe what motivation inspires participants for citizen science projects
- explain the benefits of including citizen science into formal education
- point out the challenges of including citizen science into formal education
- describe the role of teachers in citizen science application in formal education
- present teachers' competences needed for applying the methods of citizen science
- explain the particularities of citizen science application in vocational education

Citizen science projects

Regardless of the motivation for participating in citizen science projects, it always includes some form of learning. Although motivation of participants in citizen science projects varies, it seems to be connected mostly with satisfying one of the most important primary social needs: the need for exploration. **The motivation for participating in citizen science projects is connected with the specific interest for learning about a topic and the desire to be a part of discovering something new**. It is not uncommon for the motivation to be based on aims and values of the exploration project or on the desire to help others by being a part of a broader team. Some are motivated by accomplishment, some by recognition given to the participation in an effort that is valuable and useful for the community. It all points towards **the range of competences that can be gained by participating in citizen science projects being much broader than just gaining knowledge**. It definitely includes specific skills as well as values.

Informal and non-formal learning

Although it seems that citizen science projects put emphasis on informal and non-formal learning, it does not mean that citizen science has no place in formal education. On the contrary, **participation in citizen science projects can broaden the range of learning outcomes realized through formal education**, develop a tendency for the scientific approach in dealing with various challenges, and raise awareness of the importance of participating in general welfare projects. In any case, the participation in various citizen science projects demands a certain level

of skill and responsibility in following scientific protocol, depending on the scientific field and study area. Also, **the inclusion of citizen science projects into school activities broadens the choice of teaching methods and ways to evaluate achieved learning outcomes**.

Teaching methods

Including citizen science projects into formal education is a great opportunity for high school and college students. It is also **a great challenge for teachers and educational institutions**. Some projects require great material resources. However, in many cases they already exist or are not necessary at all. Then the **challenges are mostly related to the matter of connecting project activities with formal program's learning outcomes and the motivation of a part of students** who are not interested in project participation. These are the challenges primarily faced by teachers. Unlike the participants of citizen science projects, **teachers need to have an extra motivation and readiness to take on the role of a project promotor and initiator**.

Motivation of pupils, students and teachers

For many teachers it is not the question of wanting to take on a demanding role of a leader and promotor in a citizen science project. It is more commonly a case of **a lack of institutional support as well as a lack of needed competences**. That is why the process of spreading citizen science projects demands institutional support and the cooperation of educational institutions with scientists and teachers who want to get

Institutional support

Photo: Turistička zajednica Karlovačke županije

involved in such projects. It is essential **to work** systematically **on developing teachers' competences for the roles they will have in citizen science projects**. Undoubtedly, there should be no problems in terms of teachers' expert competences in their scientific field or study area they teach. It seems that the greatest **challenge in teachers' competences is related to teaching through project activities and project management**. This includes activities of popularizing science and certain projects, motivating students, leading teams, and reporting results.

Another challenge is the matter of **connecting learning outcomes that can be achieved through participation in citizen science projects with the curriculum-based, formal outcomes**. The focus of most citizen science projects is not on educational, but scientific aims, as well as aims related to the well-being of a community. At the same time, **the participation of students, especially in terms of mass data collecting, will only become more significant in the future**, due to opportunities created by widespread use of digital technologies. That is the reason why **teachers should** be included into early stages of creating and developing citizen science projects, in order to **balance educational and project activities**, which puts them into a new role. That will be especially important in projects with vocational and specialized studies students, since **the nature of both studies puts greater emphasis on practical and applicable knowledge and skills**, which are more challenging to connect to science projects. However, the existence of such challenges does not make this need less important or irrelevant.

Well-being of a community

Vocational education

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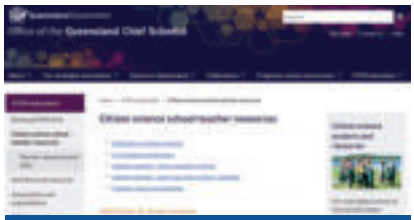

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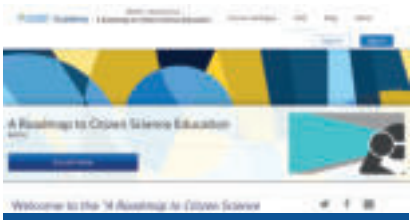

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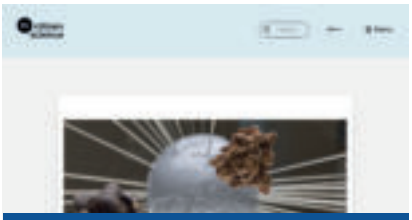

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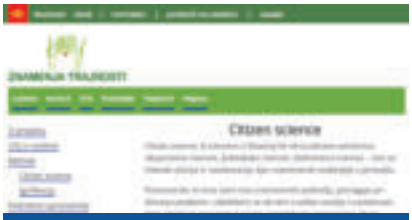

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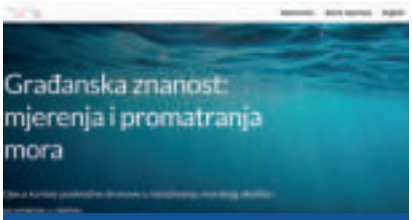

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1.2. Citizen science in vocational education for tourism

The aim of this chapter is to present readers with the particularities of occupations and the challenges of vocational education and specialized studies for tourism and hospitality, especially in terms of initiating and including citizen science projects.

After mastering the content of this chapter, reader will be able to:

- describe the most important particularities of vocational education and specialized studies
- explain the challenges in vocational education and specialized studies for tourism and hospitality
- point out the characteristics of occupations in tourism and hospitality
- explain the motivation for choosing a career in tourism and hospitality
- present the basics of citizen science projects in tourism
- interpret how citizen science projects in tourism need to be designed

Vocational education and training, as well as specialized studies, are mostly focused on competences needed for particular occupations. That is why **the aim of educational activities is to give applicable theoretical but primarily practical knowledge and skills**. Vocational education, vocational training and specialized studies encompass a wide spectrum of teaching methods and forms of learning in order to achieve such goals. Among them are apprenticeship, practical classes, work-based learning, vocational competitions, tutorials, counseling, experience - based learning, and mentorship. Vocational education and specialized studies therefore include three forms of learning: formal, non-formal and informal. This highlights the readiness of educational institutions and teachers to **easily accept different methods and approaches to education, and potentially citizen science as well**.

Teaching methods and forms of learning

Vocational education and specialized studies for **hospitality workplaces and providing various services for tourists in general, are conditioned by particularities of tourism as an occurrence**. Contemporary tourism is marked by prominent seasonality, spatial concentration, and geographical separation between supply and demand. This creates numerous social and economic challenges which are transferred onto students' motivation and the attractiveness of workplaces in general. Intercultural challenges in tourism create additional pressure. Also,

Motivation of pupils and students

hospitality demands a large number of people in workplaces that are poorly paid, and don't require high qualifications, but rather limited and specific skillsets.

Occupations in hospitality and tourism-related services are marked by **shift work, increased workload during weekends, public holidays and customary vacation time. Working hours reassignments are common, as is overtime and the night shift**. Some workplaces mean specific and difficult working conditions, some are physically demanding. Extremely uneven work rhythm and intensity are noticeable not just over the year or week, but even during a single work day. It is therefore somewhat **difficult to motivate candidates to enroll in qualification programs for hospitality and tourism**. All that can additionally affect students' motivation to participate in tourism-related citizen science projects.

Specific and difficult working conditions

However, it seems that the motivation for choosing a career in hospitality and other tourism-related services should not be simplified. Examples of highly motivated vocational and specialized studies students point towards **the existence of numerous internal factors in choosing one's occupation, not related only to income or work place appeal**. This often involves incentives related to satisfying primary social needs which can

Primary social needs

Photo: Zavod za turizem Maribor

be achieved through an interaction with tourists. Such needs may **include companionship, love, change, and even fun and affirmation**.

That is why it is reasonable to assume that citizen science projects in vocational education for tourism will need to be clearly **connected to psychological benefits that participants can achieve**. Projects should include new educational content and methods, lead towards the discovery of the unknown, and provide some fun as well. They should be designed to include team work and create opportunities for socializing. Work on projects should **encourage love for the values of the tourism destination, and even pride in these values**. Above all, participants' achievements should be adequately valuated and the sense of importance in participation should be emphasized. Citizen science projects designed in this way can simultaneously contribute to achieving **a wider spectrum of learning outcomes and increase the attractiveness of vocational education for tourism**. Finally, citizen science projects can include the activities of students and tourists at the same time.

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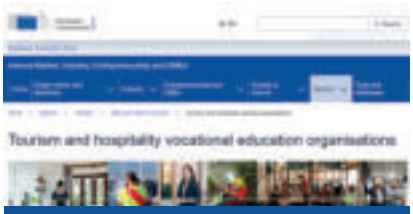

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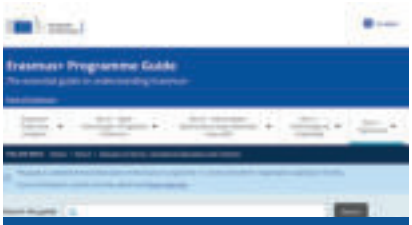

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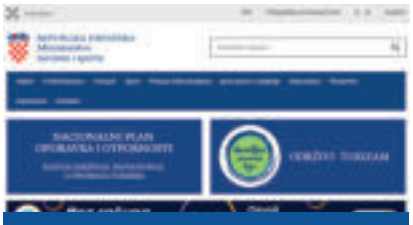

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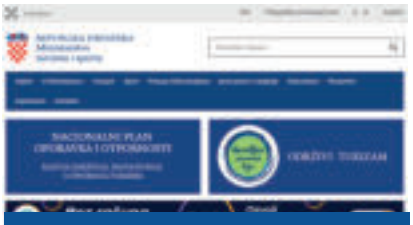

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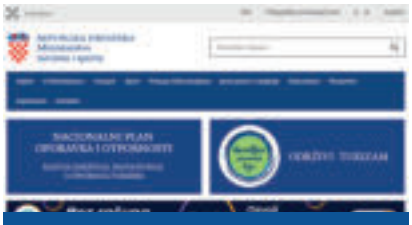

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1.3. Citizen science projects for tourists and about tourism

The aim of this chapter is to present readers with reasons, stakeholders, motivation and particularities of initiating citizen science projects in tourism and with tourists' participation

After mastering the content of this chapter, reader will be able to:

- explain different reasons why tourists travel
- describe how scientific tourism developed as a part of volunteer tourism
- present the particularities of including tourists in citizen science projects
- point out the scientific fields in which tourism research is conducted
- present stakeholders who can initiate citizen science projects
- interpret reasons for initiating citizen science projects

Tourism is a phenomenon which encompasses a wide spectrum of activities and relationships that are the result of tourist arrivals in an area. Tourists are unique travelers, who leave their permanent place of residence. They do this **occasionally, temporarily, in leisure time, without coercion or financial compensation, for personal pleasure**. Most commonly, they do this because of an activity which they cannot do at home. Even if they could, **tourism destination offers a wider activity range, in a more attractive surroundings or just cheaper than in their place of residence**. Tourists travel even to participate in citizen science projects!

Tourists are specific travelers

Such an occurrence is not surprising. Tourist attraction base includes natural and cultural heritage. It is a subject of interest for different sciences and included in research in which citizen science has been standard practice for a while now. Consequently, it is not unusual for **such projects to include not only citizens in a tourism destination, but tourists who visit it as well**. That is how scientific tourism developed as a sub-niche of volunteer tourism, due to its specific characteristic: the participation in citizen science projects. **Scientific tourism relies completely on the citizen science concept** on the one hand, and tourism as a phenomenon on the other.

Tourist attraction base

Scientific tourism

Unlike citizen science projects and volunteering that tourists don't take part in, volunteer tourism and consequently scientific tourism, rely on an

important premise that **tourists don't earn money in a tourism destination, but rather spend it**. This means that tourists who participate in citizen science projects are expected to cover the expenses of transport and accommodation. They are sometimes even expected to participate in research costs. It is not therefore uncommon for **citizen science projects to be seen from tourists' perspective as both a tourist attraction and a tourist product**. On the other hand, scientists who initiate citizen science projects that include tourists don't take into consideration only tourists' project involvement, but their financial contribution as well. This is a new way for **tourist expenditure to directly support the citizen science projects' budgets**.

Participation in research costs

Tourism also attracts the attention of scientists from different scientific fields and study areas. Considering the impacts tourism has on social and natural environment, it is understandable. That is why tourism-related research is connected not only with sociology, anthropology, psychology, geography, political science and ecology, but also with transport, law, economy, education, architecture, history and even kinesiology. **The results of tourism research can be implemented**

People engaged in tourism research

sociologists, anthropologists, psychologists, geographers, political scientists, ecologists, traffic experts, lawyers, economists, pedagogues, architects, historians, kinesiologists...

Photo: Turistička organizacija Srbije

equally in public and private sector operations. In public sector they can be used to make strategic and developmental decisions and to manage tourist flows in a destination. In private sector they can be used to make business decisions and to manage tourism and hospitality companies.

So far **citizen science projects related to tourism as an occurrence have been less present**, compared to other projects. It doesn't mean that will not change in the future. The fast advancement of technological options for mass data collecting and its spatial positioning, opens up new opportunities for citizen science projects in tourism. In areas affected by overtourism, citizens have already been mobilized by the need to limit tourism's negative impacts. This is especially related to **tracking and recording unwanted occurrences or tourist behavior and damage to heritage**. By recognizing the value of particular tourist attractions and reporting damage done to them, it is possible to include responsible tourists, not only concerned local community. In this way, support for sustainable tourism development can be ensured through cooperation between the community and tourists, concerned with caring for tourist attractions and the environment. The environment in particular presents an important issue in tourism development due to its potentially harmful impacts. The experience from numerous citizen science projects in this field shows that the inclusion of the community can significantly contribute to natural and cultural heritage protection from destruction, damage or undesignated use.

Overtourism

Community involvement

The initiator of citizen science projects focused on tourism as an occurrence can be any tourism stakeholder from private or public sector. Those can be interested citizen associations, educational and scientific institutions. It is therefore **logical to expect a higher engagement of tourist boards as destination management organizations, vocational schools and tourism colleges, as well as various scientific institutions**. It is possible to expect interest from different associations of tourist service providers, such as tourist guides, travel agencies and providers of household accommodation. Interests related to tourism in associations such as mountain climbers and guides, mountain rescue service, as well as cultural, arts and ecology clubs, cannot be ignored. It is also possible to include different heritage institutions in charge of cultural and natural heritage, such as libraries, archives, museums, and institutions that manage protected natural areas.

Stakeholders of the tourism system

Heritage institutions

Scientific institutions and scientists are first and foremost likely to suggest cooperative and support projects, based on their scientific interests. However, another accepted practice in citizen science is **creative projects, in which scientists and interested citizens work as partners throughout the project and in all its phases**. That is why the initiative to suggest and start a citizen science project lies with citizens

Scientific institutions

and other interested parties. These can definitely be vocational schools and colleges with specialized studies in hospitality and tourism. Unlike others, their interest includes **achieving learning outcomes with students through the involvement in citizen science projects**.

Vocational schools and colleges

Photo: Turistička zajednica Karlovačke županije

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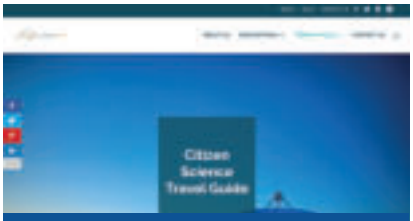

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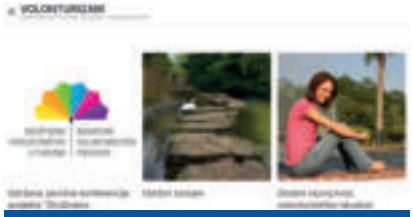

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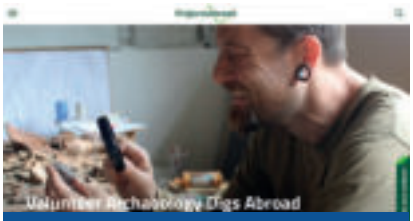

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2. Crowdsourcing projects in vocational education

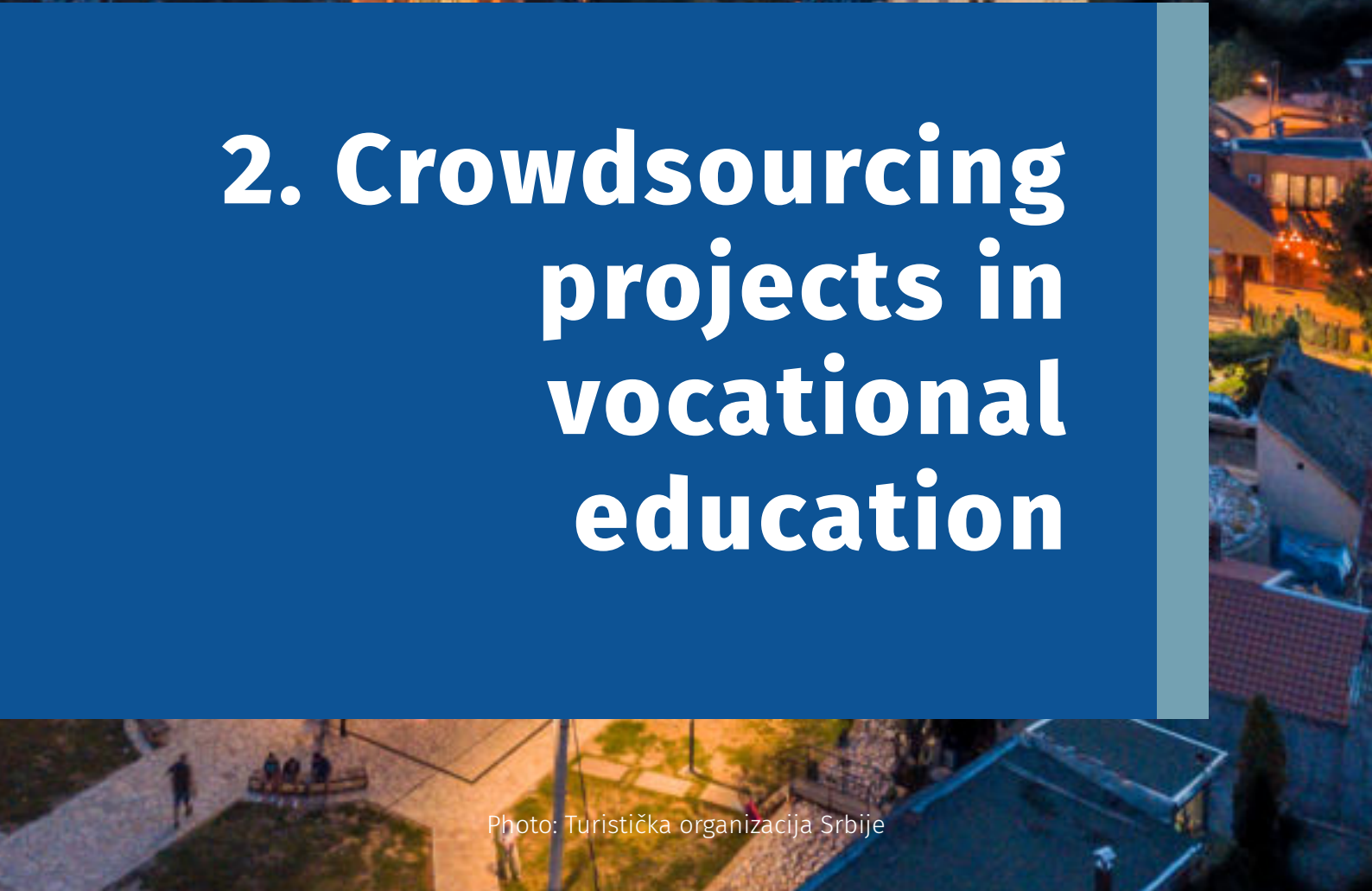

Photo: Turistička organizacija Srbije

Introduction

Crowdsourcing and citizen science are related but different terms and concepts. Crowdsourcing is utilized in a very wide range of activities and fields, depending on specific goals. In addition to being explicit, it can also appear in an implicit form, where participants may not even be aware of their involvement. Therefore, the first part of this chapter presents the concept, challenges, and use of crowdsourcing in citizen science. The challenges of using digital technologies and developing competencies for the use of crowdsourcing tools are particularly highlighted.

Open innovation, as a contemporary approach to product and service development, finds its application in tourism as well. Within the concept of open tourism, tourism organizations and companies approach innovations, knowledge, and service development by adopting ideas, solutions, technologies, knowledge, and other resources from the environment. Thus, the second part of this chapter describes the concept of open tourism, along with the prerequisites and specifics of applying open innovations in tourism. The most important examples of applying open tourism in practice are also presented.

Citizen science, crowdsourcing, and open innovation in tourism should become an integral part of the curriculum and activities in formal vocational education and professional studies for hospitality and tourism. It seems that their inclusion in formal curricula is not a straightforward process. Therefore, the last part of this chapter outlines the challenges, methods, opportunities, and barriers in implementing crowdsourcing projects in vocational education for tourism. Issues of the importance of assessing the potential and needs of participants in crowdsourcing are additionally clarified.

2.1. Crowdsourcing in citizen science and beyond

The aim of this chapter is to inform readers about the motives, benefits, and challenges of incorporating citizen science into formal education, especially regarding the specifics of its application and teachers' roles and competences.

After mastering the content of this chapter, reader will be able to:

- present the foundations of the crowdsourcing concept
- describe the evolution of the crowdsourcing concept based on specific goals
- explain the circumstances under which implicit crowdsourcing is used
- illustrate how the expansion of crowdsourcing impacts citizen science
- point out the challenges of using digital technologies in crowdsourcing
- interpret the importance of developing competencies for the use of crowdsourcing

Crowdsourcing

Crowdsourcing and citizen science, though related, are distinct concepts with different meanings. **Crowdsourcing - mass support as a result involves obtaining resources, services, ideas, or data from a large, undefined group of people**. The possibilities brought by the use of digital technologies, enabling effective communication among a large number of individuals, has accelerated the development of numerous crowdsourcing-based processes. Consequently, **the concept of crowdsourcing has evolved, depending on its specific goals**.

Today, several distinct terms exist within the realm of crowdsourcing, each with its own focus. Crowdfunding refers to the collective effort to gather funds, while **crowdworking** pertains to the distribution of tasks and the procurement of services. Additionally, crowdcomputing involves **distributing tasks** that individual computers cannot perform to a large number of collaborators via the internet. The internet has also facilitated crowdcasting, which targets creating a large user base for **broadcasting audio or video content, and** crowdfixing, which involves **collaborative actions to manage and maintain public spaces**. Other terms include crowdsolving **for problem-solving**, crowdvoting for **opinion expression**, crowdshipping for **package delivery and transport**, and crowdsearching for **locating solutions or lost items**. Similarly, crowdmapping refers to **collaboratively supported cartography**, and **crowdcreation** involves participation in **design and production processes**.

Besides these examples of explicit crowdsourcing, **implicit crowdsourcing also exists**. In such cases, participants may not even be aware of their contribution. The proliferation of mobile devices and digital platforms has further stimulated the use of crowdsourcing. New additional **possibilities for instant mass data collection have emerged due to the widespread use of GPS technology in mobile devices** and the development of high-speed wireless data transmission infrastructure (4G and 5G).

Explicit and implicit crowdsourcing

Innovations and the development of digital technologies that have facilitated the **expansion of crowdsourcing and mass data collection have also accelerated the growth of citizen science**. While the emphasis has traditionally been on involving large numbers of volunteers in data collection and processing, contemporary citizen science encompasses broader public participation in all phases of scientific projects. Therefore, crowdsourced data collection should be viewed as just one aspect or tool utilized by citizen science.

Development of digital technologies

Developing the necessary competencies for participation in citizen science projects is essential within the concept of lifelong learning and formal education. However, the **development of skills for using various tools and technologies employed in crowdsourced data collection** may

Lifelong learning

Photo: Zavod za turizem Maribor

be even more crucial than other competencies for citizen science projects. The extensive use and rapid advancement of crowdsourcing tools and digital technologies across various fields of life and work will impact a significant number of professions. Consequently, it is not surprising that this context is sometimes referred to as the appearance of the Third Industrial Revolution.

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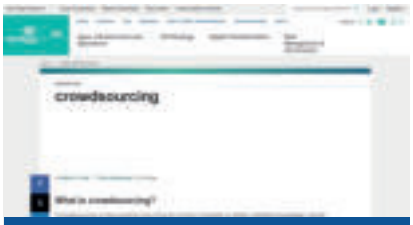

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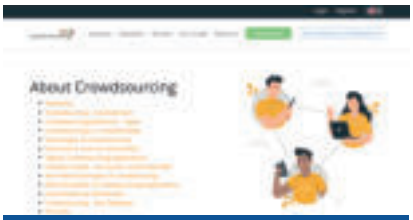

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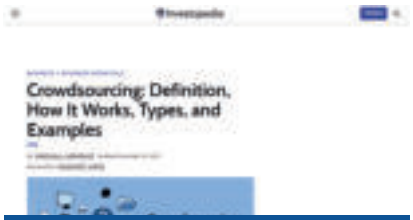

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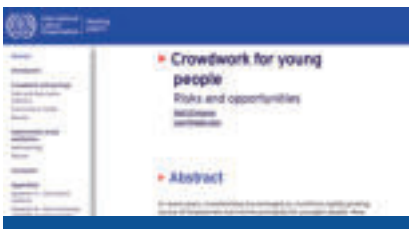

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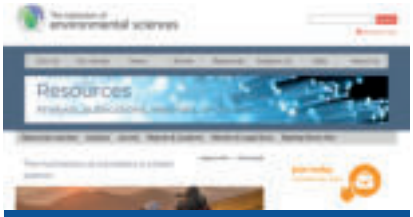

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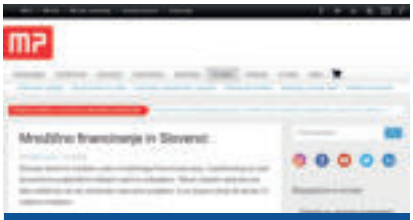

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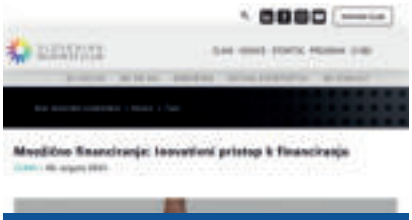

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2.2. Forms of crowdsourcing in open innovations for tourism

The aim of this chapter is to introduce readers to the concept, prerequisites, specifics, and examples of the application of open innovations in tourism, with a focus on practical examples.

After mastering the content of this chapter, reader will be able to:

- describe the concept of open innovations for tourism
- explain what needs to be achieved for the successful application of the open innovations concept
- present open tourism as a specific way of applying open innovations
- illustrate examples of open tourism in service development
- point out examples of open tourism in promotional activities
- interpret the benefits of crowdsourcing through gamification

Open innovations for tourism represent a new approach wherein tourism organizations and businesses engage with innovations, knowledge, and the development of their services. The fundamental premise of **open innovations is the adoption of ideas, solutions, technologies, knowledge, and other resources from the environment**. These are then integrated into new products and services or offered to the market as new ideas, solutions, technologies, knowledge, and resources. **Open innovations involve extending the innovation process well beyond the boundaries of a tourism organization or business**. In addition to environments close to tourism, such as universities, research institutions, and consultants, open innovations encompass interaction related to innovations with customers, users, and even competitors. The principle of open innovation is based on collecting ideas and suggestions from thinking patterns outside the conventional, encouraging changes that are not limited by the capabilities within the organization.

Open innovation for tourism

Open innovations **encompass a two-way exchange throughout all stages of the innovation process**. Therefore, it involves using input innovations and leveraging output innovations. To achieve this, it is necessary to create more permeable boundaries of action for the organization or business than was previously the case. **It is also essential to develop much more intense communication and complex relationships with a**

Inbound and outbound innovation

larger number of stakeholders in the tourism business environment. Given the complexity of tourism as a phenomenon and the typically high intensity of interaction with numerous stakeholders in their environment, tourism organizations and businesses can quickly adapt to the concept of open innovations.

Open tourism, along with the concept of open innovations and the co-creation process, uses various forms of crowdsourcing as a specific tool. This is similar to citizen science but on a much broader scale. In citizen science projects, the main goals are related to scientific research and the creation of new knowledge. Forms of **crowdsourcing in the concept of open tourism are used to achieve various public, business, and personal goals of the involved stakeholders**, and this exchange of values can generate measurable economic effects. Involving a larger number of stakeholders in the innovation process results in the sustainable development of tourism, which suits a broader spectrum of needs and goals of the individual stakeholders better.

Open tourism

There are already numerous **examples of using crowdsourcing in the hotel industry, travel intermediaries, and tourism destination management**. Projects in the hotel industry are particularly indicative, mainly due to the increasingly pronounced division into three levels of key stakeholders who create the hotel product: **companies that own properties, the owners of hotel brands, and companies that manage**

Crowdsourcing in tourism

Photo: Turistička organizacije Srbije

operations. Hotels have quickly embraced the concept of open innovations in many areas of business process improvement, service quality, and marketing, which can be found in practice. Naturally, there are also many examples of **raising funds for the construction of smaller and alternative accommodation facilities** through crowdfunding.

Digital technologies

For instance, dilemmas in hotel and room design, and even the selection of furniture and renovation methods, have been successfully resolved using digital technologies and crowdsourcing. **By using crowdsourcing tools, many hotel companies have significantly improved traditional methods of researching guest satisfaction**. Guests are encouraged to share their ideas for possible improvements through continuous feedback. This is possible in the areas of developing new services, improving business procedures, and customer relations. There are also examples of providing advice to hotel management and other guests on the use of amenities in the hotel and the tourism destination.

Viral marketing

In the field of marketing, there are common new practices that utilize the concept of crowdsourcing. Viral marketing is nothing more than using crowdsourcing to spread a promotional message. There are also examples of using the concept of crowdsourcing by employees, students, and pupils in testing promotional campaigns. However, crowdsourcing also provides greater opportunities for marketing research involving potential demand. In addition to explicit support through assistance in analyzing the content of marketing campaigns, various methods of implicit crowdsourcing are often used by collecting and analyzing data from social networks and popular tourist applications. There is a significant quantity of textual, photo, and video content available, most of which is also geotagged.

Marketing research

A special form of crowdsourcing is through gamification. By using the design and concept of computer games, it is possible to collect extensive information or reactions from the crowd. Playing games and assuming virtual roles in games is a strong motivator and attracts highly engaged crowds. Support through gaming can have various goals. It can involve identifying the target audience that needs to be prioritized in marketing efforts based on their engagement. Through gaming, it is possible to contribute to the values of a tourism company or destination and raise awareness of them. Likewise, gaming can increase the level of involvement and connectivity. Ultimately, gaming can encourage an increase in the level of competence in using the services of a tourism company or in knowledge of a tourism destination.

Gamification

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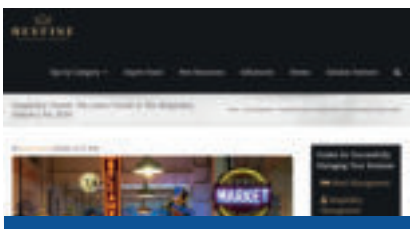

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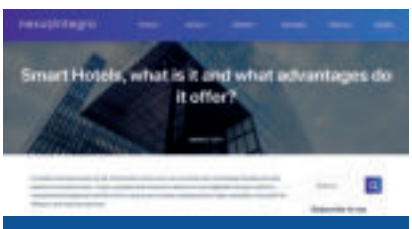

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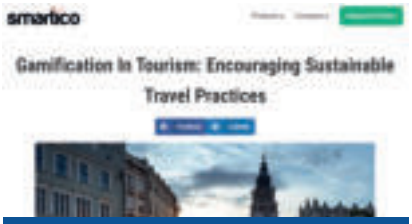

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2.3. Crowdsourcing projects in vocational education for tourism

The aim of this chapter is to guide readers through the challenges, methods, opportunities, and barriers in implementing crowdsourcing projects in vocational education for tourism, especially in terms of assessing the potential and needs of participants in crowdsourcing.

After mastering the content of this chapter, reader will be able to:

- describe the challenges of adapting formal learning outcomes to the application of crowdsourcing.
- explain how to align educational objectives with the objectives of crowdsourcing.
- illustrate the importance of assessing the potential of participant groups in crowdsourcing.
- present the importance of specific interests and needs of participants in crowdsourcing.
- point out the most significant obstacles that can affect crowdsourcing projects.
- interpret opportunities for integrating vocational education and crowdsourcing tools.

Citizens science is just one way in which crowdsourcing projects can be utilized. Considering that crowdsourcing projects in tourism encompass a broader spectrum of goals, **in vocational education for tourism, besides citizen science projects, other forms of crowdsourcing should also be taken into account**. Given their existence and expected rapid development, it is necessary to assess to what extent existing learning outcomes in formal curricula of vocational education in tourism are adapted to them. Involving students and teachers in crowdsourcing projects in tourism likely poses the same challenges as involving other individuals in crowdsourcing.

Learning outcomes of formal curricula

First and foremost, it is necessary to clearly define the goal of the crowdsourcing project, i.e., **whether the goal proposed by the project leader aligns with the objectives of the educational institution, students, and teachers**. If there are no other highlighted goals, it should be kept in mind that every crowdsourcing project involves at least sharing information, project management, and marketing, as well as the development of digital competencies. Therefore, the development of

The goal of the project

competencies that will enable independent crowdsourcing project leadership within tourism organizations should be the main goal.

In projects of crowdsourcing in vocational education, **it's especially important to assess the potential of the group that the project should encompass**. The relevance of the group is the most important criterion. It's equally important that the group is neither too small nor too large. In the first case, it could lead to project's goals not being met. In the second case, resources might be unnecessarily spent without additional contribution to the project's goal. **It's crucial to clearly offer the selected group a suitable incentive**. Additionally, participation and project work procedures must be simple and understandable. Specific interests and needs that participants will satisfy in the project must be considered. **These are mainly primary social needs: for exploration, change, companionship, love, fun, and affirmation**.

Assessment of the potential of the target group

Despite positive incentives, **there are numerous obstacles that can affect the initiation and implementation of a crowdsourcing project in vocational education for tourism**. Firstly, there are sociocultural barriers, where a lack of a positive atmosphere for acting in the general interest can lead to a lack of reaction. There are also formal obstacles, making it seem difficult to initiate and conduct such projects. Formal barriers can

Participation and work procedures

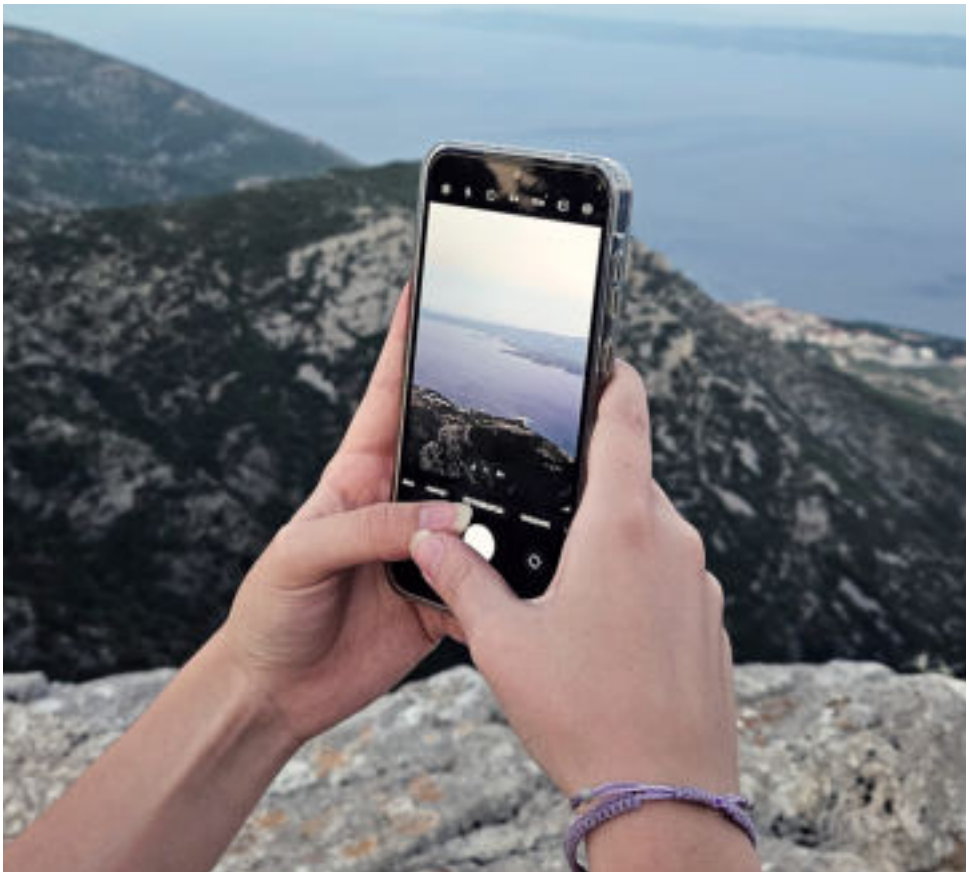

Photo: Turistička zajednica Karlovačke županije

be internal, often due to rigid enforcement of procedures within the institution, but also external in terms of the absence of a clear regulatory framework or excessive regulation. Informational barriers can also have a negative impact, too little or too much information can affect the project. Organizational barriers may arise due to limitations on the time participants must dedicate to the project, especially if the project is carried out when more important activities should take precedence.

Project obstacles

- *sociocultural*
- *formal*
- *information*
- *organizational*

In education, there are also examples of using crowdsourcing. Therefore, **techniques of crowdteaching and crowdlearning** are already being used. In the former case, digital technologies are used to create, share, and utilize teaching materials. In the latter case, it involves a form of participatory learning where students exchange information, ideas, and content using digital technologies and also teach each other. Given that vocational education and professional studies **strongly connect specific competencies to certain professions**, projects of crowd support in teaching and learning should be tailored accordingly. In the case of vocational education for tourism, these are specific **jobs for positions in hospitality and providing services to tourists**. Therefore, projects of crowdsourcing in vocational education for tourism must focus on aligning learning outcomes with these professions.

Crowdsourcing in education

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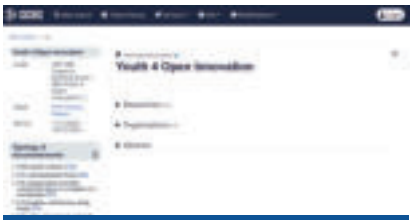

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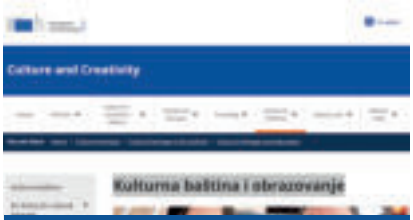

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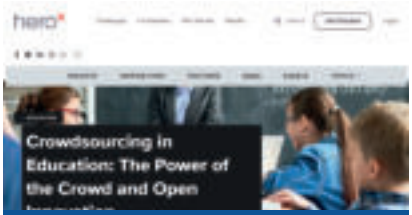

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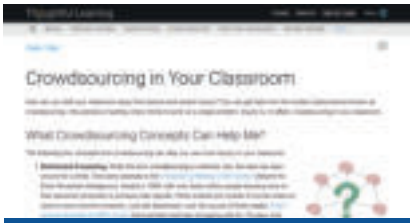

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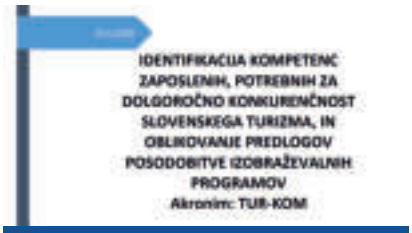

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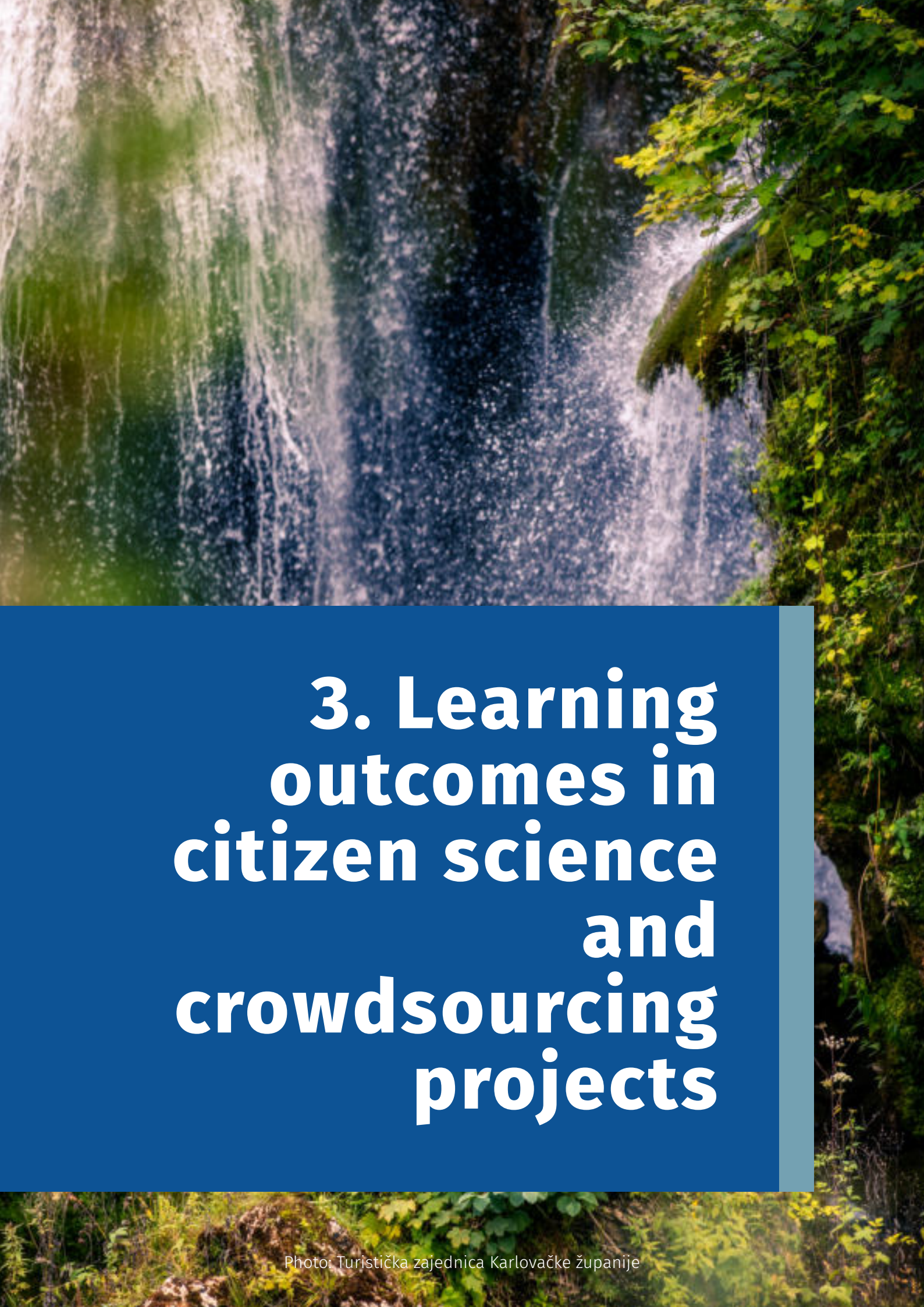

3. Learning outcomes in citizen science and crowdsourcing projects

Photo: Turistička zajednica Karlovačke županije

Introduction

Competence approach to planning educational activities is a common standard in educational institutions. Understanding the concepts of competences and learning outcomes is a necessary prerequisite. The same applies to the needs of implementing citizen science and crowdsourcing projects, while respecting certain particularities. That is why the concepts of competence and learning outcomes are presented in the first part of this chapter. They are particularly clarified in terms of the context, purpose and challenges of determining learning outcomes in crowdsourcing projects.

Defining learning outcomes is not a simple task. Because of this, stating learning outcomes is often missing or poorly done in citizen science and crowsourcing projects. However, the success of projects often depends on this, so it is necessary to overcome this challenge. That is why the challenges, elements, models, taxonomies and context of defining learning outcomes are presented in the second part of this chapter. A special attention is given to defining learning outcomes in crowdsourcing projects in tourism.

In contemporary education, which is based on the constructivist approach and the process of constructive alignment, pupils/students are in the center of attention. When creating teaching content, it is common to start with defining the necessary learning outcomes, then design teaching methods, and finally evaluate the realization of learning outcomes. For this reason, the last part of this chapter presents the challenges of applying constructive alignment in citizen science projects. In particular, challenges are presented in terms of determining learning and teaching methods and selecting appropriate procedures for evaluating the acquired learning outcomes.

3.1. Application of the concept of learning outcomes in citizen science and crowdsourcing projects

The aim of this chapter is to introduce readers to the concepts of competencies and learning outcomes, particularly in terms of the context, purpose, and challenges of determining learning outcomes in crowdsourcing projects.

After mastering the content of this chapter, reader will be able to:

- present the concept of competencies and learning outcomes
- explain the difference between general and specific competencies
- point out how well - formulated learning outcomes are helpful
- present the context and purposes in which learning outcomes are used
- illustrate the need for defining input and output learning outcomes
- interpret why learning outcomes should be considered when creating projects

The competency-based approach to planning educational activities is a common standard in educational institutions. Therefore, it is useful to understand the concept **of competence as a characteristic of an individual that simultaneously encompasses knowledge, skills, and values acquired through schooling**. This education can be formal within an educational institution or non-formal through various other educational programs. Additionally, learning can also be informal - from personal experience and influences from the social environment, rather than from structured educational content. **The understanding of the teaching process is shifting from a traditional focus on the teacher and the teaching content to a new approach that emphasizes the learner's relationship with the subject of study**.

Formal and non-formal education

The learning outcome is linked to the creation of general and specific competencies. **General competencies are transferable across various areas of life and work (literacy, foreign languages, critical thinking, etc.), while specific ones are tied to a particular profession**. To effectively

General and specific competencies

develop the desired competencies in an individual during the educational process, it is necessary to define learning outcomes. Namely, **competencies are linked to the individual, while learning outcomes are related to the educational process**. By assessing the acquired learning outcomes, it can be determined whether someone has the appropriate competencies.

Characteristics of learning outcomes

Learning outcomes are essentially records that express what a participant in an educational process will know, understand, or be able to do after the process is completed. Clearly written learning outcomes help in better understanding the results of the educational process. This is beneficial for students, educators, and employers because they will have a clear picture of the competencies acquired during schooling. Therefore, **it is important that learning outcomes are measurable and specific and that they encompass an appropriate level of independence and responsibility**.

Use of learning outcomes

Learning outcomes as a concept are used in a broader context and for various purposes. They are regularly found in **educational contexts: in curricula, qualification standards, syllabuses, and descriptions of educational programs**. However, learning outcomes are also commonly applied in **work contexts: in job standards, job descriptions, job profiles, and even in job advertisements. On a personal level, learning outcomes**

Photo: Zavod za turizem Maribor

can be found in resumes and personal competency profiles. All of this indicates that the use of outcomes is important in the concept of continuous lifelong learning, to which participation in citizen science and crowdsourcing projects contributes.

Input and output learning outcomes

It is important to define learning outcomes regardless of whether **citizen science and crowdsourcing projects are conducted as part of regular activities in educational institutions or as part of non-formal educational activities**. Each of these projects presumes the prior possession of certain competencies for effective participation, but specific competencies are also developed through a project. Therefore, it will be necessary, at the very least, to define what the input and output learning outcomes are. If the learning outcomes are well-defined, they will **provide project participants with a clear picture of what they need to know and be able to do if they want to join the project, as well as what they will be able to learn through project participation**.

Although it may seem that learning outcomes in citizen science and crowdsourcing projects should only be considered at the end, when the projects are defined, this is not a good approach. Projects that set **entry competencies for participants at a level that may limit the participation of the desired number of users often don't succeed**. Similarly, projects that **do not anticipate the acquisition of new learning outcomes will not be able to equip interested participants to take part in the project**. Even more importantly, **if the acquisition of new learning outcomes through the project is absent, there is a relatively limited space for meeting participants' needs** for exploration and affirmation.

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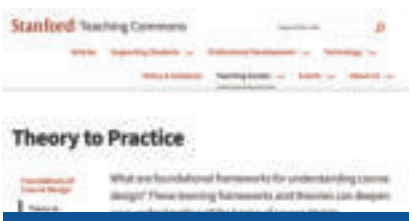

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3.2. Challenges of defining learning outcomes in citizen science and crowdsourcing projects

The aim of this chapter is to introduce readers to the challenges, elements, models, taxonomies and context of defining learning outcomes, especially in terms of defining learning outcomes in crowdsourcing projects in tourism.

After mastering the content of this chapter, reader will be able to:

- describe the challenges in defining learning outcomes
- explain what the learning outcomes should be
- present the elements that make up the record of learning outcomes
- illustrate the components of the two-dimensional model of Bloom's taxonomy
- point out the importance of defining the context of learning outcomes
- present an example of defining learning outcomes in a crowdsourcing project in tourism

Defining learning outcomes

In all **citizen science and crowdsourcing projects, learning outcomes are listed as specific records of required or acquired competencies**. The question is whether they are explicitly stated. If they are explicitly listed, the question is whether they are well-defined. **Defining learning outcomes is not a simple task**. Therefore, it is often the case that even in an educational context, where well-defined learning outcomes are expected, this is not done appropriately. It is not, therefore, surprising that in citizen science and crowdsourcing projects, the listing of learning outcomes is either omitted or not done well.

Levels of independence and responsibility

First and foremost, **learning outcomes must be clear, precise, and measurable**. In the record of learning outcomes, **the level of independence and responsibility must be visible** (explicitly or implicitly). Proper learning outcomes will make it clear to both the student and the teacher how certain knowledge/skills will be demonstrated and how the teacher will determine this. From precise learning outcomes, it is **evident what exactly the student is capable of knowing or doing**. A learning outcome where it is not clear what constitutes a satisfactory versus an

unsatisfactory level of outcome is not measurable. The issue of the required level of independence and responsibility is assumed in the records of outcomes. However, **if the level of competencies in an outcome is such that the student will know or be able to do something only if someone else's participation or approval is necessary, this needs to be highlighted**.

Record of learning outcomes

Learning outcomes are **records that always consist of an active verb, a concept, and the context in which a competence is applied**. To correctly compose a record of a learning outcome, it is necessary to understand how **active verbs define cognitive processes, how concepts define different types of knowledge, and how a specific application of that knowledge is defined by the context**. Without an appropriate theoretical framework and knowledge of a particular profession or science (except in the case of some generic competencies), this is practically unfeasible. **Therefore, defining learning outcomes should not be undertaken without appropriate competence**.

Models and taxonomies

There is already extensive scientific literature, numerous manuals, and guidelines available on the Internet about creating records of learning outcomes. Educational institutions often conduct non-formal teacher education for writing learning outcomes, and learning outcomes creation competence is also found among the learning outcomes of formal educational programs for teachers. **Models and taxonomies are used for**

Photo: Turistička organizacija Srbije

creating records of learning outcomes to help with systematic and precise creation. With a little effort and the use of these models and taxonomies, it is possible to quickly master the skills of defining learning outcomes.

The best approach **is to use the revised Bloom's taxonomy as a two-dimensional model**. This way, both the dimension of cognitive processes and the dimension of knowledge are simultaneously encompassed, and they are the most important parts of any record of learning outcomes. **The dimension of cognitive processes is represented by active verbs that denote cognitive processes on six different levels (remembering, understanding, applying, analyzing, evaluating, and creating)**. There are numerous manuals and guidelines that recommend appropriate active verbs for each level.

Bloom's taxonomy

The dimension of knowledge should be determined among four different dimensions (factual, conceptual, procedural, and metacognitive). At the factual level, one should know **basic facts about something**, primarily **terms and parts**. **Conceptual knowledge is related to general** principles and relationships among facts, such as theories, models, categories, classifications, principles, and various generalizations. Procedural knowledge refers to cognitive skills in terms of **using certain procedures, techniques, and methods**. Metacognitive knowledge implies **knowledge about cognition itself,** in terms of self-awareness, context, and conditions for solving tasks.

Dimensions of knowledge

When creating records of learning outcomes, **each record should be placed in the appropriate context**. Listing the main parts of an anti-burglary door and listing the main parts of a nuclear reactor are completely different learning outcomes due to the context. Essentially, in the cognitive dimension (remembering - listing) and the level of knowledge (knowing the main parts), it may seem like the same competence. However, it is not; ***each learning outcome, besides the concept*** (knowing the main parts), **must have an appropriate context that defines it** (anti-burglary door or nuclear reactor).

Concepts and context of learning outcomes

When designing citizen science and crowdsourcing projects, it is necessary to **define well which competencies are required for each group of participants in the project**. This, of course, depends on the level of citizen science projects and the tasks involved. In support projects for data collection and simple analysis, the level of cognitive processes and knowledge will be lower, and this also applies to learning outcomes. In collaborative projects, for people participating in defining the experiment and interpreting the data, the level of learning outcomes will be higher, and the context broader. For creative projects, especially at

Competences

the level of project design and defining new knowledge, the highest levels of learning outcomes will be required.

Similarly, as in citizen science, **crowdsourcing, which involves data collection, will require participants for whom lower-level learning outcomes are sufficient**. In crowdsourcing projects for solving problems or creating new ideas, higher-level learning outcomes will be needed. However, **all citizen science and crowdsourcing projects can deliberately develop new competencies, which need to be expressed in learning outcomes**. When it comes to tourism, these outcomes, in the contextual part, face challenges from tourism as a phenomenon.

Lower-level learning outcomes

Higher-level learning outcomes

Photo: Zavod za turizam Maribor

For example, in a project aimed at collecting spatial data about tourist attractions, participants who will collect data in the field must have a specific competence. The record of this outcome could be: **use (cognitive level of applying) a mobile phone in crowdmapping (procedural level of knowledge – concept) of tourist attractions (context – tourist attractions)**. Participants who will assess the relevance of entered data need other competencies. The record of this outcome could be: **evaluate (cognitive level of evaluating) the description of components of cultural heritage (factual knowledge about something – concept) as tourist attractions (context)**.

Record of learning outcomes

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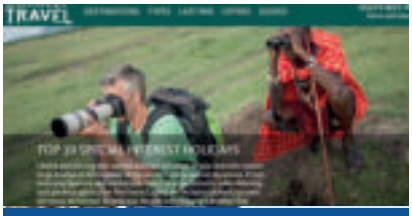

Docebo

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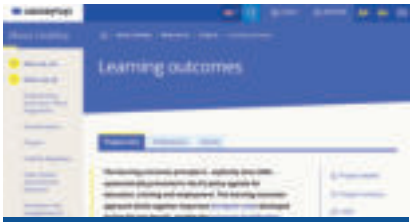

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3.3. Challenges of acquiring and evaluating learning outcomes in citizen science and crowdsourcing projects

The aim of this chapter is to introduce readers to the challenges of applying constructive alignment in citizen science projects, especially in terms of determining learning and teaching methods and procedures for testing the acquired learning outcomes.

After mastering the content of this chapter, reader will be able to:

- describe what the constructivist approach to learning is based on
- present the process of constructive alignment
- point out why the learning outcomes need to be stated in the project description
- present possible learning and teaching methods in citizen science projects
- illustrate different procedures for evaluating the acquired learning outcomes
- interpret which verification procedures are appropriate in citizen science projects

Constructivist approach

Contemporary teaching methods are primarily based on the constructivist approach. It starts from the **assumption that learning is the result of the construction of knowledge**. In this approach, teachers and pupils/students create the final result together. Teachers are responsible for creating conditions and choosing methods, and pupils/students for the construction of knowledge. At the same time, **pupils/students are at the center of the educational process, because learning outcomes are realized through their activity**. That's why, when creating teaching content, the starting point is the necessary learning outcomes, followed by the design of teaching methods and ending with the evaluation of the achievement of these learning outcomes.

All this is necessary to do when designing citizen science and crowdsourcing projects. **Competences that are necessary for inclusion or that can be acquired through participation in the project should be**

expressed in the form of a record of learning outcomes. Then it is necessary to design educational activities and conditions that will result in these learning outcomes. In the end, it is necessary to determine in an appropriate way whether these outcomes have been achieved at the expected level. This process is called constructive alignment. **In educational institutions, this is an established practice, but in the case of citizen science and crowdsourcing projects, this task is usually not approached systematically**.

Constructive alignment

Citizen science and crowdsourcing projects are fundamentally based on the assumption that the participants already possess the input competencies for participation. This assumption may be based on education level or expected as a result of lifelong learning. Some specific competencies will be acquired through informal learning within the project. **Citizen science and crowdsourcing projects do not always approach the description, acquisition and evaluation of required learning outcomes using constructive alignment**. However, with projects that educational institutions participate in and include them in their educational activities, the alignment of outcomes, teaching and evaluation is a common standard.

Prerequisites for participation

When planning the inclusion of participants in any citizen science and crowdsourcing project, it is **necessary to determine at the initial stage**

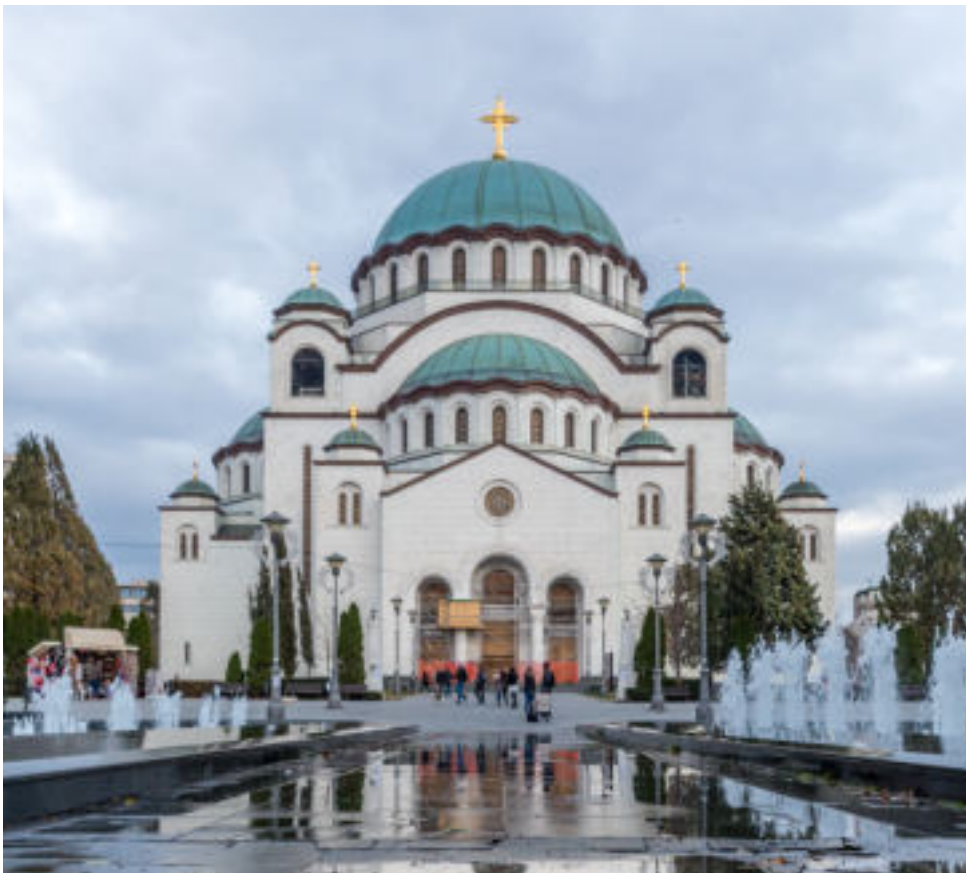

Photo: Turistička organizacija Srbije

what competencies they need to participate in the project. They should definitely be stated in the form of learning outcomes as a prerequisite for participation. It is also necessary **to assess whether there are enough potential participants who possess these competencies**, especially in crowdsourcing projects. Namely, if a crowdsourcing project requires the involvement of a specific group that does not use certain technologies or does not have the necessary knowledge and skills, the project will probably fail. In that case, **educational activities should be developed within the project, aiming at acquiring the necessary learning outcomes**.

Description of the project

It is important to identify and clearly present all learning outcomes to be acquired through the project in the project description. These **outcomes can result from educational activities that introduce participants to the project, but can also be part of the project's goals for all participants, regardless of their previous competencies**. The learning outcomes within the project can be different depending on the roles and tasks in the project, so they should be presented that way. Namely, for some participants, **the acquisition of some specific learning outcomes can be a strong motive for participation**. That is why it is important to formulate them precisely so that the project participants can later list them in their resumes and personal competency profiles.

Educational activities

After learning outcomes have been defined according to the necessary competencies for all key tasks in the project, **it is necessary to assess which educational activities should be included**. Teaching conditions and methods should be adapted to the available time of the participants and the goals of the project, and especially to the level of individual learning outcomes. It is possible to plan all traditional teaching methods. For some projects, **methods of a higher level of teacher involvement (direct teaching) will be more appropriate, and for some, minimal direct teacher involvement (independent learning) will be enough**. It is possible to include the methods such as discovery learning, collaborative and independent learning within the project, for which it is necessary to provide **appropriate prerequisites and teaching aids**.

Verification procedures

In citizen science and crowdsourcing projects, it is necessary to check whether the planned learning objectives have been achieved. At the same time, **it should be taken into account that depending on the level of cognitive processes in the learning outcome, an appropriate verification procedure is applied**. For the memory level, it is possible to use tasks that require recognition, definition or listing. For the level of understanding, tasks that require interpretation, description or summarization are appropriate, and for the level of application, tasks that require demonstration, solving, and use are needed. **For higher levels of cognitive processes, such as analyzing and evaluating, more complex verification methods should be applied**. These can be

discussions, essays, and seminars with assignments that require more complex analysis, classification, comparison, evaluation, ranking, and re-examination. Finally, for the level of creation, the most complex procedures, requiring creation, designing, proposing and concluding, should be used.

The evaluation of learning success should be **carried out taking into account all three types of evaluation: diagnostic, formative and summative**. It is useful to do a diagnostic evaluation at the beginning of the project in order to check the existing situation, before changes that are the result of education occur. Formative evaluation during the implementation is important in order to continuously check if the desired effects are being achieved. Summative or final evaluation includes an overall verification of the achievement of learning outcomes. In addition to evaluating the achievements of the participants, **the final evaluation must also include the evaluation of the teacher and the educational program**.

Final evaluation

Photo: Zavod za turizam Maribor

In citizen science and crowdsourcing, it is not necessary, and often **not even appropriate, to implement traditional types of formal evaluation, such as oral or written exams**. It is possible to use methods of observation, presentations, games, quizzes, competitions, discussions, portfolios and the like. At the same time, it must not be forgotten that **it is necessary to appropriately evaluate each form of teaching, and the teaching load distribution**. In citizen science and crowdsourcing projects, there will very often be independent work by pupils and students, workshops, projects and field lessons, so appropriate evaluation should be provided for them as well.

Adequate valuation

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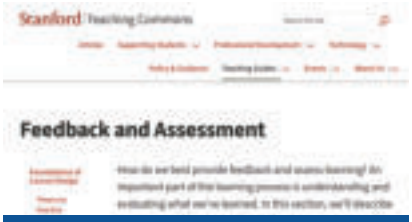

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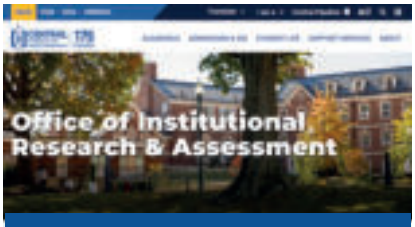

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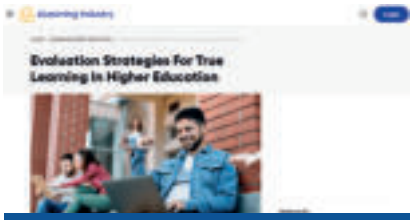

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4. Citizen science and crowdsourcing in practice

Photo: Zavod za turizem Maribor

Introduction

Different stakeholders in tourism and educational system can initiate and implement citizen science and crowdsourcing projects in vocational education for tourism. It is essential that these projects align with the capabilities of citizen science and crowdsourcing as effective methods for solving specific problems. That is why the first part of this chapter shows the options for initiating citizen science projects in vocational education for tourism. The emphasis is on challenges presented by main goals, key issues, stakeholders, benefits, project preparation and implementation.

Among the greatest challenges in the implementation of citizen science and crowdsourcing projects is the stakeholders' inclusion. That is why the second part of this chapter presents the necessity of appropriate choice of stakeholders in citizen science projects in tourism. The emphasis is on the quality identification and analysis of potential partners, and the inclusion of a higher number of different stakeholder groups.

Citizen science and crowdsourcing projects are the result of the development of digital technologies and a valuable example of the benefits of their implementation. However, a basic or traditional use of these technologies is no longer sufficient. That is why the third part of this chapter describes the benefits, results and importance of innovative use of multifunctional digital devices, especially in terms of challenges and opportunities that citizen science projects present in vocational education for tourism.

The implementation of any project can be a demanding task. In the case of citizen science and crowdsourcing projects, it can be even more so. Also, projects in vocational education for tourism create very particular implementation challenges. That is why the last part of this chapter presents specific issues, procedures, activities, and responsibilities in the implementation of citizen science and crowdsourcing projects in vocational education for tourism.

4.1. Challenges in initiating citizen science and crowdsourcing projects in vocational education for tourism

The aim of this chapter is to inform readers of the possibilities of initiating citizen science projects in vocational education for tourism, especially in terms of main goals, key issues, stakeholders, benefits and challenges in their preparation and implementation.

After mastering the content of this chapter, reader will be able to:

- present potential initiators of citizen science projects in tourism
- explain the importance of taking interest in solving problems in tourism
- point out questions that problem analysis needs to answer
- illustrate the key issues in the preparation of citizen science projects in tourism
- point out the key challenges in the implementation of citizen science projects in tourism
- interpret the main benefits of citizen science projects in tourism

Many sides may initiate a citizen science project in which crowdsourcing tools are used. When it comes to vocational education for tourism, it is possible the initiator will be one of the usual tourism stakeholders. They can be public authorities and their representatives on national, regional or local level. Or, they can be tourist boards of different levels as destination management organizations. It is possible to expect initiative from professional associations, such as hoteliers, travel agencies or tourist guides. Initiative may come from various groups connected with tourism, such as mountaineering, camping, motorsport, fishing, hunting, or ecology associations. The suggestion may be given by hospitality and service-providing companies, as well as companies who supply them with goods and services. Initiators may be scientific and educational institutions, such as institutes and universities. Of course, they may also be vocational schools and colleges related to hospitality and tourism. The initiators may be teachers, as well as students.

Subjects of the tourism system

The first step of the project is presenting an initiative. Usually, the initiator has a problem which he wants to solve by starting a citizen science project. The interest **to solve the problem may be of business, public, scientific, social, or even personal nature**, depending on how the initiator approaches the issue. The solution of the problem that simultaneously satisfies several interests will later enable connections between wider groups of project stakeholders. However, all problems cannot be solved through citizen science projects, and some may be handled much more efficiently by using a different method.

In order to make a decision about initiating a project, **problem analysis must be conducted first**. It is useful to answer several questions:

- Is it even possible to solve the problem?
- Is citizen science and crowdsourcing the appropriate method for solving the problem?
- Will the solution cover wide interest areas for stakeholders or be of public interest?
- Is the scope and complexity of the problem proportioned to resources that can be allocated?
- Can the problem be subdivided into smaller problems which could be solved through separate projects?
- Does solving the problem include activities that can satisfy multiple needs of potential participants?

It is also possible to add some specific questions related to the type of project in order to do a more thorough problem analysis.

The answers to questions listed should indicate whether the project is a good opportunity for a tourism-related vocational educational

Photo: Turistička zajednica Karlovačke županije

institution, its students and teachers. First, the opportunity should be related to achieving educational aims. Second, it is necessary to think about how to define project aims. For example, the problem of a non-existent tourist attraction database can lead to setting the main goal of producing such a database. However, this is definitely not the main goal for an educational institution. That is why **specific project aims are to be devised, and allocated to the institution, teachers and students**. It would be good if, within such a project, the institution could advance its curriculum with new learning outcomes, teachers could use new teaching methods, and students could gain new competences. We should keep in mind that other project participants may have their own specific goals as well.

Educational goals

Before initiating or deciding on project participation, it must be **checked if the set goal can be achieved through a citizen science project**. Projects with unclear goals or hidden agenda need to be rejected. Then, assessment must be made to see if the set goal will actually solve the problem. The next step is to answer the question if the set goal's realization deserves participation of a wider group of people or if it is possible to solve it without crowdsourcing. Material and financial resources needed to accomplish the goal should also be evaluated, as well as their scope and availability.

Material and financial resources

Citizen science projects that include crowdsourcing have a purpose in situations in which a large number of people are needed to collect a large quantity of data. That is why **an assessment needs to be made about whether achieving the set goal requires participation of many people in collecting a large amount of data**. Complex and sensitive scientific procedures should be avoided in citizen science projects, as a large number of volunteers may be unwilling or unable to implement them consistently. That is why the question of whether achieving a set goal includes too complex scientific procedures for volunteers to implement should also be answered beforehand. The final and possibly the most important question is the motivation of participants. It has to be clear **if the achievement of the set goal motivates the participants** enough.

Motivation of participants

There are certain factors that can have an extremely negative impact on the implementation of citizen science projects that include crowdsourcing if they are neglected prior to project's initiation. In citizen science projects **a relatively large number of people need to spend relatively little time to make a project successful**. That is why a good estimate of the time needed and the number of key participants is essential. Alternatively, the availability of resources to finance work expenses of the key participants must be determined. The second factor needed for crowdsourcing projects is the access to IT infrastructure.

Key participants

IT infrastructure

Collecting a large quantity of data can create pressure on stakeholders' IT resources. That pressure grows with the quantity of collected data, due to the reliability of technology and equipment, adaptability of software solutions, data security, and personal data protection. That is why **a good estimate of realistic capabilities of the available IT infrastructure is needed**.

Quality assurance

Quality assurance is a significant challenge in citizen science projects. This relates not only to the quality of collected data, but to all quality aspects of the project work in general. Especially important are issues of timeliness, systematics, completeness, and bias. It is necessary to define **who and how will ensure all aspects of quality for the duration of the project**. In some projects, there will be certain risks for the participants, too. If risks exist, they should be mitigated and proactively managed. If that is not possible, or if there are serious risks for participants' health and safety, it might be best to avoid such projects.

Photo: Turistička organizacija Srbije

There are numerous legal challenges involved in implementing citizen science projects. One is a matter of collecting, using and protecting

personal information of the participants. Another matter is the protection of minors who are involved in the project. There is also the copyright issue, as well as specific conditions related to project volunteering and workers' rights regulations. What must also be considered is the potential scope of communication among a large number of coworkers, communication channels, and the intensity of communication in certain project phases. Social media networking makes these challenges significantly easier. However, one must not forget that in some circumstances and for some participant groups using traditional channels and methods of communication is a necessity.

Legal challenges

Although it may seem that there were more reasons against engaging in citizen science and crowdsourcing projects listed here, in practice, **citizen science and crowdsourcing are an irreplaceable approach to solving certain problems**. When project goals are clearly defined and implementation challenges are thoroughly analyzed beforehand, citizen science offers a highly democratic method of benefit-sharing, which accommodates a wide range of stakeholders' interests. Therefore, it provides more benefits than disadvantages. Also, **mass involvement can solve some key issues which are crucial in initiating a project**. That is why the inclusion of appropriate stakeholders is essential; since teamwork experts regularly point out that alone we can do little, but together we can do much.

Democratic benefit-sharing

Photo: Turistička zajednica Karlovačke županije

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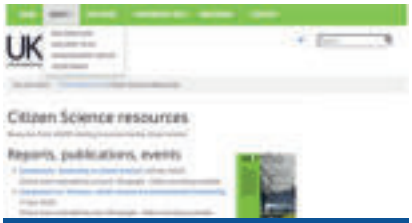

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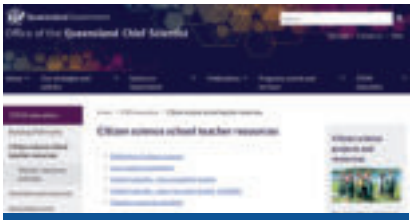

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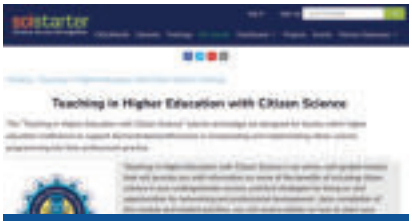

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4.2. The challenges of including stakeholders into citizen science and crowdsourcing projects in vocational education for tourism

The aim of this chapter is to inform readers of the appropriate choice of stakeholders in citizen science projects in tourism, especially in terms of identifying, analyzing and including a higher number of stakeholder groups.

After mastering the content of this chapter, reader will be able to:

- explain the importance of the stakeholder analysis in citizen science projects in tourism
- describe how stakeholder analysis helps in defining stakeholders' interests and expectations
- present the need to identify as many stakeholders as possible
- point out the activities aiming at strengthening the capabilities and resources of certain stakeholders
- illustrate the importance of identifying stakeholder - specific project goals
- interpret the benefits of widening the partnership network

All tourism stakeholders can be initiators and key participants in citizen science and crowdsourcing projects in vocational education for tourism. Including a large number of participants - volunteers - in crowdsourcing is the basis for creating a group that will solve a problem. However, **in tourism as a phenomenon there is a number of stakeholders, whether organizations or individuals, with different, or even contrasting interests**. It is, therefore, essential to conduct a stakeholder analysis as a key step in implementing citizen science and crowdsourcing projects in tourism.

Stakeholders in projects

Stakeholder analysis helps to determine real interests and expectations, as well as the potential to implement a project. **The analysis should be**

done as an early project phase, to identify stakeholders who have negative expectations and can act against project initiation. It is especially dangerous if these stakeholders can significantly influence project development. Stakeholder analysis helps not only to identify supporters and opponents, but to develop strategies to increase the number of supporters and strengthen their influence, while decreasing the number and influence of the opposing side. Regardless of the problem that citizen science and crowdsourcing project in tourism needs to solve, it is necessary to first identify all the stakeholders (organizations, institutions, companies, associations, bodies, even individuals) who can influence project results. The longer the list, the better! If possible, it is useful to divide stakeholders into smaller groups, based on same or similar project interests and expectations.

Stakeholder analysis

If the stakeholders who share project interests and expectations are the ones important for project initiation, it is a good sign, but it is not enough. There is still a need to determine which of these groups or individuals have the power, capabilities and resources to achieve their project interests and expectations. It is especially important **to develop activities that will empower stakeholders who are missing one of these key components**. For example, stakeholders with decision-making power, but lacking in capabilities and resources, need to be connected with stakeholderswho have them. These are most commonly public

Project expectations

Photo: Turistička zajednica Karlovačke županije

sector stakeholders, and some projects cannot be implemented without their support.

As shown in the previous chapter, some problems that could be solved with the help of citizen science and crowdsourcing projects may not seem relevant to all identified stakeholders from the main goal. That is why, in order to get the number of stakeholders with shared interest needed, stakeholder-specific project aims need to be developed. Then, in communication with these stakeholders, it is necessary to **point out not only the main goal, but the specific ones** that the project may achieve, and are related to their particular interests and expectations.

Specific objectives of the project

For instance, the general goal of creating a tourist attraction database will have a specific goal for an educational institution: advancing its curriculum with new learning outcomes. For other stakeholders, specific goals may be entirely different: a higher visibility of mountain paths for a mountaineering association; easier development of a package tour for a travel agency; better tourism promotion for a tourist board; or a new source of information for tourist guides' association members. In the case of regional or local authorities, the specific goal can be a more efficient management and protection of the heritage that is of interest to tourists. However, it should always be remembered that specific participant groups have specific goals. Not only do teachers, students, mountaineers, tour guides and tourist board employees have different goals, but they differ from the goals of stakeholders that they are connected to.

Different goals of individual stakeholders

It is highly relevant to estimate which of the stakeholders to include directly into project implementation, and which to attract for support purposes only. Some stakeholders may be the end users of the project results, yet not directly involved in it. Of the highest importance are **stakeholders who possess the power, resources and capabilities needed to implement the project, that need to be included as project partners**. The absence of one such partner in project initiation may significantly impact its success. The essential thing is the estimate of the partnership network scope. **Too small or too large partnership network may have an equally negative implementation impact**. This is especially connected with participants-volunteers: if there is not a high enough number of motivated participants included, the effect of crowdsourcing will not be achieved.

The scope of the partner network

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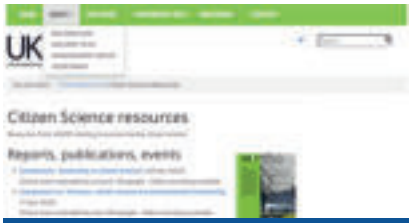

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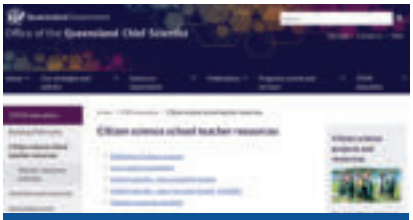

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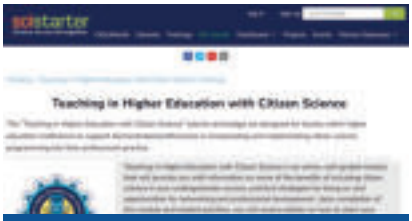

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4.3. The challenges of using digital technologies in citizen science and crowdsourcing projects in vocational education for tourism

The aim of this chapter is to inform readers of the benefits, results, and importance of innovative use of multifunctional digital devices, especially in terms of challenges and opportunities in citizen science projects in vocational education for tourism

After mastering the content of this chapter, reader will be able to:

- describe what the latest mobile phone and tablet technology is based on
- explain the results of using multifunctional digital devices
- point out the importance of easy transfer, storing and use of digital data
- present the necessity for an innovative use of digital devices and applications
- illustrate the new challenges in using digital data
- interpret the opportunities for green and digital transformation in vocational education

Contemporary devices for communication

The development of digital technologies enabled the appearance of citizen science and crowdsourcing. The latest devices for communication, processing and storing data are **based on different digital technologies, multifunctionality, wireless data transfer, mobile use and geolocation**. Also, in developed economies the use of such devices is widespread, even among children. The devices in question are **the latest touchscreen mobile phones or tablets**. The awareness of technological possibilities of these devices is not equally present in every generation. Although around 15 years have passed since the mass use of mobile phones began, it does not mean everyone uses them in the same way.

For some users, this is only a matter of functional replacement - instead of using several devices with a single function, they now use one device with all the functions included. However, this **may lead to ignoring the appearance of new functions or the option of combining them**. That is possible because of the developments in the technological capabilities of devices themselves, as well as the fast development of a large number of (often free) applications that further increase the functionality of a phone or a tablet. In fact, it is a consequence of creating cooperation platforms and crowdsourcing during application development. In this way, **technological innovations are combined with economic and social ones**. Consequently, the latest mobile phones and tablets are irreplaceable as a digital data collecting tool. This digital data may be in a form of a text, a picture, a sound, or a video, and is often geo-positioned.

Applications

Contemporary information technologies are not based solely on digital data collecting. Even more important is their transfer, storing and usage. The Internet, a publicly available global network that consists of many interconnected networks, made **transferring, storing and using large quantities of digital data available to practically everyone**. All that is needed is internet connectivity. Wireless internet connection created a

Wireless data transfer

Photo: Zavod za turizam Maribor

widespread use of mobile devices, followed by their positioning and spatial tracking. With the appearance of 5G wireless data transfer, the number of mobile devices (not only phones and tablets) that can be tracked will grow dramatically, especially with the **new types of multifunctional mobile devices**.

In relation to the further development of citizen science and crowdsourcing projects, this creates numerous challenges. First of all, there is **a matter of accepting a fast development of new functionality of the existing mobile devices and the appearance of new ones**. In such circumstances, innovative, not just basic use of devices and applications will be essential. It will be important to develop project-specific applications, and perhaps set up completely new digital platforms. **Data collecting will be focused more on photos and videos than texts and sounds, and their geolocation will become a rule**, not an exception. That is why it cannot be assumed that all project participants possess the competences needed, while some may not be ready to honestly admit to the fact.

Use of devices and applications

Collecting data will not only be done directly, but will also include the **already collected data from social media, digital platforms and various databases**. Apart from mass support, the help will be provided by artificial intelligence (AI) systems as well. Some data will be generated by various devices with microprocessors connected into a network (Internet of Things). More data will be generated by AI as personalized multimedia content. In any case, **the quantity of available data will increase**. Availability, transfer and storing will no longer present an important issue. The greatest challenge will be systematization, classification, analysis, connecting and creating new relationships between the data available. However, for some specific projects, direct and targeted primary data collecting will remain a necessity.

Artificial intelligence systems

In tourism, pressure will increase towards all destination resources, not only tourist attractions. The matter of **determining and tracking land carrying capacity, i.e. the appropriate number of simultaneous resource users, will be more important than ever**. Another matter is a chance to allocate tourist flows outside locations and time of concentrated demand. Quick alarming and reporting damage and/or pollution done to tourist attractions will be equally important as solving safety issues, as will be the mapping of realistic accessibility for disabled people. These are just a few of the challenges in tourism that using existing digital technologies in citizen science and crowdsourcing projects can already efficiently solve, without the need for new technologies or digital tools.

Carrying capacity

Reporting damage or pollution

At the same time, it is a fact that the educational system does not change at the same pace as digital technologies. That creates **the risk of the lack of competences for the digital transformation of tourism among vocational and specialized studies students**. Without questioning the importance of gaining awareness of sustainable tourism values, the development of digital competences in citizen science projects becomes even more important. This will certainly enable people to develop digital competences for jobs that hospitality and companies in tourism already have. Finally, it will help in **creating completely new professions and workplaces**, and speed up the process of the digital transformation of tourism.

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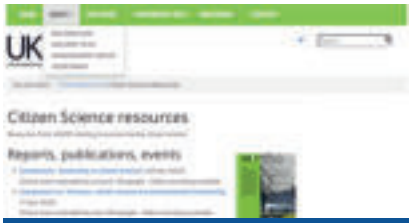

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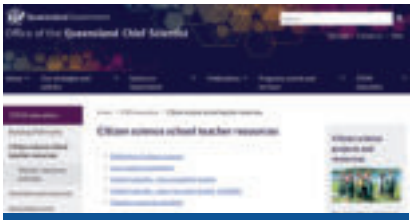

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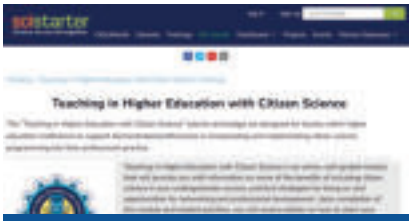

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4.4. The implementation of citizen science and crowdsourcing projects in vocational education for tourism

The aim of this chapter is to inform readers of the specific issues, procedures, activities and responsibilities in the implementation of citizen science and crowdsourcing projects in vocational education for tourism.

After mastering the content of this chapter, reader will be able to:

- illustrate the need for creating both basic and detailed plans for citizen science projects
- point out specific issues in citizen science projects
- describe the procedure of allocating responsibilities in citizen science projects
- explain the importance of identifying potential challenges and needed implementation assets
- present the necessary practical preparation and ways of motivating project participants
- interpret the challenges during project implementation and activity adjustments

Creating important assumptions and solving key issues in initiating citizen science and crowdsourcing projects in vocational education for tourism have already been described in previous chapters. That is why the following text will focus on the **activities of initiating and implementing projects**. Of course, all the standard available recommendations for any type of project management apply. The emphasis will be on the most important ones or the ones specifically related to citizen science, crowdsourcing and vocational education for tourism. It is important to say that project implementation does not have to be the sum of all the activities mentioned. Some projects may be very simple and small in scope. In such cases, it is not necessary to answer all the questions, nor will all the activities, resources, challenges or responsibilities listed be included.

Citizen science projects

Once the challenges of initiating a project are dealt with and the **partnership network between stakeholders (organizations) and participants (volunteers) is created**, it is possible to start project implementation. In the initial stage, a good project plan must be designed. It should define, as precisely as possible, what, who, when, how and with what resources must be done. The answers to these questions should be the basis for defining project goals. As already mentioned, **from the main goal, specific goals must be elaborated, and then precise activities derived** from them to help achieve these goals.

In citizen science and crowdsourcing projects in vocational education for tourism, some specific questions will appear:

- What is the subject of study?
- Which data collection method is the best?
- Which are the ways to store data?
- What is the scope of data and how long should it be stored?
- Which activities of data collecting can be done virtually, and which practically?
- Which method of data processing and analysis is the most appropriate?
- How should the results be presented?

Photo: Turistička organizacija Srbije

- Which learning outcomes are a precondition, and which are the result of project activities?
- Which learning outcomes should be achieved within the project?

If the project includes a wider partnership network, it will certainly be easier to answer all these questions. However, **project implementation relies not so much on partner organizations as on people who make up the project team and the network of associates**. It is important to clearly set responsibilities for all project activities and delegate them to project partner team members based on their competences. It might not always be possible, and the responsibility **for certain activities will be given to experts outside the team**, who are ready to work on the project.

Partnership network

Although the necessary analysis or required project resources have been done as part of the initiation phase, it now needs to be precisely defined **which of the partners provides which implementation resources, as well as when and where they are available**; which resources will come from outside partner organizations, and which will be provided by crowdsourcing. It is always good to analyze other projects which had the similar type of support of a wider group of associates and volunteers. The matter of solving all relevant challenges in terms of safety, information technologies, quality assurance and legal issues described in the previous chapters must not be neglected.

Means of implementation

Based on general information about resources needed for the project during the planning stage, it is possible to create the initial project budget. Still, after all the previously mentioned questions are discussed, a detailed project budget needs to be developed. If there is a discrepancy between ensured resources and overall cost, **activities to get extra funding need to be considered**. They too can be part of mass support in the form of crowdfunding. It is advisable to consider including new partners who possess the necessary resources, as well as applying for various private and public funding, domestic or international. That is a possibility when project goals coincide with the goals of these foundations.

Project budget

During activity planning, project management tasks must not be neglected. It is not good to assume that project activities will unfold without problem after responsibilities and tasks have been allocated. **The project needs to be efficiently managed and each stage controlled to see whether what has been planned was achieved**. That is why project management responsibilities, activities and roles need to be well planned, and some questions answered:

- How will the project management structure function?
- How will partners present reports on completed project activities?

Project management

- Who will coordinate certain project phases and activities within them to avoid unexpected delays?
- How will project management include a wider circle of associates – volunteers?
- How will project results be presented within and outside partner organizations?

All these tasks require **engagement from people with specific project management competences**, so their participation should be considered beforehand.

Practical preparations and tests

Prior to project initiation, and possibly during the project before starting a certain activity, some practical preparation is needed. This, for instance, can be **the creation of simple instructions to follow necessary procedures**, in the form of text, video or animation. They can also be forms, questionnaires or tables. All these materials should be available in electronic form and environment. Free applications and platforms that can be used should be considered, as well as the ones that will need to be developed within the project. Special attention should be given to **participants' competences in using all these tools and determining if extra training is needed**. The training may not be needed for learning purposes, but rather for testing existing knowledge, improving certain skills, and even more about value creation that motivates participants to get involved in a project.

Participant motivation

During a project, as well as all preparatory activities, special attention should be given to participants' motivation, as described in previous chapters. It should always be remembered that **some types of activities can be strongly influential in regards to participant motivation**. All activities should present a chance to learn something new and different. Whenever possible, activities should be fun. There have to be opportunities for participants to socialize even after project activities to create connections between them. Project results that put emphasis on achievement and individual involvement should be announced to satisfy their need for recognition. Some highly dedicated and successful participants should be rewarded. A sense of unity and belonging should be encouraged, since the need for social conformism may sometimes be the only motivational tool for project participation.

A community of participants

In crowdsourcing projects, **creation, development and maintenance of the project community is of particular importance**. This is an activity that takes place before, during and often after a project ends. It is a known fact that some participants may be motivated by a fear of change even more than some are motivated by a desire for change. That is why **knowing the motivation of all participant groups is critical in creating a community**. An ongoing community spirit can be achieved if participants

get involved in debates, decision making, and reporting, all combined with socializing and extensive communication through all available channels. In all that, **reasons why someone exits the project community, while someone else enters it, must be kept in mind**.

Crowdsourcing always involves handling data, and in citizen science this data has its quality and quantity. Collecting a large quantity of irrelevant data is equally bad for a project as is collecting insufficient quantity of relevant data. That is why **data management must coincide with the project goals and expected quality and quantity**. In data management, data collecting tools, type of data, storage format, collecting procedure, data access and data storing must all be considered. Hardly less important is the matter of using data already collected through other projects, the existence of faulty data, the possibility of compromising data integrity, and the availability of collected data for other projects.

Data management

During the project, certain activity adjustments have to be made, if it turns out that the original plan should be adapted in order to improve the project. During project implementation, **evaluations should be made to decide what can be improved** by performance assessment. That is why constant evaluation of what is important for the project or its participants should be done, as well as determining where the implementation is sub-standard. Such activities need to be improved, while important activities that do work, should remain ongoing. If something is not working but is less relevant, no change is needed. However, if activities are assessed as irrelevant, yet spend resources, perhaps a reevaluation of their inclusion in the project is necessary.

Customization of activities

With some projects, participants eagerly await the end, and feel no need to continue working together. That is often a sign that the project was not managed well, or that stakeholders do not share goals or values. **Well-designed projects plan the most demanding activities for the middle, not towards the end of the project**, when participants are exhausted and often weary of the project activities. Project closure should be marked by activities that create a sense of project importance in public and emphasize the benefits that the project brings to each individual participant's goals, and possibly to identifying a new problem and creating partnerships for a future project.

Recognizing a new problem

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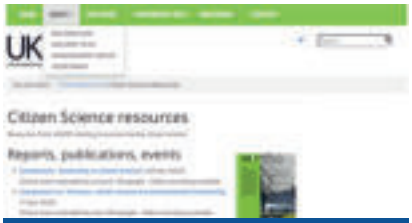

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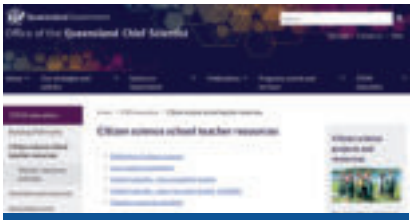

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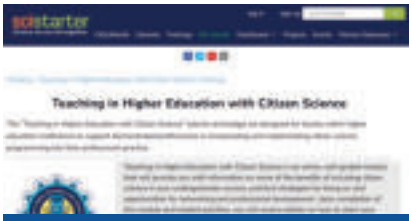

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