RI2integrate

Embeddedness of high quality research infrastructures in the Danube region

Work Package 4

Activity 4.3

Community awareness raising tool for RI utilization

Deliverable 4.3.2 Visitor center guidelines for youth

Developed by the Ex Ante Kft. within a subcontract with the Central Transdanubian Regional Innovation Agency (PP1)

http://www.interreg-danube.eu/approved-projects/ri2integrate

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Content

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General

The RI2integrate project aims to support the economic development potential and better integration of the EU's excellent Research&Development Infrastructure investment projects. To reach this goal the project focuses on three specific fields and objectives. Firstly, it aims to support enterprises on their relation to RIs. It also supports the involvement of the governments through Public Procurement of Innovative solutions. As third specific objective the project supports the community embeddedness of RIs.

Focusing on the third goal mentioned above the *Activity 4.3 – Community awareness raising tool for RI utilization* envisages the preparation of the *D 4.3.2 – Visitor center guidelines for youth* which will be a visitor centre tool applicable for RIs.

The guidelines will be used during the *Work Package 5 – Piloting the tools* in the scope of the *Activity 5.3 - Community involvement piloting*. During this activity two project partners (ELI-ALPS and FHJ) will implement a pilot action which will focus on the youth awareness raising through visitor centres. The guidelines (D 4.3.2) will be a direct input for the pilot action and its findings and recommendations will be capitalized during the piloting.

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Introduction

The RI2integrate project aims to facilitate the better embeddedness of the high-quality research infrastructures in the Danube region. For this the partnership works together on the analysis of the current situation in the partner regions, on development and piloting of innovative tools for supporting the integration of the RIs and on transferring the created knowledge and experience.

The goal of this document is to provide guidelines for planning, establishing and managing RIs' visitor centres for youth. With this it aims to integrate the RIs into the society, spread the knowledge of the RIs among young students and due to this develop the educational possibilities. This tool will be tested during the pilot actions of the project in two locations (Graz – Austria, Szeged – Hungary), but it was prepared in a way that it can be useful tool for other RIs when establishing visitor centres.

In the first part of this document the relevant and current policy background is reviewed and the connections between EU policies and the RI2integrate project, especially with this activity are described. The aim of that part is to provide context to this tool. In the next chapter the theoretical framework behind the visitor centres is synthesized in the light of the educational possibilities with highlighting the practical use of the theory and providing recommendations for creating visitor centres' concepts.

The next chapter provides guidance and practical advises in the field of preparing an action plan with the aim of establishing a visitor centre. For each step of action planning it provides recommendations about how to involve stakeholders, what activities must be implemented and what is the ideal timing of each step and what outputs must be produced.

The last part of the document puts special attention on the integration of the RIs' visitor centres on local and regional level and on the marketing and branding of them. Two good practices are also described here that can be sources of ideas when planning and establishing a visitor centre for youth.

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1. Background

1.1. Connection to EU policies

When the famous psychologist Mihály Csíkszentmihályi (1997) defined creativity, he claimed that creativity should mean something that is important enough for the people to become part of the culture. Research infrastructures are considered creative places and if we adapt this principle to the field of this project we can state that making a change in the local culture by RIs can be reached by exploiting their results, innovations and other possibilities (e.g. in the field of education and awareness raising). For this, the integration of the research centres into their surrounding area is needed and this can be reached with building strong connections between RIs and their surrounding area (e.g. public sector, universities and other educational institutions, society, etc.). One way of this integration is presenting the RIs and bringing closer their activities to the broaden public. Key elements of this process are the visitor centres of these institutions where the members of the society have the possibility to understand better what is being done in a research infrastructure.

This document aims to provide guidelines for research institutions in the field of establishing visitor centres. These visitor centres are physical places and exhibitions supplemented with different types of programs, activities and presentations where the research institutions present their activities for the wider audience. However, their role is much broader than just presenting the activities and infrastructures of the respective research institution. They can be active on the field of education, awareness raising about R&D&I, bringing closer the science to the everyday people and due to these help the better integration of RIs on local and regional level. Through these goals and activities, the RIs can act as local contributors to the implementation of EU policies. Even though the visitor centres of RIs are mostly local and regional actors their contribution to the implementation of EU policies should not be omitted and the EU level goals and objectives must be taken into consideration when planning, establishing and maintaining these centres.

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In the European Commission's strategy for smart, sustainable and inclusive growth the areas are listed where Europe had not been progressing fast enough even before the economic crisis comparing to other parts of the world. One of these three areas is the lower average growth which is related to the widened productivity gap. This is combined with the *lower level of R&D&I investments*, insufficient use of information and communication technologies, *reluctance in some parts of the European societies to embrace innovation*, barriers to market access and a less dynamic business environment. Investing in RIs can be an answer for the first mentioned problems, but - as it is stated above - innovation should be integrated into the whole society. The project, and especially its aim of establishing visitor centres in RIs can contribute to this process.

From the three priorities of the strategy (smart, sustainable and inclusive growth) RIs and their visitor centres can contribute directly to the smart growth with taking into consideration the principles of sustainable and inclusive growth. The document relates smart growth to the economy based on knowledge and innovation. To reach this the quality of education, the promotion of innovation and knowledge transfer throughout the Union and the introduction of innovative ideas as new products – among other fields – must be improved. The document defines three areas to take actions: Innovation (investing to R&D), Education, training and lifelong learning and Digital society. Promoting RIs through visitor centres and campaigns can be the connection between the first two fields. These visitor centres are places by the new forms of education and informal learning tools directly contributes to the second area. The awareness raising activities of RIs also helps the creation of the digital society.

The RI2integrate project and the awareness raising for RI utilization have the possibility to contribute two Flagship Initiatives mentioned in the strategy. RI2 integrate is implemented in the framework of the Priority 1 – Innovative and Socially Responsible Danube Region of the Danube Transnational Programme and this priority directly aims to contribute to the "Innovation Union" Flagship Initiative which aims to strengthen the links in the innovation chain. In the framework of this initiative the Member States should "*reinforce cooperation between universities research and business*" and "*ensure sufficient supply of*

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science, maths and engineering graduates and to focus school curricula on creativity, innovation and entrepreneurship". The RIs visitor centres can foster these goals since they are not just classic exhibitions, but interactive places with different kind of education programmes. Different actors (research organizations, universities, schools and business) can cooperate on designing a visitor centre for youth and its activities, new educational methods and curricula can be tested and used. The other Flagship Initiative - Youth on the move - deals directly with the youth which is also a core target group of the RI2Integrate project. This initiative aims to develop the quality of education and training, promote non-formal and informal learning which is also addressed by the project, especially by its parts that are related to community involvement.

In addition to the contribution to the Smart growth the project and its community involvement parts will also contribute to the Inclusive growth and Sustainable growth. Important objectives of the Inclusive growth are the "*investing in skills*", "t*raining*", "*help people anticipate and manage change*". These aims are directly linked to the visitor centres in the RI2 integrate project. These centres will be able to help students to acquire new skills that could be useful in their future. Sustainability can be addressed by the RIs as fields of research, due to this it can be a topic of the visitor centres.

If we narrow the geographical area to the Danube Region it becomes clear that the RI2integrate project and this guideline contributes to the implementation of the European Union Strategy for the Danube Region, especially to the Building Prosperity in the Danube Region pillar. Among other objectives this pillar focuses on innovation, information society and education. This pillar has three priority areas:

1. *To develop knowledge society through research, education and information technologies,*
2. *To support the competitiveness of enterprises,*
3. *To invest in people and skills (education and training, labour market and marginalised communities.*

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While on project level all of these priorities are addressed the Activity 4.3 contributes directly to the first and to the third one. On the field of the first priority area *the society's ability to create and exploit knowledge is a key factor for progress and growth*. The creation of knowledge in significant part is done by RIs, the exploitation of it can be reached by their embeddedness and integration into the local innovation chain or in broader view into the local economy and society. To facilitate this the information and knowledge exchange between business, academia, administration and citizens must be improved. Among the actions of the strategy the strengthening the capacities of research infrastructures and the strengthening cooperation among universities and research facilities are mentioned that connects the project and the activity to the strategy.

The third priority area (To invest in people and skills) is also strongly targeted. This field is important to reach the best use of the region's human capital which facilitates the progress in a smart and inclusive way. On this field among other interventions the empowerment of investing in skills and training is needed. The activities that must be implemented here are the reinforcing of policies on the field of education, labour market, integration and research and innovation. Developing of key competencies and organizational skills and promotion of innovative partnerships and stronger cooperation between primary, secondary and tertiary education are also necessary. From the actions under this priority area the followings are the direct connections between the project and the strategy:

- *To enhance performance of education systems through closer cooperation of education institutions, systems and policies;*
- *To support creativity and entrepreneurship;*
- *to jointly analyse implementation gaps in life long learning (LLL) policies and exchange best practises in implementation.*

Above the strongest field are highlighted where we can find the strongest connections between the RI2integrate project (especially the Activity 4.3) and European policies (Europe 2020 Strategy, EUSDR). But besides these connection points other horizontal principles and

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goals must be taken into consideration in this guideline, such as sustainability, social inclusion of marginalised groups of the society, gender equality.

1.2. Connection to previous project results

The Work Package 4 (RI integration tool) of the RI2integrate project builds on the results of the Work Package 3 (Structure Development). Due to this, while implementing the Act 4.3 (Community awareness raising tool for RI utilization) and in its scope designing this guideline (D 4.3.2 Visitor centre guidelines for youth) the previous project results have to be taken into consideration.

In the WP3 the Macro regional guideline for RI embeddedness (D 3.3.2) was designed. This document put large emphasis on technology transfer between RIs and SMEs which is a way to utilize the economic potential of RIs and enhance their economic embeddedness on more level (local, regional and national as well). To analyse the current situations of RI embeddedness, surveys were carried out in the regions of the project partners. These surveys identified twelve groups of different obstacles, barriers and resistances as well as supporting factors in knowledge and technology transfer processes. Even though visitor centres of RIs for youth do not address directly companies they are important parts of the embeddedness process, especially in when a newly established RI is not well known by the local society. Establishing a visitor centre and due to that spread information and knowledge about the activities and results of the RIs is among the first steps of the integration process. Because of this potential the following barriers that were identified in the Macro regional guideline can be addressed by them:

- Lack of trust & poor social relationship between partners,
- Insufficient market transparency of knowledge and technology providers & insufficient information about potential partners and their supply and demand.

Mutual trust is a key factor in the success of a transfer process, lack of trust and poor relationship between the partners cause significant barriers in the transfer process. From the

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side of the RIs, especially if it is newly established the first step in creating trust is to invite the local residents into their premises and present their activities. Due to this the locals will better understand the local and regional role of the RIs and with this knowledge they are able to start to think about the further steps of cooperation. The idea and intervention logic of this project pays special attention to youth. If the research infrastructure opens its gates to them when they are in secondary education or university students, the possible fields of cooperation will be already known by them when they will start to be active members of the labour market or establish an enterprise.

Other relevant part of the Macro regional guideline is the establishment of the National Expert Groups (NEG) which is one way of the stakeholder's involvement in the project. As it is described in the document the stakeholders must be identified, analysed and involved in the project implementation. In the RI2integrate project NEGs are the tools for involving local stakeholders, but every project should define its own way for the involvement, because effective stakeholder involvement is a crucial activity in successful project implementation. Stakeholders possess knowledge about the local situation that can be crucial for the project, they can help to assess project activities and outputs and tailor them to the local needs, promote the results and involve other interested players. To establish a supporting stakeholder group is even more important in the case of a newly established RI.

The NEGs in the RI2integrate project are *groups of firms, RIs, NGOs and intermediaries that cooperate on a joint development project complementing each other and specializing to overcome common problems, achieve collective efficiency and penetrate markets beyond their individual reach.* Their involvement in the project covers the fields of Information and communication, Craining, Cooperation, Marketing and PR, Internationalisation. Among other activities the Macro regional guideline recommends for NEGs to carry out own initiatives for students and NGOs and to take part in the development of a visitor centre, where the whole spectrum of the research area of the RIs should be established. Due to this the involvement of the stakeholders through NEGs will not just be part of the establishment of visitor centres, but it will provide a framework for the whole

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planning and establishment process. The details of this process will be elaborated in details in the chapter of this document which focuses on the action planning.

In the WP4 the Roadmap for community awareness raising (D 4.3.1.) was prepared which is strongly connected to this document. Awareness raising does not mean simply to inform the community about certain issues, but it aims to change the behaviour and attitude of the target group towards a certain topic. Due to this awareness raising is crucial for the integration of the research infrastructures, the visitor centre could have the best programmes but without awareness raising it will not reach the planned impact. When planning the visitor centre and its activities the awareness raising must be also planned. The main steps of planning public awareness raising, the main approaches and the different tools are elaborated in details in the Roadmap for community awareness raising, it must be also used as a tool while planning an RI's visitor centre for youth.

Take away message:

- The visitor centre of the RI contributes to the implementation of EU policies with supporting the integration of the RI
- Besides the economic integration the integration into the society is a crucial factor as well
- The visitor centre is amongst the first steps in the creation of the trust between the RI and the local actors, it can facilitate the technology transfer processes
- The visitor centre must be supported with well-planned awareness raising campaign

2. Theoretical framework of visitor centres for youth

In the traditional way of thinking a visitor centre of any kind of institution is an exhibition supplemented with a guided tour. But now when the info communication technologies are not just available for almost everyone, but their use has become significant

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part of everyday life this concept has changed a lot both from the demand and supply side. On the one hand the institutions that establish a visitor centre now have several tools and possibilities to present themselves to the wider audience and transfer their knowledge to the visitors. On the other hand, the visitors – especially youth – become more resistant to traditional methods of transferring information. They will not sit in quit and pay attention to someone who just explains general features of an RI and will not read long texts about the presented institutions. The advanced technology offers several opportunities now to involve and - during the involvement - to educate the visitors. This must be taken into consideration when planning and establishing a visitor centre, so the aim of this chapter is to present the theoretical framework of interactive involvement in order to provide guidelines for RIs to reach real impact with their visitor centres.

2.1. Possibilities regarding to interactive visitor centres

According to Florio M. et al (2015) large scale research infrastructures have several social benefits. These are the technological externalities, human capital formation, demand and value of knowledge outputs, outreach and direct cultural impact, services provided by the RI to third parties and consumers and the non-use value of discovery. In the case of the visitor centres the human capital formation and the cultural effects are the most important. A large-scale research infrastructure attracts young scientists and PhD students from abroad, but on the other hand it can be an effective tool to prevent the brain-drain and keep the young talented scientists in place where they attended high school and/or university. The visitor centre is the first step in this process, the students get familiar with the RI in relatively early age. Furthermore, if besides exhibitions they provide trainings, workshops or other kind of interactive activities the local students can become more and more familiar with the RI and with the researched topics. This increases the number of students engaged in the research topics during their tertiary education and due to this the sufficient labour supply for the RI will be ensured.

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The other social benefits strongly related to RIs' visitor centres are the cultural impacts. Besides the core activities of RIs the awareness raising is also their really task. In this scope RIs organize programmes, events and services to inform the public on advances in science and technology. Besides the activities which address the local people RIs are destinations of science tourism on regional, national, even on transnational level. The main activities of RIs on this field are the maintenance of permanent and the organization of temporary exhibitions, carrying out guided tours, special events, open days lectures and workshops. In other to reach the maximum efficiency these activities must be supplemented and supported by sufficient communication measures which are tailored to the needs of the target groups (Flroio M. et al 2015).

Florio M. et al (2015) also claims that secondary and higher education and training positively contribute to the economic growth by increasing the productivity of the labour force. As the Europe 2020 Strategy envisages to ensure the sufficient supply of science, maths and engineering graduates and their curricula should focus on creativity, innovation and entrepreneurship. The quantity and quality of these graduates lie on several factors and in this process. Besides the quality of the tertiary education the number of students entering into tertiary education on the fields of science, maths and engineering and the level of their skills and knowledge also determines the number of the graduates on the mentioned fields. On this fields RIs, secondary schools, universities and other stakeholders should act together to design and carry out innovative curricula focusing on creativity and entrepreneurship. The STEM curriculum is an effective tool for reaching these goals.

The STEM curriculum is an interdisciplinary approach in which Science, Technology, Engineering and Mathematics are taught in an integrated way. After reviewing the relevant scientific literature Thibaout, L. et al (2018) discerned five key principles of the integrated STEM. These are the integration of STEM content, problem-centred learning, inquiry-based learning, design-based learning and cooperative learning.

In their understanding the integration of STEM content means that is not enough to use content from different STEM-disciplines, but this content should be integrated across the

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disciplines. The second principal, the problem-centred learning highlights the use of real-world problems in the education which is tied to an engaging and motivating context. During the inquiry-based learning students develop themselves by questioning, investigating and developing new understandings, which means experimenting, questioning, challenging, discussing, interpreting and exploring. The designed-based learning refers to the use of technological and engineering design, that is a strategy in which students work on multidisciplinary designed problems while they are challenged to analyse a problem and find the solution. The last principle is the cooperative learning in which students work in groups which are usually small and includes students with different abilities. In this process the teachers act as observers they interact just when they feel it is appropriate and necessary (Thibaout et al, 2018).

There are several possibilities and levels where RIs can cooperate with secondary schools, universities and with other stakeholders in the field of education, especially in STEM. In many countries secondary schools lacks the sufficient knowledge and infrastructure to implement successful STEM curricula. The visitor centre of RIs can be places where the STEM curricula are implemented either in the framework of the public education during official learning hours or as an extracurricular activity. When a STEM curriculum is implemented in an RI the stakeholders can work together on monitoring its success and the progress of the students and then the know-how and lessons learnt can be used in improving the school curricula. On the other hand, students that attend these educational activities will have more knowledge and skills and due to this they will have better chances on the labour market than fellow students that attend just traditional education. The awareness raising aspects are also not negligible, the students' interest and motivation in the middle school years are important predictor for the choice of later science career and education (Lin, Schunn 2016).

2.2.Educational principles in RIs' visitor centres

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After reviewing the possibilities that RIs visitor centres offer we should focus on the key principals when designing these centres. In this chapter the most important terms will be elaborated that are necessary to know when designing the visitor centres and their programmes.

As this guideline envisages key emphasis has to be put on education during the establishment of RIs' visitor centres for youth. Generally, the education system can be divided into three main parts: formal, informal and non-formal education. The formal education is the traditional institutional education which is chronologically graded and hierarchically structured (La-Belle, 1981). In most parts of the world the formal education is strongly predominant in the compulsory education system. When talking about the role of RIs' visitor centres for youth in the field of education we must consider the other two parts of the education system: the informal and non-formal education.

Informal education and learning is a lifelong process in which individuals acquires knowledge, skills and attitude from daily exposure to the environment (La-Belle 1981). In informal education there is no need for specific time or place, the experience is the factor which improves the knowledge and skills of the people. It is necessary for individuals to learn on how to build an informal learning. Mentors are important actors in this process because they can facilitate the learning experience which can be strengthened with discussions of experiments and errors made during the process of learning and training (Baser & Buntat 2010).

Informal science experience affects and influences the attitude of a person towards science. Pei-Yi Lin and Christian D. Schuman (2016) list four domains that can be changed through informal learning. Informal learning affects the *scientific sense-making*, it enables persons to interpret common data representations, focus on mechanisms underlying empirical relationships, considering alternative explanations and using evidences. Informal learning can raise the *science interest*, students that participated in student-directed learning became curious and wanted to know more about science. It also changes the *valuing science for self and society* and motivates students by the indirect benefits of having science knowledge and

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skills (Lin & Schuman 2016). Researches (Paris et al., 1988; Stake & Marex, 2005) show that students that value science knowledge and skills likely engage in science learning and attend science courses and informal programmes which increase their knowledge. Finally, the informal science learning develops the science *competency beliefs* and due to this it increases the science-related career interest skills (Lin & Schuman 2016).

In informal science learning the students learn out of the school, the activities are optional, and the details of the participation are student-directed. In informal learning the students can read science related-books, use science-related toys attend science camps/clubs or other out-of-the school programmes, visit science museums/aquaria/zoos or spend time in the nature. Lin and Schuman (2016) listed four forms of the informal learning: semiformal experiences, informal home experiences, museum visits and being in nature. From this list the semiformal experiences and the museum visits are connected to the RIs' visitor centres.

The visitor centres offer semiformal programmes such as workshops, trainings or competitions that can complete the formal education programmes. Science museums and centres provide environment for students to observe and discover themselves. These museums and centres have infrastructure and create environment that is not available at home, nor in the schools. However, the visits to these centres and museums last for half or one day so they do not have significant effect on the students' attitude towards science (Lin & Schuman 2016). With integrating regular visits to the school curricula supplemented by interactive activities and suitable guidance the positive effects could be increased.

The non-formal education is defined as other organized, systematic and programmatic educational activity, but it is external to formal education frameworks (La-Belle 1981). The non-formal education takes place outside of the school and it is based on an educational-pedagogical concept. It aims to realize educational and social goals, exercising flexibility in applying principles, subject matter, organizations and tools which are free form the usual structural and formal conditions. According to Ivanova (2017) the children's non-formal education addresses the following goals:

- *Satisfy needs that may be related to life plans or conditioned by a specific situation,*

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- *Achieve particular goals,*
- *Add, combine and expand one's abilities, various skills and competencies,*
- *Spend free time,*
- *Get help and support in solving one' problems,*
- *Test something for one's self carry out a decision, make a choice, and gain experience,*
- *Gain individuality.*

Based on the features mentioned above the non-formal education puts the individual into the centre and provides wide range of possibilities to the persons to develop themselves according to their needs. This is one of the main novelties of the non-formal education comparing to the formal education. It can adapt to new educational challenges because it is less institutionalized and less entrenched in theory than the formal education. With this flexibility it can provide the suitable environment for students to experiment with their freedom and experience without being limited by the borders of the formal education (Romi & Schmida 2009). The non-formal education provides stress-free and relaxed educational place for students that ensures full-fledged and comprehensive self-development of each students' personality. The activities in a non-formal education place aim the self-development; correspond to personal inclinations interests and needs; enable the participants to be successful and believe in their capabilities and abilities (Ivanova 2017).

With this flexibility the non-formal education can also mediate between the new knowledge about technology and its consumers. Several opportunities lay in using of modern technologies for educational purposes. The computerized learning environment encourages the groupwork, enables the construction of knowledge and reflective thinking, develops the writing skills. This way of learning is based on relations between instruction, learning and evaluation (Romi & Schmida 2009).

2.3.Educational methods of RIs' visitor centres

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The visitor centres of RIs have the possibility to implement informal and non-formal education activities. The key features of these learning methods are presented above, the aim of the next paragraphs is to give an overview about the necessary element of the successful implementation of those principles in the visitor centres. The learning programmes of these centres must put the individual into the centre supported by sufficient guidance and mentoring and new technologies must be applied in education. The physical and social environment of these centres must be different from the schools.

The visitor centres have to offer wide ranges of possible new experiences for the students with giving the freedom of choice to them to choose the one for exploring that they are interested in. During the learning process the experience must be in the focus, the experimental learning is the sense-making process between the inner world of a person and the outer world of the environment (Beard & Wilson 2006). According to Kolb (1984) the experimental learning process contains four elements: concrete experience, observation and reflection, the formation of abstract concepts and testing in new situations (Figure 1). If the students gain meaningful experience during the learning process their knowledge and behaviour can be changed (Li et al 2017). For each element the visitor centres must provide the necessary equipment and guidance for the students to facilitate their learning activity and assist them in gaining new knowledge and skills during the experience.

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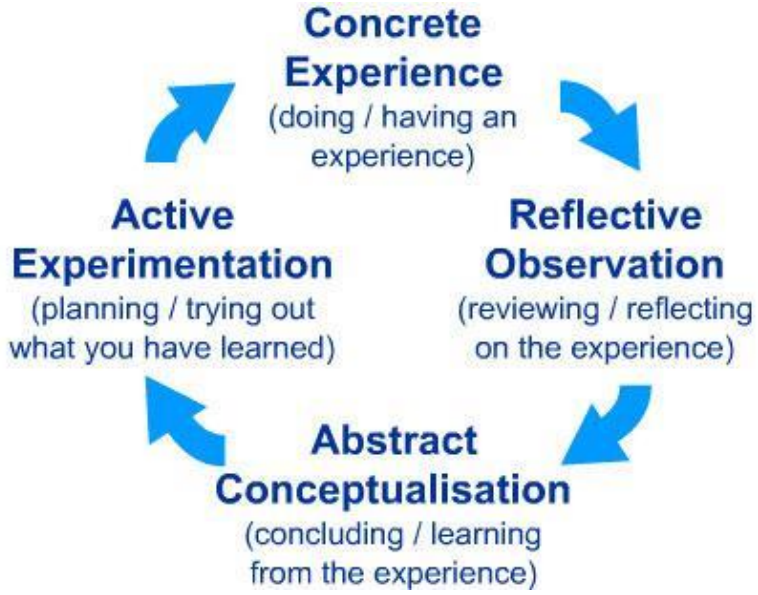

Figure 1. Kolb's (1984) four elements of the experimental learning. Source: [1]

Contrary to the formal education methods that are traditionally used in the compulsory education system in the experimental learning the students not passive recipients of the knowledge about the studied topic, but they have active role in the process. However, the role of the teacher/mentor/instructor is also important, s(he) does not act as the sole knowledge provider, but as a facilitator in the process. Similarly, to Kolb (1984) Cowan (1988) defined four stages of the experimental learning process and for each step he defined the progress of the learner and the activity of the facilitator (Figure 2).

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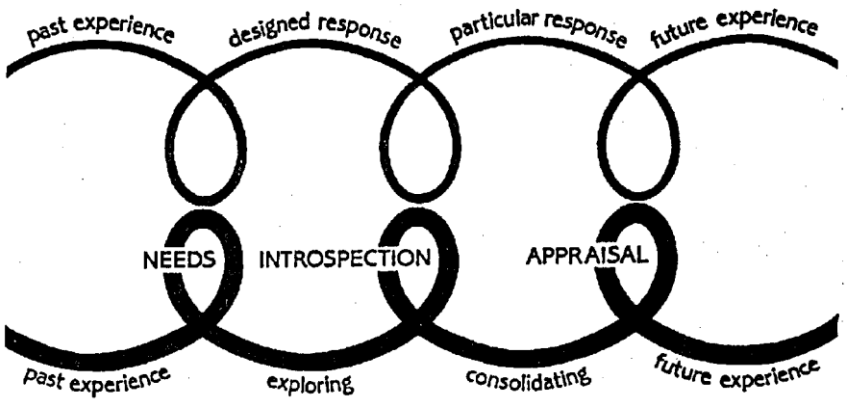

Figure 2. The stages of the experimental learning. Source: Cowan (1988)

On the Figure 2 the lower curve represents the progress of the learners. Cowan assumes that the learners enter to the experimental learning process with a prior knowledge which is the base of the further learning process and helps to define the needs of the learner and due to this to develop the direction of the learning. In the first stage of the active learning the participants' experience is tentative and exploratory. Then they review in the second loop what has been learnt and what has still to be learnt. The learners identify what the experience has to offer as constructive advice before moving on to the consolidation phase. In the last loop which is the appraisal the participants compare the recent developments with their previously set goals. If this is successful they move on to consider new needs and experiences. In this process there are two different roles of the facilitator. When the participants are engaged in further experimental learning the facilitator stays in distance, s(he) acts as source of inputs and resources. During the reflection the facilitator and the learner have close contact (Cowan 1988).

There are several tools and methods that can be used for the effective establishment of an experimental learning process. Considering the needs of the youth gamified learning process could be effective in increasing the level of knowledge and skills among the visitors of the RIs. In the gamified education game-base mechanics, aesthetics and game thinking is

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used to engage people, motivate action, promote learning and solve problems (Kapp 2012). Since games provoke emotional such as curiosity, frustration and joy (McGonigal, 2011) they have the possibility to capture and keep attention and interest which are the main goals of the educators (Buckly & Doyle 2014).

As we can see in the definition of the gamification as a pedagogical concept it has much wider meaning than just using games in education, it also means the use of design elements and activity patterns of games in educational concepts. The design elements of the games that can be integrated into an educational concept are

- the existence of *objective, specific rules* which provide the structure of the learning activity;
- the usage of *reward system* that notifies the participants about the completion of a level;
- the creation of *rapid feedback cycles* which allows to learn from trial, error, failure and success through practice, experience and reflection and
- the usage of *competitive elements* as source of the motivation (Buckly & Doyle 2014).

Westera (2017) created the casual model of learning from a game activity which reflects the interplay between the game and the player (Figure 3.). The game is based on activities which are characterised by attractiveness and complexity value. They address knowledge nodes, which could require prior knowledge. The player is characterised by the user states which are based on the actual knowledge state and intelligence. The game activity creates the challenge which is determined by the prior knowledge, the actual knowledge in the knowledge nodes and by thethe inherent complexity. The challenge and the attractiveness affect the motivation of the player either in positive or negative way. The motivation and the intelligence determine the effectiveness of the learning and due to this they also determine knowledge, that is gained during the process. This updates the knowledge status of the player and the whole cycle can be repeated again.

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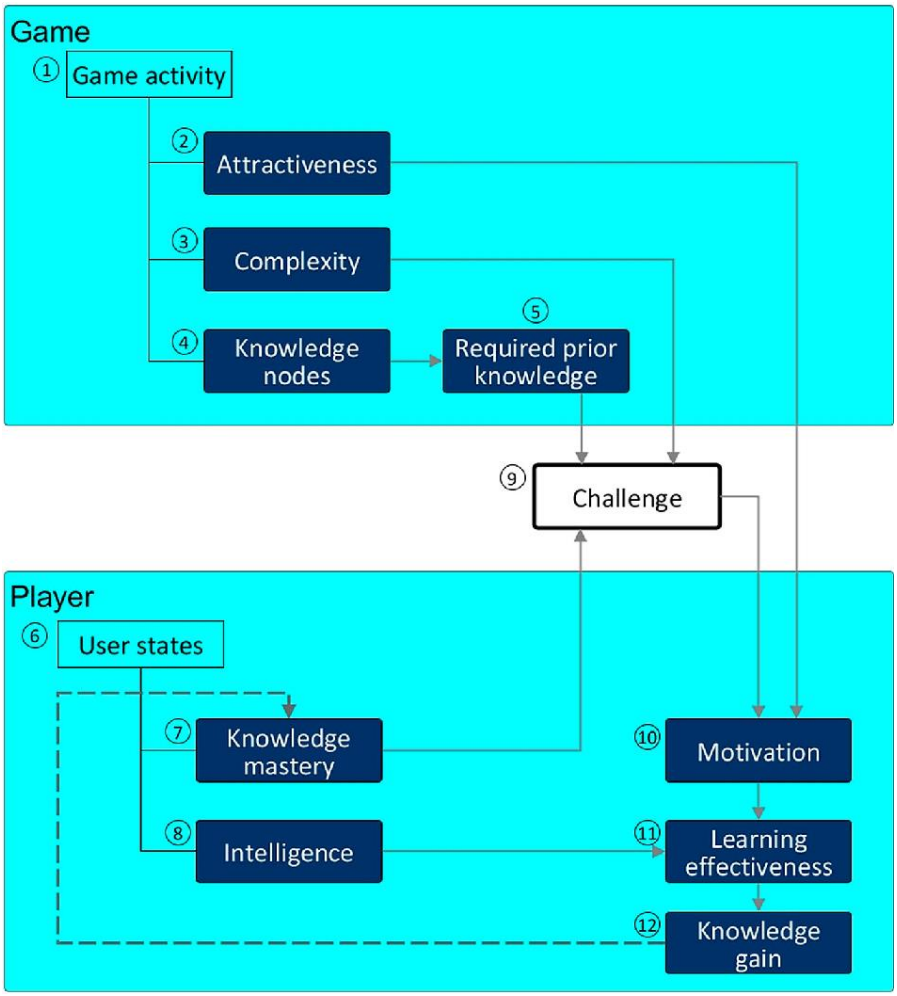

Figure 3. Casual model of learning from a game activity. Source: Westera (2017)

According to Buckly and Doyle (2014) motivation is a key determinant of the gamified learning process as well as in the model of Westera (2017). The motivation can be undermined if the playing feeling is missing from the gamified learning processes. If the participants are forced to play the process cannot be successful since the most basic element of it is missing (Prince 2013). It also must be taken into consideration that gamified learning affects differently the learners, some of them can be motivated, but it also can demotivate others (Buckley & Doyle 2014). It is the responsibility of the instructor during the process to

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observe the learners and intervene if they experience demotivation and frustration from the participants and offer other types of activities for them. It is part of the teacher's role to manage the motivation of the learner (Buckley & Doyle).

In his model Westera derives the role of the challenge in the learners' motivation from the flow theory. The flow model helps to understand the experience of deep engagement and the individual and contextual factors that can promote it. The optimal state can be described by five factors (Schmidt, 2010):

- intense concentration on the task at hand,
- deep sense of involvement and merging of action and awareness,
- sense of control over one's actions in dealing with the task at hand
- enjoyment or interest in the activity,
- distorted sense of time.

Schmidt (2010) also lists the conditions of the flow which are the engagement in activity chosen for its ow sake, perceived challenges of the task at hand are relatively high and in balance with the perceived skills, clear proximal goals that are regarded as important, immediate feedback indicating success in reaching the goals and highly focused rather than divided or scattered attention. From this list the skills and challenges are the main determinants of the flow (Figure 4.). If the skills and challenges are both high the individual can reach the flow. If the challenges are high but coupled with low skills the individual experience anxiety or worry, in opposite case the individual get boring or relaxed and if both the skills and challenges are low the individual experience apathy.

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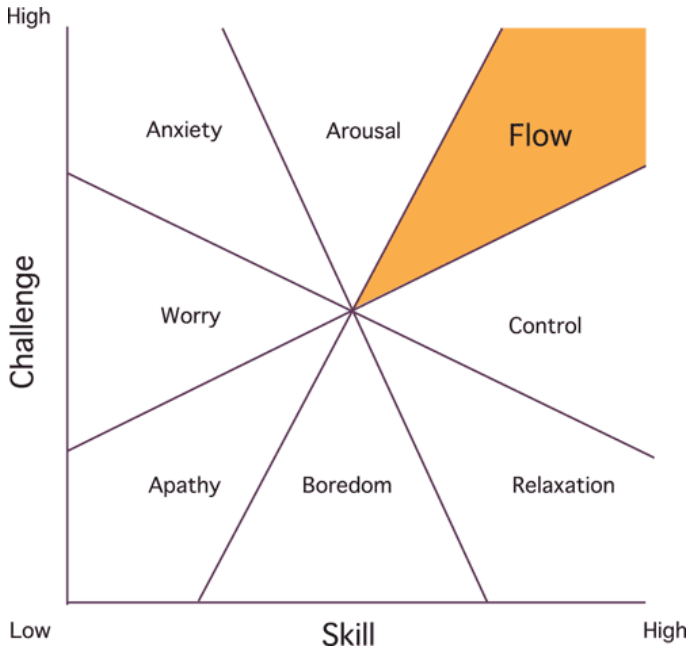

Figure 4. The balance of the challenges and the skills to reach the flow. Source: model of Mihály Csíkszentmihály (1990), figure: [2]

These are key factors while planning and managing the educational activities of the RIs' visitor centres. When planning the centre itself and its architectural design, equipment and programmes, the conditions of the flow must be taken into consideration. During the educational activities as it was mentioned already many times the instructors have crucial role. They must constantly observe and monitor the attitude of the students and they must intervene if they experience relaxation or anxiety among the them. They can change the level of the challenge or provide opportunity to increase the skills, e.g. with providing feedback incrementally or with teaching more complex skills based on the previous ones (Shernoff et al 2003).

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2.4.The structure of the creative spaces

Besides the intangible features (informal education, non-formal education, experimental learning, gamification, flow) of a visitor centre that were mentioned above its architectural design and physical environment is also important in maximizing the learning experience. Thoring et al (2018) conducted a research in which they characterized the creative spaces. In their research they determined five types of creative spaces and they identified another category that they named *spatial quality* (Table 1). This means the capacity of a place to facilitate a specific purpose which can be independent from the space type.

types of creative places	**spatial quality**
personal space	knowledge processor
collaboration space	indicator of an organizational structure
presentation space	process enabler by providing appropriate infrastructure
making space	space with social dimension
intermission space	source of stimulation

Table 1. The types of creative spaces and the types of the space quality. Source: the list of Thoring et al (2018), own editing

The *personal spaces* are usually silent places with lack of distractions and they enable the student to carry out concentrated working. The *collaboration spaces* facilitate teamwork, exchange of ideas and communication between each other. Their main characteristics are noise, playfulness and team interactions. *Making spaces* provide opportunity to experiment, try out and build things. The task of the *presentation spaces* is twofold from the students' point of view: these are the places where they can be passive recipients of the learning process (e.g. attend lectures), but also these are the places where they can actively give input through presentations. In desirable case these spaces can be easily reorganized according to the size of

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the group and the needs of the participants. This requires moveable sofas, chairs and additional seating cubes. The *intermission spaces* are not directly dedicated to creative work, but provide opportunities to take a break, discuss the work and plans (Thoring et al 2018).

Similarly, to the types o the creative spaces the spatial qualities also have five groups. The *knowledge facilitator* spaces are simple sources of information which can be stored on shelves (e.g. books), on the walls (e.g. whiteboards) but physical models and results of previous works can also be placed in these spaces. Spaces can be *indicators of culture* through expressing expectations about how someone should behave in the certain space. Written rules can support this, but it is also important to establish a specific culture to support the creative working and learning and to avoid misuse. The space can be a *process enabler* with enforcing and dictating specific procedural behaviours based on the provided infrastructure. From the aspect of the workflow it is helpful if the different kind of spaces are aligned close to each other. The *social dimension* of the spaces facilitates the interactions among the students as well as between the students and the teachers. These interactions can be artificially created with considering the locations some central objects and places (e.g. the location of the coffee machine or the copy machine can create accidentally bumps into each other). Spaces also can be *sources of stimulation* by different stimuluses for the human brain (e.g. smell, views, colours, noise) and by displaying motivational messages or providing games and gadgets (Thoring et al 2018). On the other hand, reducing the stimulations and distractions can also facilitate the creative flow (Csíkszentmihályi 1996).

Take away message:

- The visitor centre is not just a physical place and an exhibition, but it must be supplemented with different kind of activities, such as workshops, lectures and events
- The visitor centre has significant role on the field of education, it can be a place where informal and non-formal educational methods are implemented

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- The educational activities must be interactive, modern methods such as gamification must be tested and implemented
- When designing these methods, the psychological aspects must be taken into consideration
- The layout of the place must be designed according to the needs of the creative activities

3. Concept of an RI's visitor centre for youth

During the review of the policy and theoretical background several fields of education and awareness raising were identified where the RIs' visitor centres could have significant impact. The goal of this chapter is to provide inspiration for the creating a concept about the visitor centre's activities and programmes. This chapter is a pool of ideas, not every suggestion is applicable for each RI and when designing the programme of such a visitor centre these elements must be tailored to the local features.

3.1.Target groups and addressing them

The segmentation of the target groups (Table 2.) has crucial importance in implementing the visitor centre. This visitor centre aims to reach the youth, so the most important target group is the group of the students. Inside this group we can make difference between the primary school, secondary school and university students. Since the secondary school students study the physical sciences more in details they know better if they are interested in them or not. So inside this group we can make difference between students with science interest and without. The third group among the students are the university students that can be divided into three groups: the ones attending science programme, the ones on teacher training and the ones attending other programmes. Connecting to the students the

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group of teachers is also a key target group because they are the most significant actors in the learning process of the students. Furthermore, even though the visitor centre addresses directly the youth they have also potential in the field of the awareness raising among general public, so the local inhabitants and science tourists also form a target group.

Students	First level	Primary school students, age 10-14
	Secondary level	Secondary school students with science interest, age 14-18
		Secondary school students without science interest, age 14-18
	Tertiary level	College and university students attending science programmes
		College and university students attending teacher training
		College and university students attending other programmes
Teachers	First level	Specialized primary school teachers
	Secondary level	Specialized secondary school teachers
	Tertiary level	University staff
General public	Local people	Local people
	Science tourists	Science tourists from the country and beyond

Table 2. Segments of target groups

The primary school students must be addressed on a playful way that is easy to understand. These students are just on the beginning of the science learning process, due to this they are not able to recognize complicated connections between different disciplines and understand complex models. The everyday use of the topic of the respective research

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infrastructure must be presented to them supplemented with easy, but interesting experiments. The goal is to arouse their interest towards science and show them that science is fun. They should learn that science is not a privilege of a few people, but if they are interested they have also the possibility to become a scientist.

The secondary school students can be divided into two basic groups: one group with science interest and one is without. This is much more effective than dividing them according to classes and grades like in their schools. Usually in secondary school every student has to attend the same science classes such as biology, physics, chemistry, geography, mathematics and informatics and besides the possibility of extra courses there is no division among students based on their interest. This way the advance of the interested students is pulled back while the not interested students get bored on these classes. In the visitor centre minimum two different programmes must be designed for these groups. The students with science interest should learn about more complex models, scientific experiments and results and the possibility must be provided to them to engage in interactive activities in the visitor centre. On the other hand, for students without science interest the programme should focus on the general introduction of an RI and its local role, and on how a scientific result can be introduced on the market and become part of everyday life. This might raise their interest and they will engage in scientific activities, but even if this will not happen, they gain useful knowledge that they can use on other fields of their education in the future.

For university students, different types of programmes must be developed as well. The possibility of learning about latest scientific results must be provided for students that attend scientific programmes. They have detailed science knowledge, so they can understand complex processes and models and due to this there is a high potential in a visitor centre to contribute to the improvement of knowledge and skills of these students. They could also engage in scientific activities, carry out experiments and small project in the visitor centre if the RI offers a suitable space for this activity. For students that attend teacher training the educational aspects (informal and non-formal learning, gamification, STEM education, etc.) and possibilities of the visitor centre must be presented with providing possibility to engage in

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this activity. The students that attend other programmes could learn about the RI's role on their field, for example economy students could learn about the economic potential of the RI or law students could learn about the legal aspects of applying scientific results on the market. Besides being visitors of the centre the possibility to do summer internships and volunteer programmes must be also offered to these students. Since many foreign full-time and exchange students attend courses on European universities these opportunities must be provided not just on the local language, but on English as well.

The teachers are significant actors in the visitor centres. In case of primary and secondary education the teachers are the ones who organize the visits, but their role is much more complex. Before the visits they explain the students about the RI and what will they do during their visit, this way they transfer preliminary knowledge to the students that will be able to understand better what they learn during the visit. After visiting the centre, they organize follow-up activities for the students in the school where they discuss the experience and reflect to the visit. They facilitate the process when the new experience from the visitor centre become part of the students' knowledge and skills kit. During the visit they also learn about new scientific results and different educational methods that they can use in their daily work. Because the university students are more independent the role of the university staff is limited to organizing the visits and other activities and acting as a university mentor and coordinator for the students that engage in scientific activities in the centre. However, they also can learn about new scientific results during the visits.

The local people and science tourists are the visitors that are interested more in the general features of the RIs. They visit exhibitions and guided tours to learn about the research infrastructure itself. They are the ones that bring some income to the centre with purchasing entrance tickets and small gifts in the centre. A large RI can attract visitors from the neighbouring countries besides the local people. Because of this the content of the exhibitions must be available in the language of the neighbouring countries from where visitors likely come besides the local language and English.

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3.2.The environment of the visitor centre

The visitor centre must be located inside the research infrastructure or in walking distance from it. The arrival and the departure of the visitors must be well-managed it must not disturb the daily work in the RI or the arrival the other guests. Traffic issues should be taken into consideration because the groups of the students usually arrive by bus, so the access and parking of these buses must be ensured.

The visitor centre's design must be in harmony with the design of the whole centre and it must express scientific environment. Eye-catching posters can be placed on the wall and models, devices about the topics that re researched in the RI can be installed in the centre. If the conditions in the RI are suitable, guided tours can be organized for the visitors. For this a safe, but interesting route must be designed in the RI for the visitors. If there is no possibility for this the building could be presented in an interactive way (audio-visual tour) to bring closer the centre to the visitors.

The premise of the visitor centre must be divided into different parts and this way allow to carry out different activities at the same time. It must contain an exhibition place where the history and the current activities of the RI can be presented, supplemented with models, equipment and devices that the scientists use. The whole exhibition should be organized in an interactive way. The facts about the RIs must be presented through audio-visual storytelling and the devices and equipment must be presented in an interactive way as well. Organizers should avoid long texts and explanations because the majority of the visitors would not read them and listen to them, and because of this they would not get a good experience about the centre.

Besides the exhibition, there should be an education place in the visitor centre where the visitors (mostly students and their teachers) could engage in scientific activities. This can be a large single room divided into smaller parts by the furnishing, or the centre could be divided into smaller, separated rooms. Either way is chosen the education place must contain a lecture space for presentations, spaces that are suitable for teamwork and for individual

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work as well and makerspaces. Friendly atmosphere must be created by the furnishing and by the posters, written messages and colours inside the centre.

3.3. Guidelines for developing the programmes and the activities of the visitor centre

As it was described we can divide the target groups of the centre into three main groups: students, teachers and general public. These groups could be also divided into smaller subgroups and for each subgroup the centre must provide different activities.

3.3.1. Students

For students the centre must provide educational activities which are out of the school context. Even though these visits have the possibility to supplement the formal education they usually do not have large impact on the educational level of the students because of the short time that is spent there (Lin & Schuman 2016). Because of this the programmes of the visitor centre must be supplemented by preliminary introductions and follow-up activities and the visits must be continuously repeated. A chain of visits could be established which provides opportunities from primary school until tertiary education for students to visit the centre and always gain new and relevant knowledge.

Primary school students

Before going to the centre, the primary school students must receive information about the place and about the activities that they will do there. This can help them not to be shy and surprised when they arrive, so they can enjoy the whole visit. The aim of their visit is to present them that science is fun and interesting. Stressful and competitive situations must be avoided.

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The visit could start with an interesting audio-visual presentation of the research infrastructure in the presentation space. Then they could take a short walk in the exhibition where the instructor provides interesting details about the RI and about the things they see there. Then comes the interactive part. Different types of programmes must be designed for the students according to their grade, level of knowledge and interest, also their disabilities must be taken into consideration. When organizing the visit, the teachers must discuss with the staff of the visitor centre about the programme and choose the most suitable one.

In the interactive part of the visit the instructor presents an experiment to the children. The experiment must be understandable and not too long, and it must be related to real life. For example, it can present the logic how a device that is used in everyday life works. During one visit 2-4 experiments can be presented. After the instructor presents the experiment the opportunity must be given to the children to try out the device or try to repeat the experiment with the overview of the instructor and the teachers. The special needs of children with disabilities must be taken into consideration and the possibility to explore must be provided to them as well. The whole visit lasts for 1,5-2 hours.

After the visit, when the students return to their schools or during the following days the teachers must initiate a discussion during the classes about what they have seen in the visitor centre. The goal of this to make sure that from the things they have seen as much as possible becomes part of the students' knowledge and skills kit. They must be also asked to complete a questionnaire about the visit or share their opinions in other ways, because this feedback is useful for the further improvements in the centre.

Secondary school students

As it was mentioned, secondary school students could be divided into two groups based on their science interest and knowledge. Comparing to primary school students secondary school students have more detailed knowledge about science and they are able to

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work individually. Based on this besides the organized visits they can attend extracurricular activities in the centre as well, which more focus on the individual work.

Before the visit the students must be preliminary informed about the RI and about the visit in their school so when they arrive to the centre they will have already initial knowledge about it. After their arrival, they attend similar programme as the primary school students. They should also receive audio-visual presentation of the RI or if the conditions in the research infrastructure are suitable they can attend guided tours as well. After this this they can visit the interactive exhibition.

During the interactive parts the secondary school students can choose between two types of activities. One is focusing on experiments and research and the other is on the everyday use of the research's results. For the experiments the students must be divided into smaller groups (3-5) and they must be provided with the necessary tools, devices and materials. With the assist of the instructor they must plan and carry out an experiment, conclude the results and discuss with each other and with the instructor. The process must capitalize the knowledge that they already have from their formal education, but the principles of the non-formal education must be applied. During the programme the students must use the simplified devices and tools of the RI or if this is not possible they must use other equipment that are related to the RI's research topic. The instructor has crucial role in this process, (s)he does not interact with the groups continuously but observes and intervenes when it is necessary. For example, at the end of the planning phase, after the experiment or when (s)he notices that a group get stuck. Their role is not to be the only source of the knowledge, but to provide help to the students to find out the solution. This is not necessary a concrete information, but a hint in which book from the visitor centre's bookshelves they should look for the solution or which keywords they should use to search on the internet. Letting the students to explore, fail and restart, discuss and evaluate provides the framework for the programme.

The programme for secondary school students that are not really interested in science must focus on the everyday use of research and on the process during which and idea

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becomes a product on the market. This must be presented by authentic voices, by people that have experience in this process. The programme must not have regular lecture structure, but it must be interactive, the opportunity must be provided for the participants to ask and discuss. The main steps of the process during which and idea becomes a product must be presented by models, pictures, videos and by minor experiments as well. The workshop should also focus on the crucial activities and ingredients for success.

After the visit the visitors must be asked to complete questionnaires or must be interviewed about their experience and the feedbacks must be used for the improvement of the programme. The teachers after the visit should discuss the experiences during the classes in the school and try to facilitate the process during which the experience becomes knowledge.

The secondary school students have the necessary level of knowledge and independency to attend extracurricular activities on their own. With organizing these activities, the RIs can increase the level of STEM knowledge of the students who will might continue their studies on scientific fields. In the afternoon in the visitor centre extracurricular activities must be organized for interested students. These activities are led by the instructors and the infrastructure of the centre is used. On the one hand, similarly to the organized visits, more advanced experiments could be carried out by the students with the assist of the instructors. On the other hand, students would have the opportunity to work on their own projects in the makerspace. Here the necessary infrastructure and guidance is provided for the students and besides this, the supporting environment is an important factor as well. The participants can meet with fellow students from other schools with the same interest and they might start to implement common projects.

Besides the regular activities the students must be addressed with special programmes as well. The visitor centre must organize competitions for the students around different research topics of the RI. These can be done during the school year when the participants work on different scientific topics. During implementing their small-scale projects to find solutions for different scientific problems they must have access to the infrastructure of the visitor centre. Mentors from the staff of the visitor centre must be also designated to each

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group. At the end of the competition they should have opportunity to present their ideas to the jury which must be composed by the RI's staff. Summer camps must be also organized for selected students during which they could engage in different activities such as attending lectures, do experiments, implement small projects and engage with the staff of the RI and with fellow students.

University students

From the perspective of the RI's visitor centre the university students could be divided into three main groups: students that attend science programme, students from teacher training and students that attend other programmes. Since university students have detailed and broad knowledge they can not just visit the centre but contribute to its activities as well.

The university students that are in scientific programme must be provided with the opportunity to have a guided tour or if this is not possible to have detailed audio-visual presentation of the RI. During their visit they also must have the opportunity to do groupworks but organizing continuous educational programmes could be even more effective. This practically means that the classes of a subject are led by the staff members of the RI and organized in the premises of the visitor centre. During this programme they could carry out complex experiments and researches and they would receive credits for completing these courses. On the other hand, possibility to carry out their own researches and projects must be provided to the university students as well. They could use the infrastructure of the centre to do their thesis research. During this they could engage with other students (even with high-school ones) and share ideas about each other's projects. Similarly, to the secondary school students, competitions and summer schools must be organized for university students as well, but with advanced topics. The university students can be also volunteers and interns in the RI and in the visitor centre. They can participate in hosting the primary and secondary school students and they could be also the mentors in the projects and competitions for the secondary school students.

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Besides the general programme the visit of the students that attend teaching training must focus on the special STEM teaching methods and principles that are used in the visitor centre. In the framework of their education they could contribute to the educational activities of the centre. They can participate in the analysation of the questionnaires that are fulfilled by the students after the visits and based on them they could take part in the development and improvement of the methods. They could also do internships, volunteering and join to the work related to the visits and activities of the primary and secondary school students.

The visit of the university students that attend other types of educational programmes in university could focus on other topics related to the RI. Besides the guided tour in the RI and visiting the exhibition they could attend workshops that focus on specific fields of research and held by the staff members of the RI. For example, law students could attend workshops about the legal aspects of research and innovation, the economy students can attend workshops about the economic development potential of the RI. Furthermore, they could join as interns or part-time employees to the RI and get relevant experience on their field while they are still in the tertiary education.

3.3.2. Teachers

The role of the teachers concerns two fields. One is to organize and facilitate the visits of the students, the other is to develop themselves and their professional skills. When organizing the workshops, they should not just organize the logistical details, but provide details to the staff of the visitor centre about the level of education of the students, take part in the preliminary and follow-up activities and contribute to the development and improvement of the educational programmes of the RIs.

On the other hand, they can attend workshops as well where they can develop their professional skills. On these train-the-trainer workshops they acquire knowledge about educational forms that are used in the RI such as non-formal education tools, methods related

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to gamification and learning by experience. These methods can be introduced in the daily education in their schools. They can also hear about new research methods and results and with sharing this information with their students they could make more colourful their lessons. The RI can also design a "study box" with relevant learning materials and simplified tools that can be also used in the daily education.

In addition to the activities described above the teachers from secondary schools must encourage the talented and interested students to take part in the extracurricular activities of the visitor centre. They can be the contact points in the schools of the students and they can reward their extracurricular activities. In the case of the university staff their role in the field of mentoring and coordinating is important. If their students decide to join to the activities of the RI as interns or volunteers or they take part in different competitions and projects they can be the ones who provide mentoring for them form the side of the university. In addition, all the three groups of the teachers must be involved into the activities of planning, monitoring and improving the programmes of the visitor centre.

3.3.3. General public

Besides the youth and the teachers, the third target group is the general public. They are residents from the area of the RI and science tourists from the region, country or even abroad. They visit the exhibition and attend the guided tours. Special events can be organized for this target group such as open lectures and presentations or organizing thematic exhibitions and events marking special days that are related to the RI, for example the Earth Day or the World Water Day.

Take away message:

- The three main target groups of the visitor centre are the students their teachers and the general public

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- Different activities must be designed for students with different interests
- The educational activities must be done by using STEM educational methods
- Besides the visits extracurricular activities must be designed where the students can create independently why engaging with each other
- University students are visitors but with doing internship or volunteering they could also join to the work of the RI
- The teachers' role is twofold: they organize the visits for their students and during the programmes they are visitors themselves, on the other hand they attend train-the trainer courses during which they learn about the educational methods of the RI that they can use in their daily work
- Monitoring the experience of the visitors is crucial to improve the programmes of the centre

4. Guidelines for preparing action plan for RIs' visitor centres for youth

This chapter aims to provide guidelines for preparing an action plan about establishing and managing RIs' visitor centres for youth. The action planning process encompasses six basics steps: analysing, ideation, prototyping, testing, updating and monitoring (Table 3.). For each step of the action planning the activities, the used methods and sources, the ways of the involvement of stakeholders and the necessary outputs are described. For preparing this chapter the output of the AgriGo4Cities project (another DTP project), the Approaching urban agriculture as a social innovation: Guidelines for the development and implementation of an action plan was used. However, the addressed topic is totally different the guidelines can be adapted and tailored for establishing a visitor centre, since the steps of participatory action planning are described in details in it and due to this the guideline was a relevant source of ideas when writing this chapter.

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Name of the step	Activities	Involved players	Outputs
Analysis	Analysing internal documents of the RI Collecting data and information to analyse the local situation Stakeholder analysis	RI's internal project team, External experts	Plan of the process State of art Stakeholder matrix
Ideation	Workshops for common thinking Preparing preliminary plan of the visitor centre Allocating tasks among the participants	RI's internal project team External experts Representatives of stakeholders	Common vision about the visitor centre and its activities To-do list with allocated responsibilities
Prototyping	Physical establishment of the prototype of the visitor centre based on common vision Designing the programmes and activities of the visitor centre	RI's internal project team External experts Representatives of stakeholders	Physical prototype of the visitor centre Prototype programmes and activities of the visitor centre

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		Subcontractors: service and product providers Students Teachers	
Testing	Testing the prototype of the visitor centre	RI's internal project team External experts Representatives of stakeholders Students Teachers	List of errors and recommendations
Updating and finalizing the concept of the visitor centre	Implementing the necessary changes in the centre and its activities that emerged during the testing	RI's internal project team External experts Representatives of stakeholders	Final plan of the visitor centre and its programmes and activities

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		Subcontractors: service and product providers	
Monitoring	Setting up indicators Estimate the staff and monetary needs of the monitoring, define the monitoring activities with allocated responsibilities	RI's internal project team External experts Representatives of stakeholders	List of indicators (output, outcome and impact) Monitoring plan with necessary resources and allocated responsibilities
Final output: The action plan of the establishment and management of the RI's visitor centre for youth			

Table 3. The steps of action planning of RIs' visitor centres for youth

4.1.Analysis

The first step of the establishment of visitor centres of RIs is the analysis of the situation. For this data and information must be collected, the identification of the stakeholders also takes place in this stage of the project. These activities must be done by the respective RI's internal project team, but external experts could be also involved into this task. To start the entire process an initial brainstorming is needed among the project team members and external experts where the further steps will be defined.

Collecting relevant information, data and drafting the state of art based on them are crucial for the successful implementation of the project. The internal documents of the RI must be reviewed, this means the analysis of its management and communication plan and its

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budget, but the available place that can be allocated for the visitor centre must be identified as well. This information must be synthesized and made available for the internal project team of the RI and also for the external experts, because it will provide the framework for the whole planning and establishment of the visitor centre and affects also its future management. In this phase the steps and activities of the planning process also must be determined. This means determining the estimated timeframe, budget, staff needs of each step; planning the activities, outputs of the planning phase and milestones of the project.

In this phase the relevant local, regional and national plans also must be reviewed and connections between the visitor centre and the goals of the relevant territorial units must be identified. With this step the interest of the municipality and the region can be increased. In addition, better local context can be provided to the visitor centre in physical terms and concerning its activities as well. Besides analysing the relevant planning documents, the statistical analysis is important too. In order to plan the activities of the visitor centre it is important to know certain features about the target groups. Data must be collected about the local schools, about the number of students (while paying special attention to vulnerable and marginalized students), number of teachers that can be involved and about other relevant features that could be important for the visitor centre.

Last, but crucial step for successful project implementation is collecting data and information about our stakeholder group. These are the different actors on the field that have interest in the project and have possibility to influence its implementation either in positive or in negative way. Involving and informing these stakeholders is important because they have resources that might lack from an RI, especially if it is a newly established one. These stakeholders have knowledge about the local situation, they have connections, furthermore they are usually known by the local society. Because of this they can contribute on high level to the project implementation.

In the RI2integrate project the National Expert Groups were established as national stakeholder groups. The NEGs must be activated while planning and establishing the visitor centre, but these groups can be supplemented with other relevant and interested members.

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Involving new members (or establishing a stakeholder group in case of other projects) requires the mapping and identification of these stakeholders. The stakeholder matrix (Figure 5) must be drawn in which the stakeholders are not just identified, but their power, possible attitude towards the project are also indicated.

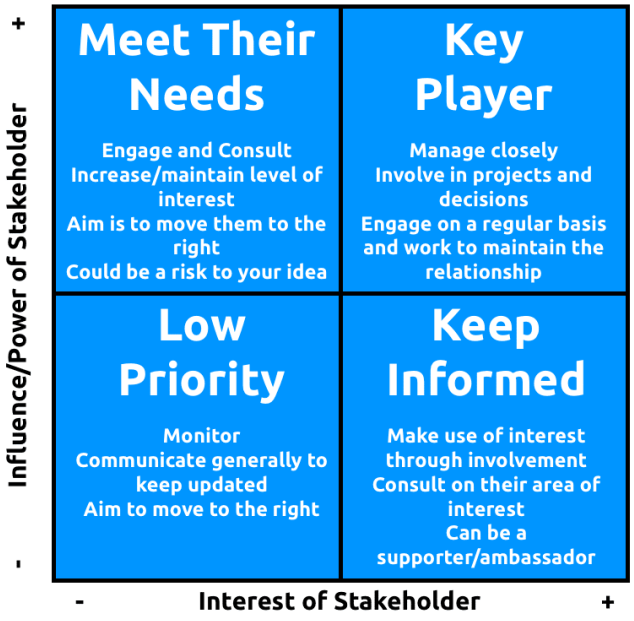

Figure 5. The stakeholder matrix. Source: [3]

4.2.Ideation

After the first step when we have a plan about the planning process itself, the state of art is prepared, and the stakeholders are identified we can start with the concrete work. In this step the crucial part is the involvement of the identified stakeholders. They must be informed about the project and about the work that has been done before their involvement. They should also receive the draft plan of the action planning phase and the state of art that was

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prepared before their involvement. These actors not just have to be informed but also convinced to join to the project.

When the involvement of the stakeholders is ensured, the ideation phase takes place. This means sharing ideas, expectations, knowledge about the project. In this process key emphasis is put on the opinions of the stakeholders. It is not a satisfactory solution to present them the project idea, the tasks that have been already done on a workshop and then wait for their contributions. They must be directly and actively involved. Of course, the idea behind the project and the already achieved goals must be shared, but then active common work takes place on the stakeholder meeting. There are several methods to share ideas and to use them the assistance of professional trainers might be needed.

The work during the ideation aims to establish a common vision and concept of the visitor centre. This includes its physical features, programmes and activities and the way of involvement of the target groups. Furthermore, the involved stakeholders share their expertise and possibilities, so their way of contribution could be also identified. The next steps of the planning phase with the chosen methods must be also addressed. The outputs of this phase are the preliminary concept and vision of the visitor centre, a depository about skills and resources of the stakeholders and a plan about the next steps of the project.

Depends on the size of the project, the ideation phase can be carried out during 1-3 workshops. These workshops can be supplemented with bilateral meetings, Skype meetings or with using online idea sharing platforms (e.g. Tricider) and creating an e-mail list could be also necessary to spread information among the stakeholders.

4.3.Prototyping

The prototyping is the first step in the process in which the students – which are the main target group of the visitor centre – are directly represented. The aim of this phase is to improve the concept that was prepared in the previous phase with creating a prototype about the physical environment of the visitor centres and its programmes, activities.

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Groups of students and their teachers must be involved in this process. They must be asked about their needs regarding such a centre. This can be implemented during questionnaires, groupworks, interviews and focus groups while taking into the consideration the skills of the participants. This process requires more steps of iteration. The teachers are key actors in this process, their role is twofold: they share their opinion and needs about the centre and they facilitate the involvement of the students. The task of the project team is to ensure the involvement of the target groups, synthesize the ideas and share them with the other stakeholders for reviewing them.

The involvement of the students requires special attention. Since this is just the prototyping phase there is no need to work with large numbers, but more groups of students must be represented. Choose the students from different level of education: primary, secondary (gymnasium, vocational schools) and university. It depends on the size of the project but while working with 50-60 students which represents diverse groups could be effective for developing a prototype.

Before starting with the process take them to a similar visitor centre of an RI to help them to understand its concept. After this visit their ideas can be collected several ways. Questionnaires (Annex 1.) and interviews (Annex 2.) that fit to the level of skills and education of the students can be done with focusing on what they liked or did not like in the visited centre. Group discussion after the visit can be also useful because the students have the possibility to reflect to each other's opinion. During this the teachers act as facilitators and the members of the project team observe the process and make notes about the discussion. Asking the students to take photos or short videos while visiting a visitor centre and during the activities there can be also useful for the further planning steps.

Besides the activities above that more concentrate on the programmes of a centre the students also contribute to its physical features. Depends on their level of education they must be involved in the prototyping the space of the visitor centre itself. The primary school students can be asked to draw a visitor centre or build one from different materials (e.g. small building bricks) and then explain their model. Secondary school students can be asked to

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create a model of the visitor centre in their classroom with furniture and equipment that are available there. This model can be supplemented with other elements such as models of equipment from cardboard or with post-its that mark the different places and equipments of the centre in their model. University students are able to act more on their own. They can be asked to write down and draw their prototypes and send them to the project team members, but they can work interactively as well.

When the ideas and prototypes are collected by the project team members, they review and synthesize them and prepare the final prototype of the visitor centre. The members of the stakeholder group are also involved in this process. When the plan of the prototype is ready it is implemented in the visitor centre. This means the physical implementation, procurement of the necessary elements, the training of the staff and designing the programmes; basically, it means the creation of the visitor centre's physical prototype itself. This prototype does not have to be large scale and complete, but the most important elements from the feedbacks must be implemented and it must be suitable for receiving small number of visitors.

4.4.Testing

When the prototype of the visitor centre is ready to accept the first visitors it must be tested by the target groups. To do this the students and teachers that participated in the prototyping and also new students and teachers must be invited to take a visit in the prototype centre. In this phase they attend the programmes of the visitor centre and then share their feelings and opinion about it. In this phase the visitor centre operates for testing purposes and accepts limited number of visitors. The aim of this phase is to test the prototype and implement necessary changes and adjustments.

In this phase the project team members collect information in two ways. First, they attend the visits of the target groups and observe their behaviour and non-verbal reactions during the visits. They can also make photos and videos that can be analysed after the visit and engage with the target groups, but during this they must not influence the opinion of the

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visitors. On the other hand, the invited students and teachers fulfil questionnaires, attend groupwork or group discussions about their experiences. They can share if the offered programmes met their expectations and recommend necessary changes. All the gathered information must be analysed and synthesized by the project team members and/or by external experts with the overview and participation of the members the stakeholder group.

4.5.Updating

In this step based on the recommendations and reported errors the team designs a plan for updating the prototype. This concerns the improved environment in the visitor centre as well as the development of its final programmes and activities. In addition to the updates the project team with the involvement of the stakeholders and external experts establishes the operational guidelines the centre. This means the preparation of a management and a communication/marketing plan and the creation of the structure of the visitor centre staff with allocated tasks and responsibilities. The output of this step is the updated plan of the visitor centre, its activities and its management and communication.

4.6.Monitoring

This is the last step before the visitor centres will be fully established and starts to operate. During this step the project team together with the stakeholders defines the indicators that are suitable to monitor the progress and measure the effects of the centre. They set the input, output outcome and impact indicators (Figure 6.) as well as the plan of how to measure them and assess the results.

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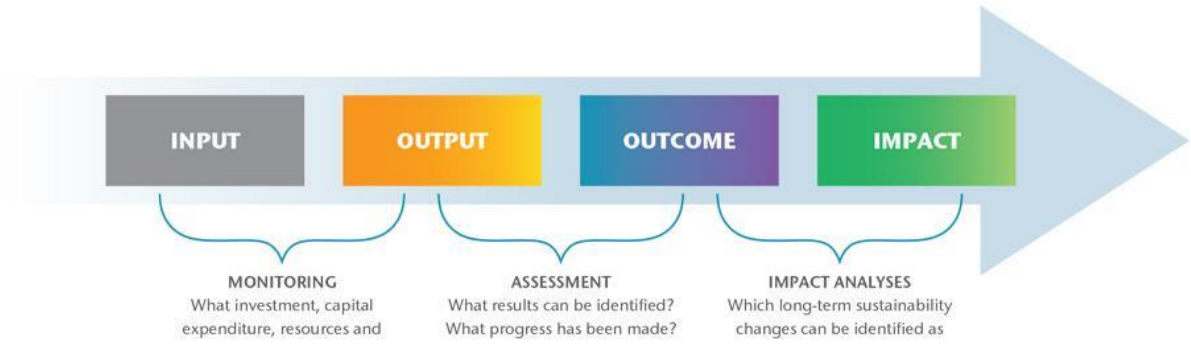

Figure 6. Types of indicators. Source: [4]

Input indicators are the necessary investments and activities that are needed to implement a project, in this case to establish a visitor centre of an RI. Monitoring the performing of these indicators can show deviation in early phase of the implementation. For example, if a certain amount of money is planned for establishing a lecture room in the visitor centre, but the spending deviates from the spending plan it is likely that the establishment of the lecture room will be delayed. The output indicators are the concrete measurable resources of the project, in this case the most important are the visitor centre itself with certain features (e.g. square metres), the equipment, the furniture and the developed programmes and activities.

Outcomes are the changes achieved by the project that lead to the final goal. Contrary to most of the output indicators these are usually intangible ones such as the number of students and teachers that visit the centre or attend events there. Impact is the long-term effect of the project. In this case it can mean the level of skills of the students and teachers that results in better grades, in increased number of applications for certain tertiary education programmes or better opportunities on the labour market. The achievement of the outcome and especially the impact indicators are not just affected by the implementation of the project, but by the management of the visitor centre and by the follow-up activities as well.

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4.7.The implementation

The final output of the action planning process is the plane about the RI's visitor centre for youth with its programmes and activities. This plan envisages the necessary physical changes and expansions in the prototype visitor centre, the needed improvements of its programmes and activities and it also contains the management, communication and monitoring strategies of the centre. However, the participatory aspect should not be forgotten during the implementation and management. Assessing of the opinion of the students, teachers and other visitors should be a continuous activity during the operation of the centre, these opinions should be analysed and based on them necessary changes and adjustment must be implemented during the operation of the centre. Stakeholders should be provided by the opportunity to review the results and the collected data and should be involved in the monitoring process too.

Take away message:

- Involving the local and regional stakeholders is not just a step of the action planning phase but it provides the whole framework to it
- Multiple iteration of the planning helps contributes to the development of the successful final centre
- Students must be involved into the planning phase to tailor the centre and its programmes to their needs
- Indicators must be defined during the action planning, with monitoring the necessary improvements could be implemented in the centre

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5. Promotion and marketing of the RIs' visitor centres for youth

In the management of the visitor centre it is crucial to pay special attention to its promotion and marketing to increase its regional embeddedness. In details the Roadmap for community awareness raising (D 4.3.1) deals with the communication, marketing and promotion of the visitor centres, this chapter aims to synthesize the most important information and integrate it into the guidelines for visitor centres.

In communication there are five basic categories of approaches: personal communication, mass communication, education, public relations (PR) and advocacy. Concerning the visitor centres significant part of the *personal communication* takes place during the visits. To communicate properly the staff must create mutual principles, they must be professional and helpful, and they should communicate clearly to the visitors. The experience of the visitors is crucial because they tell about the visit to their friends, relatives or fellow schoolmates and the behaviour of the staff influences significantly their experience. The *mass communication* has crucial role after opening the centre, through this the centre can communicate about its programmes and offers to the general public. The fast spread of the information can be reached with a proper mass media campaign. During the operation of the centre the mass media can be effective tool to communicate about large, open events and occasional programmes of the centre.

From the five approaches of awareness raising the *education* plays the most important role in the RIs' visitor centres for youth. The aim of education in the field of awareness raising to provide skills and incentives for the target groups to change their behaviour and attitude towards the research infrastructure and towards science in general. The train-the-trainer workshops for teachers, the use of formal and informal education methods, providing the right information, permanent and travelling exhibitions all contribute to our goals.

Public relations (PR) aims the establishment and maintenance of the reputation and credibility of the awareness raising campaign. On the one hand, it includes regular communication to the press, but it also includes the regular stakeholder meetings. The co-

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operation with stakeholders gives the framework to the entire planning and establishment process of the visitor centre and it also must be part of its management. The most important stakeholders are the local government, the universities, the local primary and secondary schools and the NGOs that deal with related topics. With co-operation their essential knowledge could be channelled into the visitor centre which contributes to the establishment of better programmes and improvement in the management, so it facilitates to reach better user experience and due to that the desired impact.

Advocacy and lobbying is an activity which is strongly related to the public relations. It can be crucial to ensure the support from the governments and the previously mentioned organisations. Creating strategic alliances and partnerships, meetings with politicians from all level while focusing on the professional topics could be effective ways to ensure their support which is necessary for the effective operation of the centre.

Take away message:

- You should have a clear message what you want to communicate to your target groups
- Use different approaches for different target groups also use different the different approaches in the different stage of the project
- Advocacy and PR are effective activities to maintain the relationship with the stakeholders during the management of the centre

6. Good practices about RIs' visitor centres

Before establishing a visitor centre we must examine international good examples to capitalize their results. While doing this we can get inspired, learn from their success and read about ideas and methods that can be adapted in the new visitor centre. In this chapter two international good practices about research infrastructures' visitor centres are presented.

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6.1.CERN, the European Organization for Nuclear Research

CERN was founded in 1954 and it is located near to Geneva, close to the French-Swiss border. In the institution the physicists and engineers are probing the fundamental structure of the universe. They study how the particles interact and provide insights into the fundamental laws of the nature. To do this the scientists use the world's largest and most complex scientific instrument [5]. Besides the extended scientific research, the centre put great emphasis on interaction with students and educators [6].

For teachers they offer summer teacher programmes. The summer programmes last between 3 days and 3 weeks and they aim to improve the teachers' knowledge and skills about the latest developments in particle physics and related areas and offer them the possibility to experience international research environment. The programmes are facilitated by experts and during them the teachers have the possibility to meet with their colleagues from all around the world [7].

CERN offers the possibility to visit the facility free of charge in the framework of guided tours for individuals and for group of students as well (Figure 7.). The tours contain guided tour on the historical area of CERN, the visit of operation centres and visit points and the tour is supplemented by audio-visual elements. They also offer two permanent visits which are available without prior booking [8].

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Figure 7. Discovering how experiments wok in the Microcosm exhibition of CERN. Source: [9]

From the aspect of the visitor centres the most interesting initiative of CERN is the S'Cool LAB. This centre is located at the CERN area and offers possibilities for high school students and their teachers to take part in hands-on and minds-on particle physics experiment sessions. During these programmes students discover independently and scientifically and learn how to apply their knowledge in a new setting. During this they engage with CERN scientists and can have a look to the life and work in a research institute [10]. In the S'Cool LAB three types of activities are offered: S'COOL LAB Cloud Chambers, S'Cool LAB PLUS+ and S'Cool Lab Summer CAMP.

In the Cloud Chambers students have the possibility to build a cloud chamber which is a particle detector and then they can track particles that are made visible by the chamber. The students also learn about the importance of the clean-up activities in a laboratory and this way they learn how the be responsible users. The entire process and the group discussion at the end is facilitated by a specially trained tutor from CERN's scientific community [11].

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In the S'Cool LAB PLUS+ high school students participate in two particle experiments (Figure 8.). One is the cloud chamber workshop and the other is one of the other S'Cool LAB Experiments, such as building an electron beam and studying electrons, operating an X-ray machine and studying the absorption of X-rays in matter using a fluorescent screen and pixel detector, using scintillation detectors to understand the basic principles of Positron-Emission-Tomography (PET) and locate a positron source (Na-22) and measuring the electrical resistance of a normal conductor and a high-temperature superconductor . They work in groups of 2-4 students and explore particle physics phenomena. During the workshop they make predictions, observe experiments and discuss their results. The workshop is led by a specially trained tutor from the CERN scientific community. Besides learning, the students contribute to a scientific education research by fulfilling questionnaires, being interviewed by researchers and testing new S'Cool LAB worksheets [12].

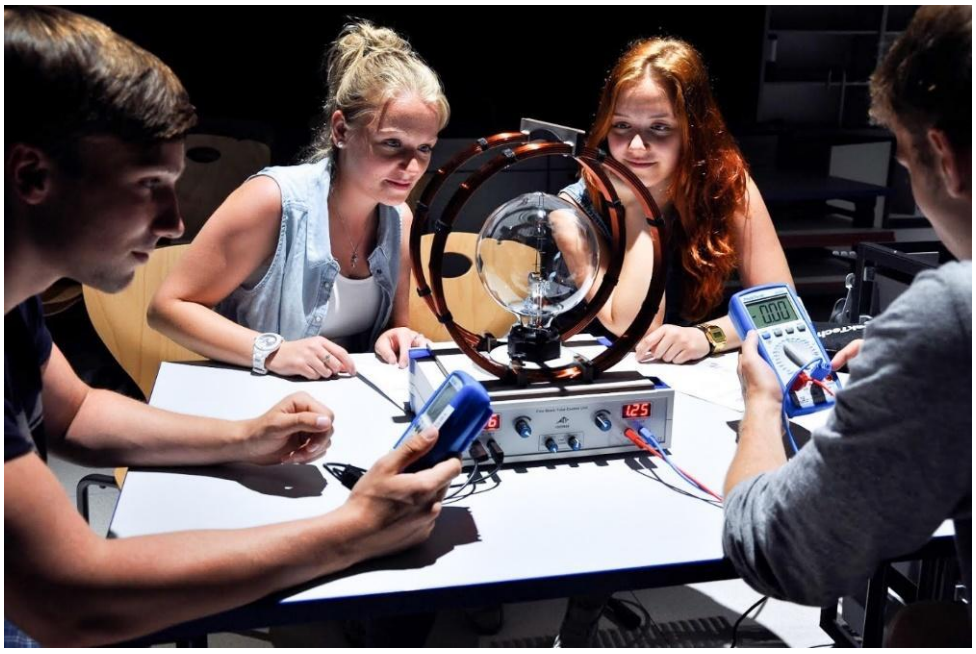

Figure 8. Students making small experiment in S'Cool LAB. Source: [13]

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CERN also offers S'Cool LAB Summer CAMP for high-school students. From all over the world 30 selected students above the age of 16 participate on the two weeks long camp. During the camp they attend lectures and tutorials, they work on their own research projects and visit the research installations [14]. Besides this CERN offers student work opportunity for students to spend their university training there [15] and an internship programme for high-school students which focuses on giving students the chance to discover STEM in the CERN context and environment, strengthening their understanding of science, and developing their skills in a high-tech environment [16].

Besides the on-site visits CERN made available a vast of scientific information if someone wants to learn more about the researched topics of the centre. CERN visits are available for children that are older than 12 years, but they designed an interactive online learning platform for kids. On this webpage they can watch videos about CERN and its activities, explore the laboratory and the universe itself in an interactive way and play games (http://www.cernland.net/).

6.2.Goddard Space Flight Center and Goddard Visitor Center

The Goddard Visitor Center is located in Maryland and it is the visitor centre of the Goddard Space Flight Center which is part of the NASA's network. The centre plays crucial role in the Agency's missions, more than 50 spacecrafts collect observations for scientists. The missions support multiple scientific disciplines, including Earth science, solar science and the sun-Earth environment, planetary studies and astrophysics [17].

The visitor centre (Figure 9.) of Goddard presents the centre's innovative activities in Earth science, astrophysics, heliophysics, planetary science, engineering, communications and technology development. The centre pays special attention to visitors with disabilities, they offer sign language interpreters, CART reporting services and designated sighted guides for walking tours. This way they make available the science to people with disabilities. In the

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centre they organize events for special occasions such as NASA 60th Anniversary Events and they have recurring events as well [18].

Figure 9. Goddard Visitor Center. Source [18]

Every month the Sunday Experiment which is a free programme is organized. The programme is about Goddard's world-renowned science and engineering research and technological developments. The programme is organized for children between the age of 5 and 10 and for their families. In the centre they also celebrate NASA Goddard's major science missions. The aim of the programme is to provide opportunity for the visitors to discover the centre and get inspired through fun and engaging activities [19].

The centre also organizes Model Rocket Launches which are free events for the people that want to build and launch their own rocket (Figure 10.). The visitors have the opportunity to bring their own models to the centre where they can also buy necessary elements such as motors and supplies, but they can buy their rocket there as well. During the building they

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receive advices from the centre's expert team. There is also a possibility to attend the rocket launches as passive participants [19].

Figure 10. rocket launching in the Goddard Visitor Center. Source: [19]

Not the visitor centre but the Goddard Space Flight Center has an Educator Resource Center, where they provide help for teachers to learn about NASA's educational programmes and about how to use them. They work together with educators from every level and type to find out how to share NASA's knowledge. With giving their expertise NASA scientists and engineers participate in the development and the implementation of the programme. The Educator Research Center provides demonstrations on educational technologies, trainings and instructional products in the centre workshops are also organized. The professional development of the educators aims the use of NASA's unique materials to enhance curriculum needs and address content standards in areas such as Earth science, space science,

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aerospace, technology and engineering. Educators also have access to teaching materials engineering design challenges, model rocket launchers, mass and weight kits and to free publications and products such as posters, videos, lithographs, DVDs, NASA TV episodes, CDs curriculum guides and podcasts [20].

The Goddard Space Flight Center also offers different educational programmes which are focused on STEM education. In the centre they organize public events and provide experimental learning opportunities, resources and STEM challenges. The students have the possibility to talk directly with crew members of the International Space Station. For middle school-aged students form minorities and underrepresented populations the centre provides a weeklong summer programme to introduce the technical working environment, Goddard missions, observations and the students also participate in interactive activities. High school students can attend on-site experiences during the school year for what they could receive credits in their educational institution. College students can participate in mentored experience-based researches and the centre pursues teaching degrees that demonstrate how to use NASA content and materials in the classrooms [21].

In the Goddard Space Flight Center internships, fellowships and scholarships are offered for students. These programmes enhance and increase the capability, diversity and size of the future STEM workforce in the USA. The internships are available from high-school till graduate level and it provides the opportunity to participate in research and experimental learning with the guidance of NASA mentors in the agency's facilities. The centre also offers career possibilities for students while they are enrolled or accepted for enrolment in a qualifying educational programme. They can work and explore while they are still in school and if someone successfully completes the programme (s)he might receive permanent or temporary employment offer from the agency [22].

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Summary

The aim of this document is to provide guidelines for research infrastructures that intend to establish a visitor centre for youth. The guidelines were prepared in the framework of the RI2integrate project, so the primary aim of the document is to provide guidelines for the members of the partnership for implementing pilot actions. However, the document contains vast of information and recommendations that can be useful for other RIs as well.

With reviewing the policy framework and previous results of the project the context for this document and the pilot actions were described in details. The theoretical background of the visitor centres provided information about methods and principles that must be taken into consideration while planning and establishing these centres and the chapter about the concept of these chapters provided guidelines about how to use the theory in the practice. The action planning phase intended to help the RIs' teams which are responsible for the establishment of a visitor centre in the planning phase. It emphasized the importance of involving relevant stakeholders and target groups to the planning in order to reach the maximum impact. Since promotion and marketing of the centre affects significantly its integration the relevant chapter overviewed the five basic approaches of awareness raising, and it provided tip for developing a communication strategy.

At the end of the guidelines there are two descriptions of good practices. These descriptions overviewed two visitor centres of research infrastructures (CERN and Goddard Visitor Centre) that implemented several educational activities and actions to communicate with the public, especially with youth. With reading these you can find further tips how to be successful in the implementation of an RI's visitor centre for youth. None of these recommendations can be implemented when following these guidelines completely, but all of them must be tailored to the local situation.

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[18] https://www.nasa.gov/centers/goddard/visitor/home/index.html

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Annex

Annex 1. Questionnaire template for prototyping

The questionnaire aims to analyse the experience of the students about to visit in a RI's visitor centre. Besides that, it also contains questions about the students, attitude towards science to enable the researchers to make differences between the opinion of the students with different attitudes. The questionnaires should not be too long and must be tailored to the students' competence level. In case of students younger than 18 parents must know that they were asked to fulfil the questionnaire!

1. The first section aims to get to know the students experience about the visit. It should start with a general "warm-up" question for example "Did you like the visit?" or "Have you ever been in such a centre before?". General questions about the visit follow the first question. It is recommended to use scales that can be completed easily by the students. The questions must concern the different activities, the instructors and the relevance of the topic. Below you can find some examples.

nent	**gly not agree**	**gree**		**gly agree**
y enjoyed the exhibition.				
y liked participating in an experience.				
that I have enough knowledge to participate in the experience.				
ow the instructor led the workshop.				
hat I can use in the school what I have learnt in the exhibition.				
hat I can use in the school what I have learnt in the experiment.				
d like to attend more visits like this.				

Besides focusing on scales the questionnaire can contain some open questions about the visit, for example:
- Please list three things that were the most interesting for you during the visit!

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- Please list three things that you really did not like during the visit!

2. The second section of questions aims to get knowledge about the students' attitude towards science. Since these are more personal questions they follow the section about the experience in the visitor centre which section could create the trust from the students and they will be more open to answer the personal questions. Below you can see some examples.

nent	**gly not agree**	**gree**		**gly agree**
o read scientific articles.				
o watch scientific programmes in the television.				
cience fiction movies.				
cientific games.				
free time I usually create or fabricate new stuffs.				
like the maths/biology/chemistry/informatics/physics/geography classes in the school.				
magine myself as a scientist in the future.				

Questions about their performance in the school must be also asked. For example:

- What grade did you get in last year from maths/biology/chemistry/informatics/physics/geography?
- From which field do you have better result from school: science/arts/same
- Which fields do you like more: science/arts/same

In case of secondary school students it can be asked if they want to go to college/university and if yes on what fields are they planning to continue their studies.

3. In the third section students must be asked about their demographic background. Following topics must be asked:
   - Gender,
   - How old are they,
   - How many siblings do they have,
   - Where do they live (the name of the municipality),

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- Financial status of the family (not directly, but with categories; e.g.: poor, average wealthy).

It can be interesting to ask is there any scientist in their family or do they know any?

Annex 2. Draft of interview questions for prototyping.

After the visit in a visitor centre, students can be interviewed to gain more detailed knowledge about their experience. It is not important to aske very member of the group, the person who concludes the interviews can choose students from different groups. The interviewer can decide based on the questionnaires or (s)he can observe the visit and choose students that enjoyed the visit also students that seemed to be bored, etc. The interviews should not be too long (maximum 30 minutes) and friendly atmosphere must be created. Try not to ask direct yes or no questions but make the interviewees to talk by themselves. Below you can see some examples:

- Can you tell me what did you do during the visit? (Pay attention if the interviewee talks excessively about an activity and/or does not mention another)
- Can you tell me what did you do during your favourite activity?
- When you arrive home what will you tell your parents/siblings/friends about this visit?
- What can you use in school from the things that you have learnt during the visit?

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