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The importance of integrating Thinking Design, User Experience and Agile methodologies to increase profitability

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Abstract: *Since every company wants to make a big profit, it is necessary for every company to focus on the customer and his requirements. This paper discusses the advantages of the methodologies Design Thinking, User Experience Design and Agile and based on other research shows that their connection is important in practice because it leads to greater creativity, innovation and profitability. Various researches and considerations (from scientific papers) on the integration of design thinking, User experience and agile development are presented, and conclusions are made as to why it is good to use combined methods. The author of the paper created a picture, which is a key contribution of the paper, which shows the key features of each of the methodologies where a cross-section shows the importance of using all three methodologies together. Through the cross-section it can be seen that in practice all three methodologies focus on meeting the needs of product users (customers) because companies aim to keep customers satisfied because in this way they would provide a profit. User Experience focuses on making products usable and useful, desirable and affordable to customers (users). Design Thinking methodology offers the possibility of aligning the goal of a highly innovative project with maximum utility for users.*

Keywords: *design thinking; user experience; agile; user centered;*

1. Introduction

Design Thinking (DT) is a people-oriented model that focuses on creativity to create a product (McKay, et al., 2008) or service for the customer. Improves the innovation of a new product, designs a simple solution to a complex problem or involves the whole team in generating design ideas (Nedeltcheva., & Shoikova, 2017; Nedelthceva, & Shoikova, 2018). User Experience (UX) is based on digital experience and empathic research to define the problem to be solved and find a way to innovate. It is used to continue designing, testing, replicating, and building a product or service. These two methodologies are very similar, but the aspect of DT cooperation is not always done in the UX process in practice. There is research interest in integrating UX and agile software development. "User experience deals with how the user feels about the artifact when using it in the real world" (Preece, et al., 2004). The goal of UX is to create a

positive user experience through satisfaction, joy, excitement, fun, attitudes, emotions and added value when the user interacts with the artifact (Kuniavsky, 2010; Adikari, et al., 2013). As mentioned before, the focus is on the user and is due to user interaction with products and reactions to products that go beyond efficiency, effectiveness and conventional interpretations of satisfaction. The point of agile software development is to deliver a quality software product in an economical way for the appropriate time through a series of iterative and incremental development cycles (Adikari, et al., 2013; Chamberlain, et al., 2006). Client is the main source of information. Developers talk to customers because the goal is to meet all requirements (Adikari, et al., 2013). Agile methods help decide what exact characteristics are needed to meet the basic needs of customers. This is importance especially for innovative projects that require a detailed understanding of customer needs (Przybilla, et al., 2018; Corral & Fronza, 2018).

The contribution of this paper indicates the importance of DT, UX design and agile methodology and the need for their integration. It is crucial to emphasize that Design thinking starts with a problem and seeks a valid solution, and Agile is a method for solving pre-defined problems. The user experience starts with the solution and makes it work in the user context. Agile UX is trying to integrate UX practice with Agile software development teams. Agile UX aims to bring an iterative approach to the design and improvement of functions that are built through teamwork and customer feedback management.

2. Research methodology

2.1 Subject and problem of research

The problem of the research is how to increase profitability and innovation in companies with the use of the mentioned three methodologies, and therefore the subject of the research is to consider the advantages of each of the methodologies as well as their integration.

2.2 Research goal

The aim of this research was to collect all existing studies that indicate the advantages of integrating methodologies and how they affect the success of companies in practice.

3. Literature review

A review of the literature discusses the integration of Design Thinking and agile development, as well as the integration of User experience with agile development and the combination of all three methodologies together. The purpose of the literature review is to see what are the strengths of combining methodologies.

3.1. Design thinking and agile methodology

Agile methods have gained great popularity (Miller & Sy, 2009). and many empirical studies suggest that agile methodologies are necessary to increase project success (Przybilla, et al., 2018)., useful when project objectives are known to the product owner. In agile software development, it is important to understand the needs of the end user, to include user feedback in the software development process. The Design Thinking methodology (Przybilla, et al., 2018). offers the possibility of aligning the goal of a highly innovative project with maximum utility for users. There are different definitions of design thinking. When all mentioned definitions (Cross, 2010; Dunne & Martin, 2006; Adikari, et al., 2013; de Paula et al., 2014; Brown, 2009; Zhu et al., 2020; Rowland, 2004; Voogt & Roblin, 2012) are taken into account, it can be said that design thinking implies the study of cognitive processes that are manifest in the action of design and represents the way designers think and apply their mental judgments to the design of an object, service or system as opposed to the end result of elegant and useful products. It represents an approach to human-centered innovation that uses the sensibilities and methods of designers to align people's needs with what is technologically feasible and what sustains business strategy can be turned into customer value and market opportunity. It is very important that designers progress in the design process with a creative mind towards design solutions and that they discover new possibilities that lead to the development of software that will suit the customers. Designers need to be innovative and creative and put themselves in the role of the customer, i.e. to know what the customer would like.

The main characteristics of design thinking are (Adikari, et al., 2013; de Paula et al., 2014): Empathy, Integrative Thinking, Optimism, Experimentalism, Collaboration. The stages of the process can be grouped according to Brown (Brown, 2009)., who emphasizes the importance of innovation. Figure 1 shows the Brown model:

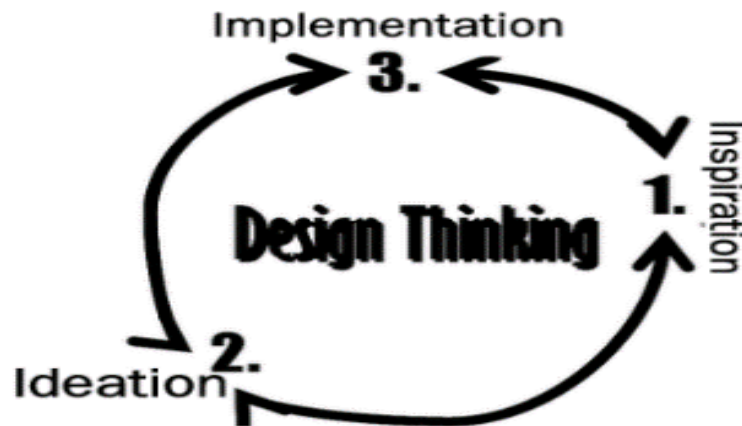


Fig. 1. Design Thinking model (de Paula et al., 2014; Brown, 2009)

The DT fits well into the Agile model of digital design. There is a lot of literature written on how to report DT and its phases (Corral, L., & Fronza, I. (2018), how to incorporate UX into the Agile process, how to innovate and how to apply them in a project in practice (Nedeltcheva., & Shoikova, 2017; (Adikari, et al., 2013). Figure 2 shows the DT phases. The first phase in DT aims at an in-depth analysis of the needs, desires, opinions and aspirations of the end user. In second phase it is very important to differentiate the existing facts about the challenge from the data collected during interviews and observations in order to fully objectively view the information. The ideation phase aims to research and find ideas for solving problems, in accordance with all defined needs of the person. In third phase, a prototype is created, which is actually a cheaper and simpler version of the product that reflects all the key features of the final product, with the aim of revealing possible problems related to the proposed solution. In fourth phase the prototype provides an opportunity to bring the idea to life, test it, test the practicality of the current model, and potentially explore on a small sample of users how they think and how they use a product or service. It is important to note that it can return from the prototyping phase to the ideation phase if the inapplicability of certain aspects of the product or service is discovered. In the final phase, the product that was identified as the best solution during the previous phases is tested. However, in an iterative process such as Design Thinking, the results generated in the testing phase are often used to redefine the problem, idea, or as a trigger to return to the empathy phase.



Fig. 2. Phases in Design Thinking Process (Nedeltcheva & Shoikova, 2017; Nedelthceva & Shoikova, 2018)

The phases are not necessarily sequential and the ultimate goal is to solve them. The good thing is that you can always go back to the phase where it is needed and correct mistakes. DT provides a solution, and then needs to determine how those solutions will be delivered to the market, and Agile works by focusing on smaller parts of a larger project, quickly delivering value and adapting or changing based on real-time feedback (Nedeltcheva., & Shoikova, 2017). DT and Agile offer great benefits for innovation, creativity and profitability, and are not limited to software development itself. They combine to make the process work better. DT helps to understand what needs to be done, Scrum helps to decide how to do it. DT and Scrum are iterative (Kuusinen et al., 2012) and the mentality and approach required for successful implementation are similar. They require adopters to develop sufficient insight to recognize early successes/failures through continuous evaluation and adjustment. Agile's iterative approach allows project teams to better respond to changes and challenges and deliver the finished product in a shorter period of time. Company combine DT and Agile processes to identify the right solution, and then focus on building a better product. Understanding the problem is necessary to find more creative and useful solutions (Burba, 2016). The integration of DT and Agile approaches helps organizations find the right user-focused solution. Agile methodology seeks different ways to solve problems innovatively, giving priority to working together in teams.

In one paper (Nedeltcheva & Shoikova, 2017) where it was presented how to best apply the principles of Design Thinking and Agile practice by giving examples with IBM Design Thinking framework and Autodesk use case, the main advantages are that they can be used by any type of business and can be implemented in all possible levels. More satisfied customers have been generated, so it can be said that the focus is on customers and their needs and desires, which coincides with other literature that emphasizes the importance of the customer. So, designers need to make a product that customers will like.

3.2 Agile user experience design

As already pointed out, the user experience refers to the feeling that a person has while communicating with the product under certain conditions. According to Yong (Yong, 2013), the user experience is a study of how users feel about the product, before, during and after the interaction. The user has the following psychological spheres: values, emotions, expectations and previous experiences (Arhippainen & Tähti, 2003). Therefore, it can be said that it is very important to notice which product characteristics provoke emotions in users, because it is crucial to discover positive emotions and make a product accordingly, while it is also necessary to know what negative emotions are.

Agile user experience is a project management principle for the development of software based on Agile values and principles related to user-oriented design (UCD) and supported by good practices and methods of UCD (Maguire, 2013; Kollmann et al., 2009). Many experiments show its value (Chamberlain, et al., 2006; Armitage J. 2004; Ferreira et al., 2007; McInerney & Maurer, 2005; Nummiahho, 2006; Schwartz et al., 2011; Singh, 2008; Sy, 2008; Schwartz, 2013). The integration, called Agile-User Experience Design or Agile-UX, is related to the interesting performance of the Agile method to quickly provide software that meets the needs of users with a certain level of quality (Kuusinen et al., 2012; Schwartz, 2013). Just as the goal of every company is to make as much profit as possible, so it is necessary to make an appropriate effort to make the product suitable for the user. According to the ISO 9241 human-centered design standard (ISO 9241-210, 2010), there are four basic actions to be taken to include user needs in the software development process: understand and specify the context of use, specify user and organizational requirements, produce design solutions and evaluate design requirements (Maguire, 2013). There are a reasonable number of studies dealing with integration, as can be seen in (Da Silva et al., 2012; da Silva et al., 2011). Improving the understanding of coordination and integration of the work of UX designers and Agile programmers contributes to bridging the gap between software engineering and HCI disciplines (Patton, 2002; Obendorf & Finck, 2008; Ferreira et al., 2011). According to the authors, Agile methods mainly describe activities related to code creation or project management, and UX design methods describe activities for designing product interaction and/or user interface (Preece, et al., 2004; Fox et al., 2008). Agile methods tend to deliver software prototypes as quickly as possible in short iterations and therefore it is not bad to use a combination because in addition to quality software it is important that the software arrives on time, when it suits the client. "Ferreira et al. (Ferreira et al., 2007) state that the integration of user interface design

and agile development is not well understood and cite a qualitatively grounded theoretical study of Agile projects involving significant user interface design." (Singh Beyer, 2010). suggests a process, U-Scrum, promotes usability (Da Silva et al., 2012). UX design methods allow software development teams to create user-friendly software. It is also seen that HCI techniques bring a holistic view of the product (Ferreira, 2007; McInerney & Maurer, 2005) and express conceptual notions about the product in some physical form (Lievesley & Yee, 2006). Agile development provides opportunities for feedback on UX design at regular intervals [Ferreira et al., 2007; Miller, 2005]. Fitzgerald interviewed participants from eight different organizations and found that none of them rigorously followed the methods (Fitzgerald, 1997), and Gason also showed that in practice he deviated from the planned user-centered design process due to unforeseen circumstances (Gassonm, 1999).

The integration of Agile and User experience designs can cause the problem of synchronizing their activities and practices (Ferreira, 2012). It can also be a problem because the collaboration between UX designers, Agile developers and other teams needs to be improved through a large amount of communication. Communication between UX designers and developers is important because each group will have different priorities, goals and processes (Lee & McCrickard, 2007; Jurca, et al., 2014). In one paper, the authors explored the role of user experience in agile software development where the results show that there were difficulties in integrating UX design and software engineering in an agile and iterative way and that there was a clear need to establish new ways of collaboration between UX professionals and software designers (Isomursu et al., 2012). In some companies UX designers cannot work closely with developers (Da Silva et al., 2012) because UX designers work on multiple projects, and also UX designers cannot work ahead because they are too busy with too many projects at the same time. Some recommendations often suggest that UX design should be performed in parallel with Agile development. UX and Agile can coexist well, provided that the organization's management understands and supports UX work, UX practitioners display leadership and spend time on outreach their colleagues, the Agile workflows are flexible enough to accommodate the needs of the UX, and UX people are part of the product teams, where they can build respect and rapport with developers.

4. Discussion of coupling Design thinking, User Experience and Agile

Many papers deal with the integration of all three methodologies, so one paper (Nedelthceva & Shoikova, 2018) argues that the collaboration of Design Thinking, User Experience design and Agile is important in practice because it leads to greater creativity, innovation. and profitability. It can be concluded that the analyzed methodologies are not limited to software development in order to satisfy customers, ie. that these methodologies can be applied in other disciplines as well. The results of a study (Ferreira, et al., 2012) show that integration in practice is achieved through mutual awareness, expectation of acceptable behavior, negotiation of progress and mutual engagement, while in some papers the authors (McCarthy & Wright, 2004). present the results of a study on the role of UX practitioners in agile projects. The authors found that, from the point of view of UX designers, their understanding and attitude towards agile development influences their successful integration into the team. This is followed by a study which investigated how many different settings in which Agile developers and UX designers work together and how these settings shape their work. The results suggest that the values and assumptions of non-team decision makers shape UX/Agile practice (Ferreira et al., 2010). Most studies have investigated the integration of usability (Chong Lee & McCrickard, 2007; Dayton, & Barnum, 2009) user interface (Sohaib &Khan, 2010) or interaction design (Ferreira et al., 2007), with agile software development, or how UCD can be used in agile software development (Chamberlain, et al., 2006; Blomkvist, 2005; Detweiler, 2007). UCD is one of the most commonly used methods to ensure that the focus of users is at the center of development activities (Dayton & Barnum, 2009). User interface and design interactions as well as agile development were analyzed and found to have much in common. Both emphasize the importance of iterative development (Chamberlain et al., 2006; Hussain, et al., 2009) and emphasize the role of collaboration with various stakeholders, including clients and business professionals, in development work (Blomkvist, 2005; Ferreira et al., 2007). Both support fast feedback cycles and testing (Hussain and et al., 2009) and accept, and even accept, change as a natural phenomenon (Kollmann et al., 2009; McCarthy & Wright, 2004).

Based on other studies, it can be concluded that Agile and DT are complementary and that DT is particularly suitable for situations where the problem is not clear, focusing on defining the problem, shaping the problem and clarifying requirements and it relies on identifying end-user needs and discovering solutions to meet those needs. Agile methods are for projects where requirements are subject to change (McInerney & Maurer, 2005). DT places great emphasis on a clear understanding of the problem and helps to understand what needs to be done, and Agile

(Scrum) gives autonomy to decide how to do it. Agile uses the DT approach in identifying problems and challenges, as well as in generating ideas and innovative solutions. UX designers need to be actively involved in giving design proposals to improve software at all stages and they have the task of helping to develop solutions that are easy to use. Agile is efficient in fast software delivery because it is a repetitive process and allows user requirements to change over the life of the project, allowing it to be completed on time. Scrum development teams have been a part of the design process from the beginning, which allows them to better understand the needs and requirements of customers. Table 1 lists the essential characteristics of each methodology (Spiring Pixels, 2021; You X Ventures, 2020).

By applying a combination of DT, UX and Agile approaches, in a good way, company can reduce risk and make higher profit (Nedelthceva & Shoikova, 2018). So it's not bad for a company to be aware that:

- Agile and UX work well together when management values UX and when UX is embedded in teams. UX designers should be actively involved in providing design proposals to improve software at all stages. Agile is efficient in fast software delivery because it is a repetitive process and allows user requirements to change over the life of the project so that changes are possible over the life of the project.
- DT and Agile emphasize people in relation to processes, Scrum development teams are part of the design process from the beginning that can lead to product improvement. DT places great emphasis on a clear understanding of the problem and helps to understand what needs to be done, and Agile gives autonomy to decide how to do it.

Figure 3 shows the sets where each set represents the appropriate methodology. DT strives for creativity where the goal is to see the desires that the end user of the product strives for, as well as to objectively see what feelings the product would provoke in the user, and then a prototype should be defined where there is an opportunity to test the idea. It is crucial to say that due to the agile methodology, it can be returned to each of the phases and corrected if there is a change. With both DT and UX, it is important to get an easy-to-use product. The UX methodology is important because care is taken to make the products usable, desirable and useful to customers. It is crucial to emphasize that UX together with agile methodology is well applied in practice because agile methodology implies that the product is delivered on time.

Through the cross-section, it can be seen that all three methodologies (combined) focus on meeting the needs of product users (clients) through an innovative approach to delivering new

and quality products on time. An agile (iterative) approach is important, which allows the project to be divided into smaller parts where it is constantly checked how the project is progressing and changes are made if necessary. It should be noted that teamwork and good communication are key to achieving the project goal. Designers should successfully cooperate with developers in order to complete the complete product that the customer needs, all in order for the company to have a higher profit.

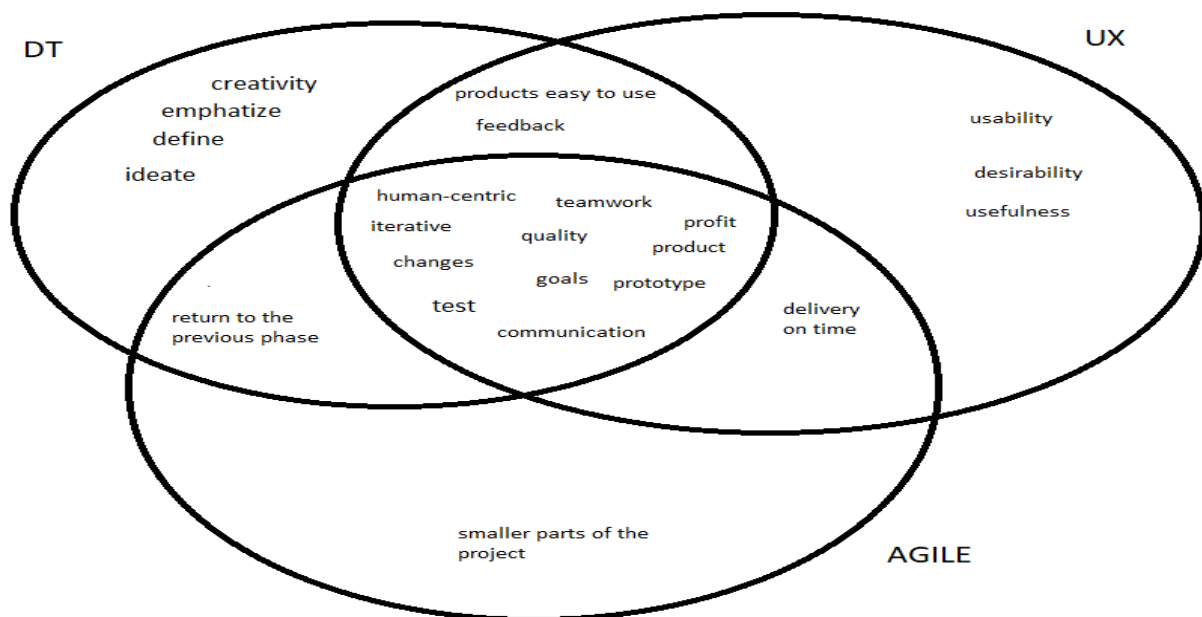


Fig. 3. Methodologies presented using sets

6. Conclusion

Based on a review of the literature, it can be concluded that Design Thinking and Agile offer great advantages for innovation, creativity and profitability. It is important to note that both DT and Scrum emphasize people and companies must ensure that the right people are appointed for each project. User Experiences focuses on making products usable and useful to customers, but also that they are desirable and affordable. UX designers need to consider what users expect. Users do not like when the interface does not behave in accordance with their expectations. Agile UX brings Agile software development along with product design and interactions done by UX experts. It incorporates UX experts into the Agile team and requires an understanding and evaluation of the role of UX. Good communication between developers and designers is also important and that is why it is important to take care that designers are not too busy, i.e

that they are not in charge of many projects, because then they will not be able to do their job on time. Work on the entire project will slow down and developers will also wait for designers to do product design. This is bad for the company because it has an agreement with the customer to deliver the right product on time. The goal of every company is to deliver a quality product that will suit the customers, but the agreed time should be taken into account. In the future, we could investigate whether IT companies in the Republic of Serbia combine methodologies, in what way and to what extent it is successful.

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New community spaces in the library - Makerspace

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Abstract: *The rapid change of info-communication technology and the resulting impact on the world of work and society in general have also influenced the operation of libraries. One of the latest demands libraries have to face is functioning as sites of preparation for the use of info-communication technologies. On the whole society must be prepared to meet the expectations of the labour market changed by the Fourth Industrial Revolution while the cultural paradigm shift taking place in the educational sphere calls for instruction methodologies meeting the needs of the alpha generation. The Makerspace movement provides a solution to both challenges while developing cognitive and cooperative competences in a creative way. Libraries are ideal for applying and propagating the Makerspace method. Since the application of this approach is in the beginning stage in Hungary, it is important to support measures promoting its introduction in the library sphere. We hope to contribute to the realization of this goal as, in addition to describing specific methodological approaches pertaining to the basic features and devices of the Makerspace model, we will also introduce the results of the analysis of a large sample questionnaire survey administered to library managers in Hungary. The inquiry focused among others on the current availability of equipment and the respective human resources and the propagation and application of the makerspace lab methodology.*

Keywords: *Makerspace; Library; Makerspace in libraries; 3D printer; laser cutting; engraving machine; smart home*

1. Introduction

The Fourth Industrial Revolution generates a substantial effect on our daily lives. The emergence of smart homes, smart towns and cyber-physical devices has a major impact on information consumption while changing the forms of entertainment. These processes result in such new concepts as the cyber-physical society (Monostori, 2014) entailing physical and cybernetic spaces transformed due to a technological development and the related living, working and cultural environment.

Cultural paradigm shifts generate a significant impact on libraries. Such a change is taking place currently and libraries have to be prepared for these developments, analyse the expected

demands, and be ready to meet them. “Those libraries that fail to understand or embrace these technologies may, in fact, be left behind” (Lund, 2021).

Our concept the multifaceted analysis of the respective demands should include the following steps:

- Assessment of the demands imposed by society,
- Analysis of international and domestic strategic plans,
- Assessment of the competences and options of local libraries.

The interest toward Makerspace labs covers all the abovementioned three fields. Makerspace is “spaces used by people to share tools, knowledge, and ideas” (Burke, 2018).

In the following section we introduce the results of a survey taken among American users, which tend to be supported by the findings of a qualitative content analysis of international strategic documents. In Hungary the main aspects, operation, history, and structure of the makerspace movement are not well-known. In addition to promoting the popularity of the movement, our study introduces practical solutions widening the methodological arsenal of libraries willing to use this approach.

2. Demands imposed by society

Digital technologies revolutionised our lives and children grow up in a technology controlled world. Consequently the demands of the labour market changed as well (Racsko, 2021). The library-related opinions, views, and demands of American society are regularly assessed by the Pew Research Center. The survey (Horrigan, 2016) performed in 2016 confirmed that 53% of the population used the respective library services in the previous year and identified the additional services expected of libraries. As indicated below, accessibility to technology appears to be an important concern. Thus libraries are expected

1. “to offer such services, which teach people (including children and senior citizens) to use digital devices, computers, smart phones and applications,”
2. to provide more comfortable space for working and relaxation,
3. to purchase 3D printers and other digital devices enabling people to learn the use of such equipment for the production of various objects,
4. “to decrease the number of books in public areas in order to provide more space for technological centres, reading rooms, conference rooms and cultural events” (Horrigan, 2016).

In the European Union the demand is expressed on the one hand by the labour market as there is a tremendous need for experts possessing ICT competence and profound professional knowledge (Lengyel Molnár, 2013) and this concern is expressed in the strategic guidelines of the Netherlands-based IFLA as well. The 2013 IFLA strategy has identified five key themes, among them the familiarisation of the population with new technology, especially such aspects as 3D printing, blockchain technology, artificial intelligence and mobile technology. At the same time the other devices are all considered new technology by the strategy.

The code map of the 2016 IFLA strategy prepared via a computerised content analysis software (MaxQDA) indicates the strength and intensity of the respective links with the thickness of the given lines. Figure 1 shows that the 2016 IFLA strategy reinforces the need for the previous point.

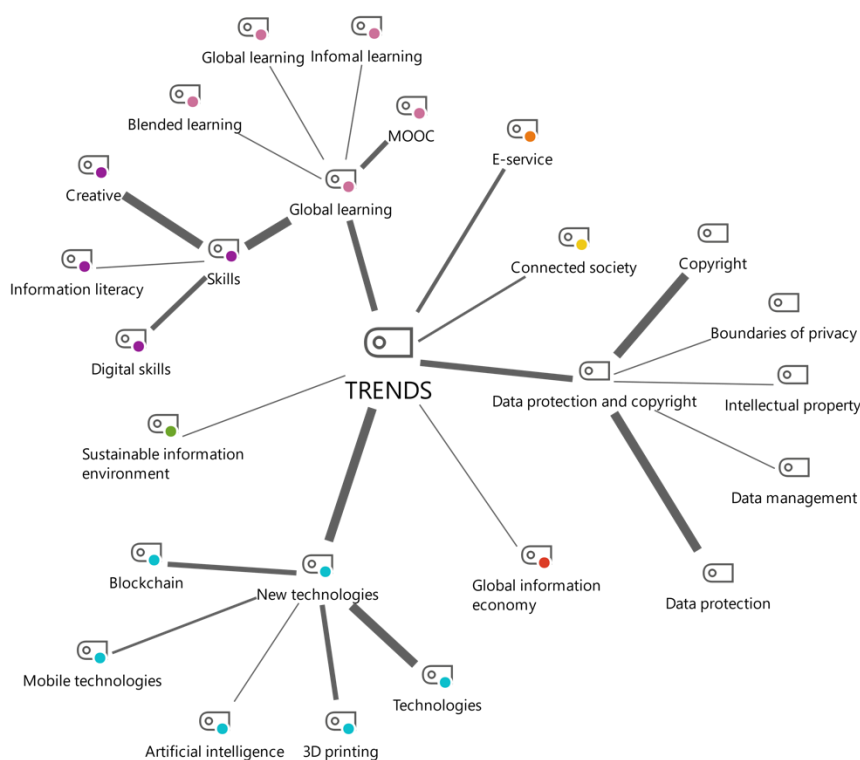


Fig. 1. IFLA Trend Report 2016 Update code-map (Lengyel Molnár, 2020)

The 2017 IFLA strategy dedicates a separate chapter for promoting the application of the Makerspace in libraries.

In Hungary this process is still in the beginning stage as the concept, its main features, and respective potential are not yet well-known. Below we describe the conceptual system and the given means and we will propose device-specific methodological recommendations.

3. Makerspace

Makerspace entails a learning support environment utilizing state of the art technology, which enables the participants to perform creative work by the use of digital devices. Accordingly, tutors relying on thoroughly chosen methods prepare the participants to meet the demands posed by society and the labour market, develop STEM competences, and promote the experience of creation via digital means.

3.1. *Historical aspects*

The establishment of Makerspace centres is based on three developments (Burke, 2018):

- Hacker groups aiming to share open computer technology with the public,
- Maker Faire centres promoting the implementation of DIY and art programs in a community context,
- Fab Lab creative centres hosting Do It Yourself-type projects.

The professional community has yet to reach a consensus whether the following three terms can be considered synonymous: fab lab, hackerspace, makerspace (Holm, 2015).

Nowadays in Hungary a greater attention is given to this “movement” promoting cognitive and cooperative skills via creative learning. “Creative insights are either achieved when the existing ideas are combined in an unexpected manner, or are re-interpreted, or when they are used in non-compatible areas. Often this goal is realized via the formation of extraordinary concepts, or the discovery of analogies and connections between unrelated ideas and objects.” (Turner-Bisset, 2016) Accordingly, a great change takes place in the thinking of the participants as our visceral evolutionary cognitive instincts are superseded by a group-dynamics induced social perspective. While the individual as a creative force or agent is still present, the given product can only be created via the use of shared resources. The significance of the Makerspace approach is in the creative community, the development is represented in the given creative process. Thus a venue emerges for relevant exchange of experience where raw material, device, the creator and the mentor are united in a shared creative effort.

Yet, how could we define Makerspace, a term, whose appropriate Hungarian equivalent has yet to be found? Let’s start with the words themselves.

3.2. *Maker*

The term “maker” refers to the creator, the creative person participating at a given session and enhancing the shared knowledge with their own skills. During the creative process he or she participates as an independent entity in the process chain, where they can personally influence the respective changes or developments and the impact of such decisions will be felt at the community level as well. The module-based work processes enable the participants to function independently, or contribute their personal characteristics or expertise to making the shared product. The process has no upper age limit as the creative effort is eternal and the types of goals to be realised are only limited by the interest of the participants and the same applies to the lower age limit as well. It must be emphasized that the creative process is based on teamwork as the given products are so complex that one person could not prepare them on their own.

3.3. *The community of creative individuals*

The participants always learn and work in teams and experience failure and success as a team too. This way the creators will form a creative community, whose members will perform partial tasks while developing their cooperation skills during making the final product. Each member of the given group gains new experiences resulting in the development of their cognitive skills and eventually altering their overall perspectives. The obtained knowledge can be inspiring either on the community or individual level of the creative process and can even impact the respective reality modeling methods. Due to mutual learning the creative participants can bridge over social barriers while developing new networks, exchanging information and enjoying the benefits of experience-based learning. Consequently discourses, debates and opposing arguments can be formed promoting community building and critical thinking. The fostering of critical thinking skills is only one of the aptitudes demanded by 21st century society and the formation of a community creative space can contribute to this goal. The implementation of the 4C model includes Collaboration, Communication, Critical Thinking, and Creativity (Sipayung et.al., 2018). External stimuli help participants of the group sessions to adapt to the potentially emerging challenges. The road to the solution of the given tasks starts with the recognition of perspectives embodied in a relevant action. The group can only reach its goals if the members can focus on the solution in a complex way and communicate effectively during the implementation of the various modules while the respective questions and answers contribute to finding the given solutions.

The Makerspace context does not determine the aspects of the creative process as these are up to the participants. The required technological knowledge is delivered by a proficient mentor. The mentors provide guidance, introduce the various themes, and foster the thought process of group members in order to facilitate goal implementation. Due to the several decision-making options this process can be continuously changed according to the needs of the group members. A mentor can regulate the difficulty level or stop the process even at one module as these components can function independently. The overall goal is not performing an exhausting intellectual or physical effort but obtaining shared experiences.

3.3.1. The modularity of the creative process

Although the topics of the Makerspace sessions are determined by the mentors, the preferences of the group and the technological background of the given creative workshop are taken into consideration as well. The creative process can imply an ordinary project such as a smart home, but in our thoughts we can explore the universe and prepare a tool or device for the solution of a virtual problem. There are several effective, and well-functioning options including 3D printing, editing A/V or still images, VR, AR, gastronomy, green cities, smart home, security technology, or even programming.

3.4. *Makerspace*

3.4.1. Current policies

Such workshops have already been integrated in the education system in the United States, the Benelux countries, Spain, Denmark, and China. Makerspace is a project space enabling participants to become familiar with a wide selection of community-based creation options and work processes. Fortunately, this process has already become part of the Hungarian education sphere and educational policy making. Accordingly, the 2020 version of the National Core Curriculum includes Digital Culture as a special subject. The creative process has already been popularized in the United States since the beginning of the 21st century and in 2006 more than 900 projects have been displayed on the Maker Fair event aimed to promote creative activities, new devices and tinkering activities. The Maker Fair has turned into a major international event and will be held in Europe in special venues as Vienna is expected to hold the event in 2021. It must be noted that the “Maker Movement” has already arranged several special programs in that city.

3.4.2. Makerspace in libraries

The project spaces entail a creative workshop equipped with a variety of state of the art hardware and other technology. The wide selection of the devices available in one location encourages the community to strive for more complex solutions in realizing their goals. Thus the creative workshops become a special unit made up of skills and machines within the organizational structure of the libraries. Currently libraries are considered as sites for learning and information acquisition in addition to the traditional function of borrowing and returning books. These facilities financed either by tender grants or by the institution's own resources provide an ideal space for community organizations. The integration of makerspace labs into a library environment started as a natural process since libraries have always applied the achievements of technology in an innovative way and the available infrastructure is sufficient to launch such efforts. Such solutions do not always require a major financial investment as relatively low-priced programming equipment, worth a few thousand HUF, can be used by mentors to develop high quality sessions. Larger informatics investments with a potential to attract creative participants require additional financial resources.

3.4.3. The history of creative communities

Makerspace solutions were always based on contemporary technological achievements. At the beginning of the nineteenth century the artificially lit spaces facilitated the unification of libraries, lecture halls, and laboratories in Scotland. In 1826 a faculty was established in the Maryland Institute College of Art in Baltimore to promote the training and shared thinking operations of merchants, mechanics, and builders. The Maker Fair series had a predecessor as well since an exhibition organised in San Francisco in 1857 targeting manufacturers and inventors displayed 900 exhibits. While these events were not fully open to the public as only registered members could take part in learning or creative activities, these facilities paved the road toward a more complex creative process. In 1876 Thomas Edison established a research laboratory in Menlo Park followed by the first Bell Lab brought about by Alexander Bell. The Bell Labs assigned high significance to cooperation along with the possession of state of the art equipment. Until 1940 entrepreneurs and inventors established an additional 350 creative spaces and during the second half of the twentieth century creative workshops were transferred to libraries and schools (Holman, 2015). In 1938 John Dewey called on teachers to arouse the curiosity of students in order to promote the desire to learn and to set such educational goals which can be achieved with an appropriate intensity of experience-based learning. In his view

the Makerspace would combine the complexity of relevant experience and the interests of the community with the use of devices and materials (Williams, 2017). Seymour Papert (1980) integrated computers into creative spaces, while informatics devices were considered as cognitive tools and part of the creative process.

3.4.4. The library as a makerspace hub

The new creative workshops primarily need good ideas and a creative team, rather than devices. Makerspace type of thematic community activities have already been implemented in Hungary, one such example is egg colouring sessions at Easter. While in Makerspace the given group has to be familiarised with the use of new and innovative devices, the currently available machinery can be enhanced, as modularity is one of the basic aspects of informatics.

In addition to the development of creativity and the ability to function in groups workshop participants become familiar with the use of the given devices. Consequently such individuals gain a competitive edge in the labour market. Therefore these workshop-based creative activities help in enabling the general public to meet the challenges posed by the world of work impacted by the Fourth Industrial Revolution.

3.5. *Typical devices in a Makerspace lab*

The most typical Maker space lab devices include robots, but we know of libraries maintaining a full makerspace lab as well (Figure 2).



Fig. 2. Békés County Library Makerspace (Genczinger, 2019.)

Let's take a closer in-depth look at what tools you can find in a lab and how you can teach how to use them in a library session!

3.5.1. 3D printer

One of the tools effectively used in creative spaces is the 3D printer. The 3D printer represents a new perspective and technology as the three dimensional creative process utilizes a melted material, the filament. Participants become familiar with the design process along with several new concepts. Three dimensional creative activities require more creativity compared to production in a vertical and horizontal direction. During the shared design effort (Figure 3) several skills of the other participants develop unwittingly in a playful form as the group focuses on the joy of shared creation. The end result is an object produced by a new technology, a 3D printer (Figure 4), building on the creativity of the group members making various objects from the filaments with heat either as a sub-task of a module or a final outcome of a given project.



Fig. 3. Craftware 3D editing program in use¹



Fig. 4. 3D printing, demonstrating the internal structure of the given object

3.5.2. Laser cutting and engraving machine

Laser cutting machines (Figure 5) are suitable for cutting, engraving, or marking a variety of materials. This device can provide useful and exciting options in the Makerspace for marking the form designed by the participants themselves or even for the transmission of the given information entailing the engraving of a QR code or a certificate number. Participants should be familiarised with more materials and their features partly determining the goal of the creative process. Those participating in the creative effort will experience how the image on the screen will turn into a tangible (Figure 6) object after being forwarded to the laser engraving machine and performing the respective operations.

¹ The pictures or photos displayed in the article (Figures 3-9) were made in the Bródy Sándor County Library.



Fig. 5. Laser engraving machine



Fig. 6. Laser engraved CD-ROM, as a Bakelite record

3.5.3. Sewing machine

The sewing machines can be successfully integrated into the analog and digital equipment pool of Makerspace labs in libraries. While the creative process remained essentially unchanged throughout the years, new materials and implementation methods emerged. Learning the use of microprocessor controlled sewing machines takes less time than the previously described innovative devices. Such a feature implies an ideal opportunity for working together and making pieces of clothing, puppets, or even objects.

3.5.4. Microbit

The Microbit is an open source code hardware device designed by the BBC with a LED display, several buttons and sensors, and numerous output and input functions. The Microbit provides an ideal option for the solution of an imagined or real problem. Its application in libraries promotes creativity and cooperation while developing algorithmic thinking skills, thus it can be a well-integrated and valuable component of the Makerspace lab. A unique feature of the system is that as a result of the program prepared in the laboratory the screen displays not a value, but the result of the program process promoting changes on a little device. (Figure 7) Programming languages can be learned in a playful manner and the group becomes motivated in acquiring or becoming familiar with a new language and ways of thinking. (Sentance et.al, 2017)

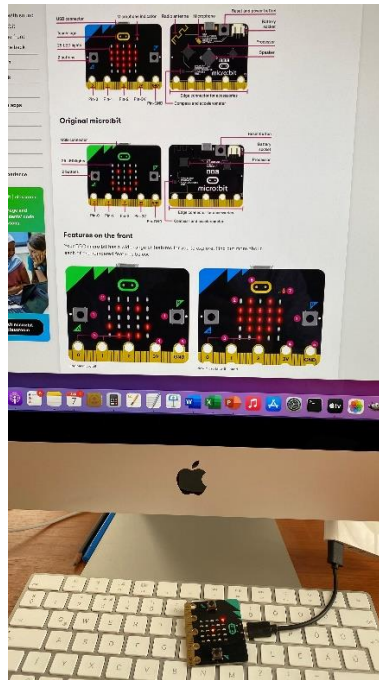


Fig. 7. BBC micro: bit programming

3.5.5. Smart home

While the new innovative devices have become part of our homes and perform several tasks and improve the living standards, the respective options are not widely known and people tend to be reluctant to apply them. The demonstration of the use of such devices in the library sessions widens one's perspective and contributes to the general increase of digital competences. Makerspace labs provide an opportunity for the participants to become familiar with such devices, including programming them or giving them commands. Such an exercise would be programming a light switch to come on after opening a door.

3.5.6. New and novel areas

There are several innovations which are not part of our everyday life, but provide or imply exciting opportunities. One such solution is the LiFi offering an alternative to WiFi technology. In this case the group can perform thought experiments, exploring their legitimacy and the given area where this technology can be used, and the respective alternatives. Also working solutions can be introduced and the technological advantages can be pointed out to the participants. (Scace, 2018) The profile of the Makerspace lab can be enhanced by identifying and introducing similar innovations.

3.5.7. VR/AR

During application of virtual reality in libraries we can familiarise visitors with commercially available virtual reality programs prepared for educational and entertainment purposes. Makerspace labs participants can not only try the application of augmented reality, but can create and program such solutions with the guidance of their mentor. For example, Figure 8 shows an implementation of AR created with a smart phone. The modeled object (Burdea & Coiffet, 2017) positioned in a virtual space can be enhanced with interactive features as well.

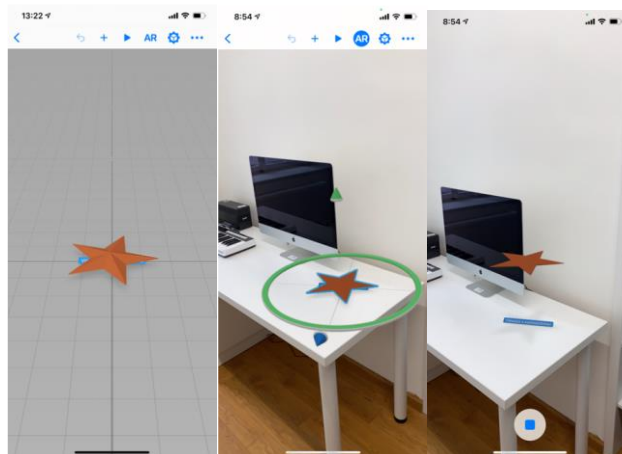


Fig. 8. The implementation of AR with a smart phone

3.5.8. Sound and video labs

We can produce and edit audiovisual materials or various peripherals can be combined into (Figure 9) a solution similar to the YOUmedia Network in the United States where the latter functions as a community project facilitating extracurricular learning (YOUMEDIA, n.d.). Preparing a podcast dealing with real problems requires only editing and disseminating the respective content in addition to the demonstration of the given tools.



Fig. 9. A/V laboratory

3.5.9. Drones

These trendy devices facilitate the performance of interesting and exciting tasks, and can provide excellent opportunities for learning. Having obtained the required navigation skills, pictures can be taken or videos be recorded which can be forwarded to the video lab for editing. The session leader and the group can cooperate in making a shared project based upon the compatibility of the other devices.

3.5.10. Mobile devices

The mobile telephones and laptops can function as ideal devices for collaboration. Participants in Makerspace programs should be made familiar with the given applications and the methodological options via pictures, video recordings, sound recordings or social media along with the creative use of various services available via cloud solutions. During a larger project it is worth to rely on own devices for the preparation of photo or video documentation in order to trace and record the respective work processes.

3.5.11. Drawings

The digital drawing board is perhaps the easiest to integrate. Accordingly, independent programs can be implemented including preparing an artefact connected to a common theme or event. Pictures can be converted into images processable by laser engraving in addition to making moving picture series. Thus an additional new technology is integrated into the creative activities at the Makerspace lab.

3.5.12. Digital story telling with LEGO devices

Digital story telling combines classic narration with the methodology of multimedia based processing and presentation (Antal, 2019). The LEGO Education developed a comprehensive tool kit for digital story telling including software, which enables users to convert the photographs of the episodes of the stories constructed from LEGO elements into digital works complemented by subtitles, backgrounds, and video clips. Since digital storytelling is an ideal method for processing reading experience, it is becoming an integral aspect of the methodological arsenal of libraries.

3.5.13. Team development

The Makerspace lab not only develops personal digital competences and promotes creativity and collaborative skills, but it has a significant impact on socialization as well. The sessions result in the development of a team as in the Makerspace movement the library provides the resources for the community, and the librarian functions as the mentor, fulfilling the most important role, that is the helper. The mentor supported by their qualification and creativity supervises the whole team formation process, introduces the various technologies and provides advice in order to help the group to realize its goal. Furthermore, in addition to a high proficiency level the mentor is expected to adapt to the skill level of the group and differentiate or distinguish between the difficulties related to implementation. In case of a product containing several modules utilizing various devices and technologies it is useful if the mentor customizes their approach as the given group can contain people with differing ability and skill levels. The result of this effort would be the promotion of professional communities on the long run.

4. The situation in Hungary

4.1. Research questions

The main focus of our research is helping Hungarian libraries to catch up with the international library sphere. Consequently, we explored the current state of the respective domestic institutions from such aspects as infrastructure and human resources. Our inquiry extends into attitudes related to innovation and training along with specific plans for the improvement of technology and various training programs. We aim to draw conclusions regarding the potential significance of the given concerns along with evaluating the present efforts and future perspectives related to the popularization of the makerspace approach.

4.2. Methods

We administered an online questionnaire: (tinyurl.com/akonyvtarakdigitalisatallasa) to a comprehensive sample of all library managers of Hungary in the spring of 2021. The respondents included

- leaders of national libraries (3 institutions),
- leaders of university and college libraries (68 university and college libraries),
- leaders of county libraries (19 managers of county libraries and institutions maintained by the given county library, summary 3389),

- all principals of public education institutions where a school library operates (4482 institutions).

We sent individual emails to the heads of the institutions inviting them to fill in the questionnaire, and responses were voluntary.

4.3. Sample

We received one response from each institution, for a total of 502 responses and 415 could be considered valid since the given questionnaires were fully completed.

4.4. Results

Although the library managers were asked to respond, the breakdown of respondents by function is as follows:

84.6% of the respondents in the case of academic libraries were in a managerial position, 49.2% of the respondents in the case of public libraries were managers, 100% in the case of academic libraries, while school librarians and librarian teachers were the respondents in the case of school libraries, but only 3.9% of them were in a managerial position.

In terms of gender, 10.6% of respondents are male, 87.6% are female and 8 respondents (1.8%) did not wish to specify their gender.

The primary objective of the survey is to assess the institutions providing Makerspace services. The responses revealed that presently 2,18% of school libraries and 8,73% of public libraries provide such service. The proportion of libraries providing Makerspace services is 4,1% (Table 1)

Table 1 Institutions providing Makerspace services

Type of library	Number of respondents	Number of institutions providing Makerspace services	Rate of institutions providing Makerspace services
library affiliated with a higher education institution	13	0	0,00%
school library	275	6	2,18%
public library	126	11	8,73%
scientific and professional library	1	0	0,00%
Total	415	17	4,1%

The survey indicated that more than half (54,36%) of the responding libraries are equipped with tablets or smart devices, and in 40% of the respective facilities digital boards are available as well, so some technological element is already present in library services, but they are not used as makerspace services.

As can be seen in Figure 10, tablets and smart devices are present in all types of libraries, while interactive whiteboards are most common in school libraries.

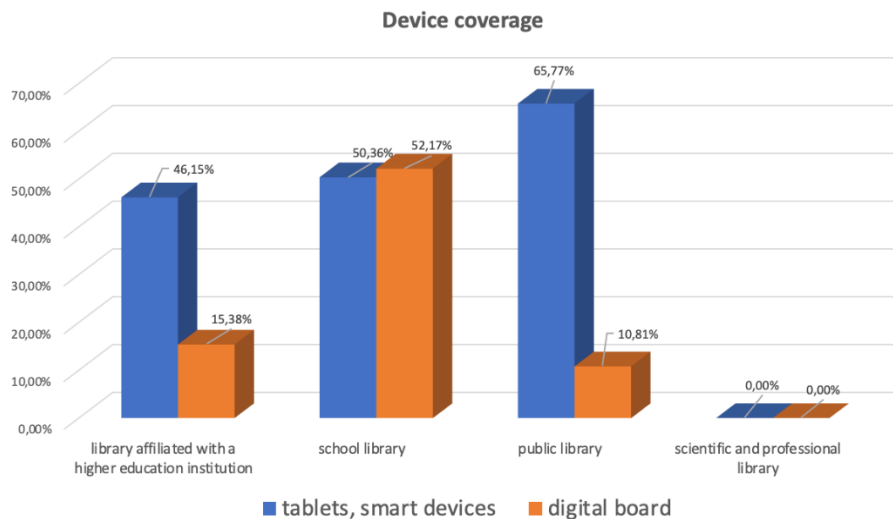


Fig. 10. Device coverage

The survey also explored whether appropriate human resources are available for the operation of Makerspace labs. The respective data confirm a low rate of participation in such training programs (Figure 10).

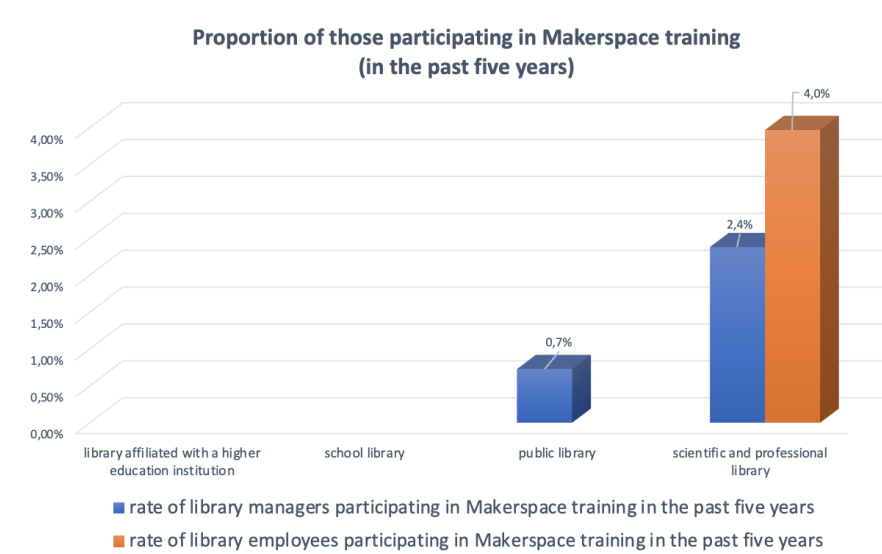


Fig. 10. Proportion of participants in Makerspace training in the past five years

It is encouraging that the survey confirmed high demand for such training. In all library field find like library managers across the board would either like to participate on their own, or would want their employees to take part in such programs (Figure 11).

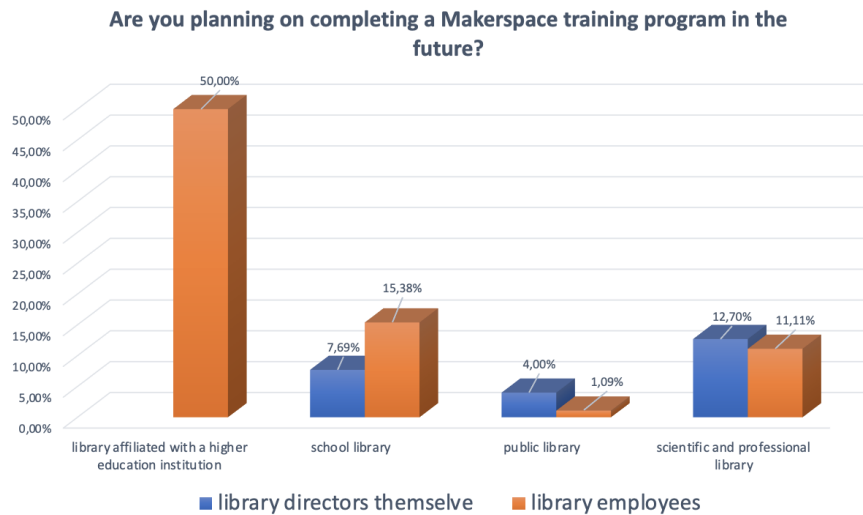


Fig. 11. Proportion of those planning to complete a Makerspace training course

5. Conclusion

Answering the research questions the libraries abroad and at Hungary as well have implemented various positive activities and innovations. Such developments are supported by library strategies too outlining definite trends for further progress. Answering the research question the libraries are open to methodologies based on technological tools.

While in the near future more and more Makerspace labs are expected to operate in Hungary, compared to the international sphere the respective development is slow. Although the 2013 library strategy contained such guidelines, the first Makerspace lab was only established in 2019 and not more than 17 institutions have offered such services two years later. The development of libraries into makerspace centres is also an opportunity for schools, which could in the future learn to use the tools that schools lack.

Yet, the increasing interest is encouraging as not only school and public libraries are open to such innovation as libraries associated with higher education institutions and scientific and professional libraries also expressed their intention to host or develop Makerspace labs.

As a last word of encouragement we can expect that librarians will be needed in the future. as Lengyelne Molnar (2020) states, “Nevertheless, the preservation of the name of the profession cannot be guaranteed, as in the 21st century the rate of information presented in the form of traditional books is expected to decrease. At any rate the library experts of the future have to

be highly trained in the retrieval of information and the discipline of informatics.” Additional responsibilities include the preservation of cultural heritage, the people the transmission of general culture and prepare the population for technical challenges.

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Teachers' evaluation of recent changes in the school subject environmental knowledge

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Abstract: Nowadays, in Hungary, the Framework Curricula determine the requirements of education. Currently, education is provided by the requirements of the 2012 and 2020 National Core Curricula (2020, hereinafter NAT). The latter shall be applied in the ascending system from the 2020/2021 school year onwards. With the introduction of the new NAT, several changes have taken place in the subjects. These changes also had a major impact on the subject of environmental education. Our research aimed to assess the knowledge of environmental education educators on the topic of wildlife and to examine their views on the new 2020 NAT. The results presented in the article show that the topic of wildlife, which was the 2nd-grade curriculum according to the 2012 NAT, will be left out of the lower grade curriculum with the introduction of the 2020 NAT. This step could deprive students of any knowledge at school about this topic. The research carried out reveals that teachers in the lower grades of public education do not have adequate and accurate knowledge of the subject.

Keywords: National Core Curriculum; environmental knowledge; teacher;

1. Introduction

The issue of wildlife is a unique topic these days. It is present in the daily life of both adults and children. The place of acquaintance with the species is primarily the family, as this is the elemental socialization scene for a young child. It can take place on the occasion of a forest trip, a visit to a game park, and our domestic wild game species also play a role in many of our tales. Just think of our folk tales of “*The Wolf and the Fox*”, “*Little Red Riding Hood*”, “*Mr. Nyávogi*”, “*The Deer Who Admired Himself*”, all featuring wild animals. The parents are the most important people in the cognition process because curiosity is present as an age trait in early childhood. The parent is responsible for answering their child’s questions.

Within the institutional framework, the place of socialization is the kindergarten and later the school. Here, the educator is responsible for the transfer and possible supplementation of knowledge. Curriculum and environmental lessons that provide a framework for all this to happen help children to get to know the world around them. In kindergarten, the National Basic

Program of Kindergarten Education formulates and summarizes the educational tasks aiming at developing habits of environmentally conscious behavior and getting to know the environment in the chapter “*Active acquaintance with the outside world*”.

In everyday kindergarten life, children actively discover nature and their environment, to which kindergarten teachers - ideally - convey appropriate scientific knowledge during the processing of the knowledge contained in the recommended activities. The development of an environmentally conscious approach is an educational process that influences the development of the whole personality, therefore it is necessary to ensure the organized transfer of knowledge in this field from the first ages (Molnár, 2015). The question arises whether the educator can convey correct, accurate knowledge to the children.

Environmentally conscious education, environmental morals, and scientific education develop social sensitivity in the field of environment and nature protection. Nowadays, we carry out consciousness-forming activities by passing on knowledge, providing experiences, and developing environmentally conscious behaviour (Molnár, 2009).

To develop an environmentally conscious attitude, environmental education must start already in the first class, basic knowledge of wildlife and many other topics are needed as a basis for environmentally conscious behaviour and education for sustainability.

Today, 21st-century children spend their free time at home using digital devices. Due to the rushing world, children can get to know e.g. animals inside a house or apartment with the help of a TV, computer, or tablet, which gives by no means as much experience and knowledge as personal experience in nature. Through crawling, climbing, and perceiving a much closer relationship develops between child and nature (Mesterházy, 2019). This has eliminated the opportunity for children, parents, and educators to meet our wildlife outdoors, in the natural community of animals.

In Hungary, the NAT - including the Framework Curricula - provides guidelines for teachers in public education. In the case of public education, the Office of Education divided the framework curricula into two groups: 1-4. and 5-8. classes (National Core Curriculum, 2020).

The role of training is essential when it comes to knowledge transfer and accurate knowledge. Within teacher training, students are introduced into several subjects. At the Teaching Department of Eötvös Loránd University the subject Functional Anatomy and Health Sciences, Natural Sciences and Environmental Protection I., II., then Pedagogy of the Natural Sciences Subject I., II. and III. are included within the theme of Pedagogy of the Natural Sciences

Subject. Each of them is worth 2 credits, with a total of 56 hours of lectures, divided from the first to the fifth term (Eötvös Loránd University-Information, 2013).

In the same department of the University of Pécs, in addition to the above-mentioned subjects, there are Environmental Projects, Locality and Sustainability and Forest School subjects in addition to the range of compulsory subjects (University of Pécs-Study Guide, 2019).

Thus, teachers have several subjects available during their training, with the help of which they can deepen their knowledge in every field of education. Due to the information above, it can be assumed that practicing teachers transfer the subject of environmental knowledge to the growing generation with sufficient/accurate knowledge and experience.

The framework curriculum states the following about the teaching of the subject of environmental education and the acquisition of knowledge: “To the continuous extension of knowledge, it is essential that the educator forms students' motivation, interest, and attitudes towards the environment, nature and the functioning of their bodies during the education. The framework curriculum supports this with the choice of topics and problem raising that also influence students' emotional attitudes” (Education Office, 2020).

In the study entitled “*Methodological Challenges in the Education of the New Generation,*” Istvánné Éger writes: “We can only capture the attention of the new generation by means other than the ones we are used to. I am not just thinking here of the replacement of outdated, frontal work, forms of education based on student involvement in small groups. In modern pedagogical workshops, the - most technical - tools are already available, which the future generation grows up on” (Éger, 2012).

So educators have a big responsibility. On the one hand, they need to provide students with appropriate, credible, accurate knowledge, while maintaining their motivation, and on the other hand they should be encouraged to get acquainted with the game management and our main domestic wild species within the topic of sustainability by raising and stimulating their interest.

2. Problem identifications, goals, hypotheses of the research

In Hungary 2020, the framework curricula define the requirements for students, which is distributed to institutions in terms of subjects and classes. Currently, NAT 2012 and NAT 2020 are in effect in public education. The latter must be applied by institutions in an ascending system from the 2020/2021 academic year (National Core Curriculum, 2020).

The introduction of NAT 2020 involved several subjects including environmental sciences in lower classes. More precisely, this means that the aforementioned subject of environmental knowledge dealing with nature will disappear from the 1st and 2nd classes, and the subject will remain unchanged in the 3rd and 4th classes. In the ascending systems, it is planned to realize the knowledge of nature by incorporating it into the Hungarian language and literature subjects. This raises a problem. The research (Mesterházy, 2021) conducted in spring 2020 confirmed that among the lower-class textbooks on the 2019/20 textbook list, the 2nd class curriculum includes most sections of major wildlife species. This will disappear with the introduction of the new NAT 2020.

This research aims to assess the knowledge of educators teaching environmental knowledge on the topic of wildlife and to examine their opinions on the NAT 2020.

Our hypotheses were as follows:

H / 1 The NAT introduced in 2020 had a negative impact on the subject of environmental education.

H / 2 The wild animals in NAT 2012 are not in line with the core material of the lower-class textbook family on the textbook list.

H / 3 Environmental education teachers do not have adequate knowledge of the deer species so teachers can't transfer accurate knowledge, knowledge of the main wild species must be included in their training/aids.

3. Research methods and sample

To reach a larger target group in this pandemic situation as well, we chose the online questionnaire as our research method, in which environmental education teachers were asked 24 questions grouped around the three hypotheses. The questionnaire included 4 open-ended and 20 closed-ended questions, two of which were 1-5 grade Likert scales. The questionnaire was shared on social websites and sent via email to the target group. Based on this, the survey was completed by 51 people. The questionnaire was completed in October-November 2020.

In the present study, I will present the most striking results plotted on diagrams.

The chart below shows the gender distribution, with 42 women (82.4%) and 9 men (17.6%) answering the questions (Figure 1).

Gender
51 answers

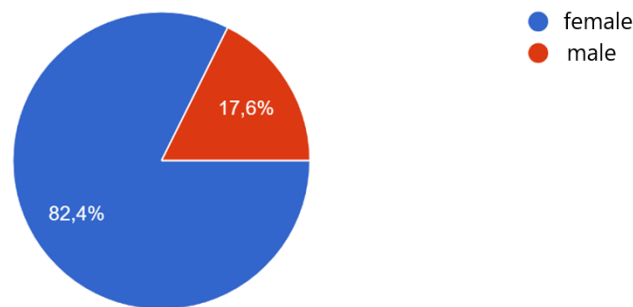


Figure 1: Gender distribution of the responders

Most of the respondents were aged 46–55 years (18 people, 35.3%), followed by those aged 36–45 years, and the least were aged 56–65 years (Figure 2).

Age
51 answers

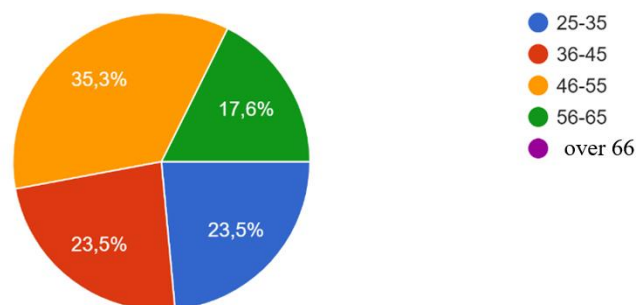


Figure 2: Age distribution of the responders

26% of the respondents (13 people) have been in the teaching profession for 6-15 years. 12% of educators, 6 people, have been in the teaching profession for more than 36 years.

The next question was about teaching the current environmental subject. 96.1% of the respondents (49 people) were teaching the subject of environmental knowledge when filling in the questionnaire, and 3.9% answered “No” to the question (Figure 3).

Do you still teach environmental education?
51 answers

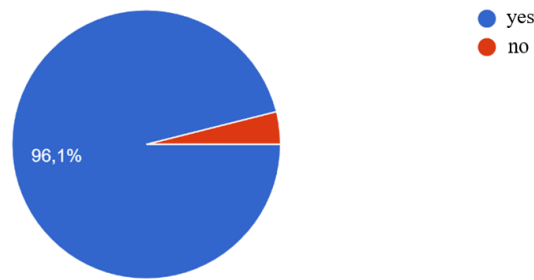


Figure 3: Question regarding teaching the environmental subject

Among the environmental education teachers, 19 (38%) teach in small towns, 17 (34%) in villages, 8 (16%) in large cities, and 6 (16%) in the capital.

Most of the respondents (8-8), who filled in the questionnaire, are from Győr-Moson-Sopron and Pest counties, which is 17.5-17.5%. This is followed by Vas county with 6 received answers (11.8%) and by Jász-Nagykun-Szolnok county with 4 received answers (7.8%). The map shows that 3-3 people from the eastern part of the county: Borsod-Abaúj-Zemplén and Szabolcs-Szatmár-Bereg counties filled in the questionnaire, which is 5.9% for both counties. In Zala, Fejér, Tolna, Csongrád-Csanád, Heves, Nógrád and Baranya counties, 2-2 people filled in the questionnaire. 1-1 people from Veszprém, Somogy and Bács-Kiskun county answered. No filling was received from Hajdú-Bihar and Békés counties (Figure 4).



Figure 4: Number of respondents in the 19 counties of Hungary “The word “fő” means “head” in the Figure.

4. Results

In the following, the results are presented according to hypotheses. The results are illustrated by diagrams. Some of the answers to the open-ended questions are also listed below.

4.1. First hypothesis

Our first hypothesis is as follows: The NAT introduced in 2020 had a negative impact on the subject of environmental education.

To prove this hypothesis, we asked educators 5 questions.

To our question about the positivity and negativity of NAT 2020, respondents were able to mark their answers on a 1-5 grade Likert scale. Answers 1-2 meant negativity, 3 meant a neutral answer and 4-5 meant the positive option. 19 people (37.3%) and 13 people (25.5%) feel completely negative and negative about the impact of NAT 2020 in general. 15 people (29.4%) think the changes are neutral and 4 people (7.8%) think the changes are positive (Figure 5).

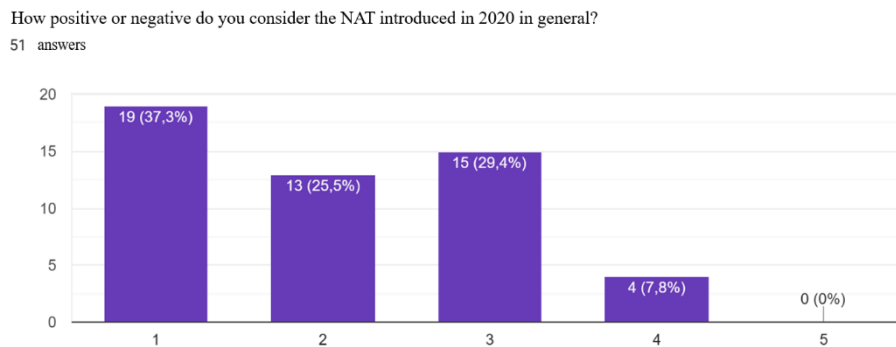


Figure 5: Judgement of NAT 2020 in general

24 (47.1%) of the number of all respondents think that the impact of the NAT 2020 on the subject of environmental education is completely negative and 14 (27.5%) think, it's negative. 10 people (19.6%) gave a neutral answer and 3 people (5.9%) gave a positive answer to the question (Figure 6).

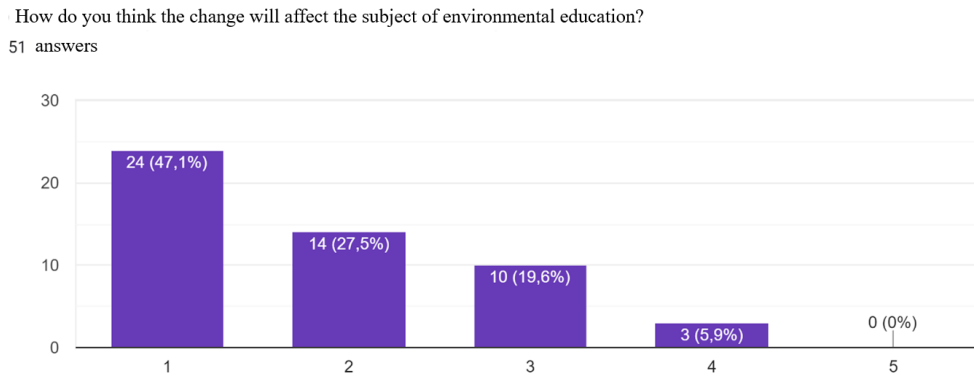


Figure 6: The effect of NAT 2020 on the subject of environmental education

The following statements about NAT had been made by us to aim at educators who teach Environmental Education. Their task was to mark the statements which they agreed about. Multiple answers were allowed. Our claims were as follows:

- The requirements in the NAT overburden children.
- It is sufficient to start teaching the subject of environmental education in 3rd and 4th classes.
- Teaching the subject of environmental education should begin already in 1st and 2nd classes.
- With the introduction of the NAT 2020 students' competencies and their development will come to the fore.
- In the 1st and 2nd classes within the subject of Hungarian language and literature, teachers can transfer the knowledge material of the deleted subject of environmental knowledge.
- The NAT 2012 provided the appropriate framework for the proper transfer of environmental subject knowledge.

Most people - 39 (76.5%) - agree with the statement that teaching the subject of environmental education should start in 1st and 2nd classes. 37 people (72.5%) agree with the statement that the NAT 2012 provided the appropriate framework for the proper transfer of environmental subject knowledge. 22 people (43.1%) believe that the requirements in the NAT 2020 overburden children. Only 4 people (7.8%) think that it is sufficient to start teaching the subject of environmental education in 3rd and 4th classes. 3 respondents (5.9%) agree that with the introduction of the NAT 2020 students' competencies and their development will come to the fore. 7 people (13.7%) think that teachers can transfer the knowledge material of the deleted subject of environmental knowledge in the 1st and 2nd classes within the subject of Hungarian language and literature.

The following chart shows whether the opinion of environmental education teachers was sought about the introduction of the NAT 2020. It can be seen that 98% of the respondents, i.e. 49 people, marked the “No” response option. Only 2 people claim that the school management asked for their opinion on this (Figure 7).

Focusing on the subject of environmental education: Has anyone asked for your opinion on the introduction of the new NAT?

51 answers

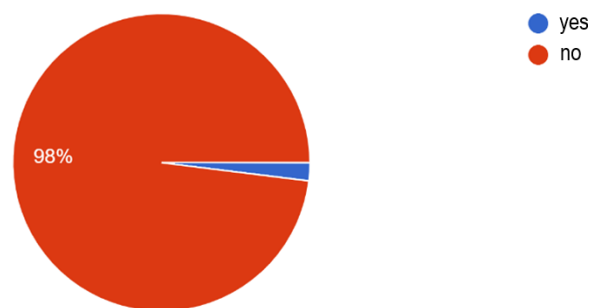


Figure 7: Asking for opinions on the introduction of a new NAT

4.2. *Second hypothesis*

The second hypothesis is as follows: The wild animals in the NAT 2012 are not in line with the core material of the lower-class textbook family on the textbook list, so the transfer of such knowledge is problematic for teachers.

It can be seen that 46 (90.2%) environmental education teachers miss some of the topics that were included in the 1st and 2nd classes according to the old 2012 NAT (Figure 8).

Do you miss any of the topics that have been covered in 1st and 2nd grade environmental classes so far?

51 answers

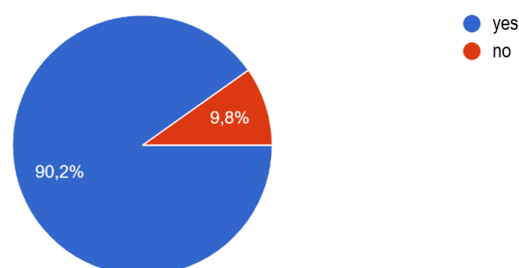


Figure 8: Missing topics due to the NAT 2020

The next issue contains a list of topics, in which multiple answers were allowed. From the possible answers, most respondents missed the topic of Communities of living beings (40 people, 78.4%), Orientation in and around the school (28 people, 54.9%), and Materials around us (27 people, 52.9%).

Among the surveyed educators, 42 (82.4%) find wildlife an important topic. 9 people (17.6%) think that this topic is not important (Figure 9).

Do you find the topic of wildlife important?
51 answers

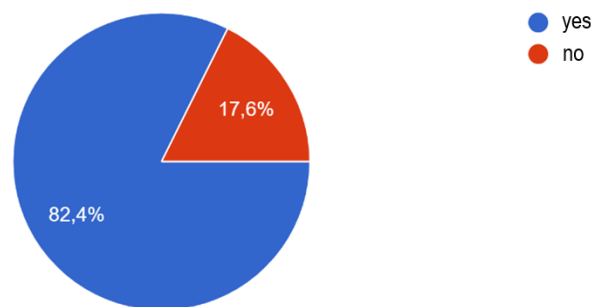


Figure 9: The importance of wildlife

For both options, the educators had the opportunity to justify their answers. The ones, who answered “yes”, hereby considering the above question/topic important, justified their answers with the following:

- “Children need to know their environment, forest animals are also part of our environment. As adults, they cannot identify so much with the protection of the flora and fauna of the forest if their awareness is not raised in childhood.”
- “Every student should be familiarised with the world around him/her and the living beings on it. They need to be taken to nature as much as possible, and it must be ensured that a family program does not consist exclusively of a weekend shopping in Tesco.”
- “It is necessary for students to deal with living nature as much as possible, to bring the topic of living nature close to them, as they are mostly surrounded by inanimate things. Although wild animals live in it as well.”
- "Getting to know the fauna and flora is part of the general education."
- “Children need to get to know nature and to be able to appreciate and appraise the values nature provides. All this contributes to becoming the growing youth more responsible.”
- “We can have a positive opinion of what we know. This is important.”
- “For demonstrating the food chain and raising awareness about the environment.”
- “We love and protect, what we know. It is also important for generations who have moved away from nature to get to know the animals around us better.”

- “Most children of today are not even sure to meet a pet. They meet wild animals only in the zoo, but most of them don't get even there.”

The educators who indicated the “No” response option justified it with the following:

- "Later, they will learn it anyway, first they learn about their environment and pets."
- "Unimportant."
- "It will be over later."
- "We don't meet them."
- "There are more important topics which children do not have a basic knowledge in."
- "Unnecessary, more important is the topic of pets."
- "There should be other, more important topics, it is unnecessary to know anything about wildlife since we don't meet them."

The old 2012 NAT includes the following wildlife species (curriculum for 3-4 class): crucian carp, pike, egret, white stork, anglewings, common cockchafer, starling, blackbird, common vole, deer, and fox. The question was whether these wild animals had been described in detail in the textbook. With this, the description of the habitat, the feeding, the reproduction, the exact naming of the individuals of the species was meant. The chart shows that 28 educators (54.9%) say that the species listed above are not detailed enough, 14 people (27.5%) say “Yes”, and 9 people (17.6%) think that only some species are described in full detail (Figure 10).

Were the wild animals listed in the old NAT (crucian, pike, egret, white stork, moth, May beetle, starling, black thrush, field voles, roe deer, fox) described in detail?

51 answers

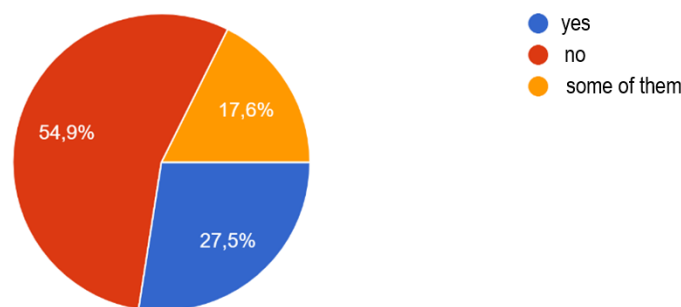


Figure 10: Detailed description of wild animals according to the textbooks compiled according to NAT (2012)

Those who marked the “Some of them” answer option had the opportunity to explain their answer. They mentioned the egret, the crucian carp, and the pike. According to them, these species are discussed in detail in the textbook. One respondent wrote “You don’t even need deep knowledge. That is the reason I choose “Some of them”. I think it’s plenty enough to be aware of the names.”

4.3. Third hypothesis

The third hypothesis focused on the knowledge of environmental education teachers, according to which: Environmental education teachers do not have adequate knowledge of wild species so that teachers can transfer accurate knowledge, knowledge of the main wild species must be included in their training/aids.

In the following there were pictures, the correct answer had to be chosen from the list. The answers included correct names and incorrect/false ones.

The first image showed a European roe deer, buck.

The chart shows that 35 people (68.6%) marked the correct answer. 9 people (17.6%) chose an incorrect/false answer, which was the red deer, a buck (Figure 11).

What do you see in the previous picture?
51 answers

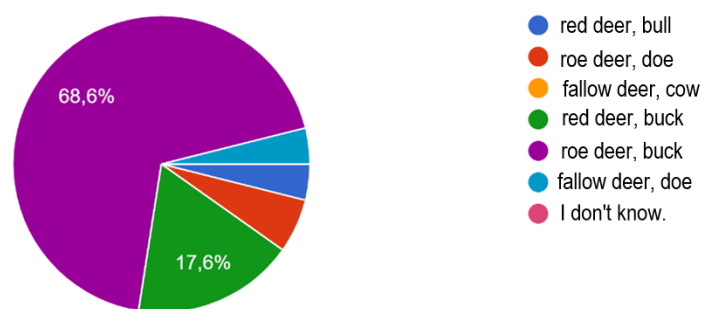


Figure 11: Recognition of European roe deer buck

The next picture showed a red deer, a cow with her calf.

The chart shows that 27 people (52.9%) of the respondents thought that a European roe deer with her calf is in the picture. 13 people (25.5%) chose correctly and 6 people (11.8%) marked the “Don't know” option (Figure 12).

What do you see in the previous picture?

51 answers

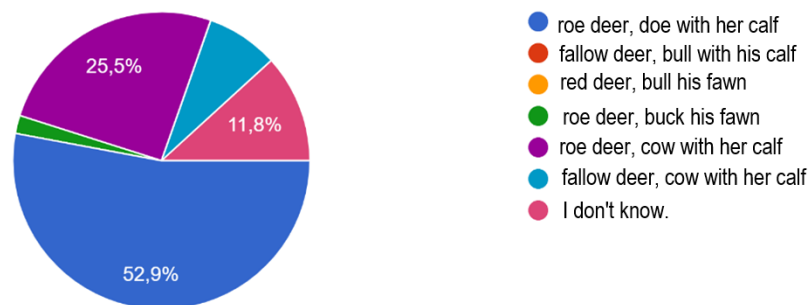


Figure 12: Recognition of red deer, a hind with her calf

Among our big domestic wild species, the following picture showed a fallow deer (cow).

The diagram proves that only 9 (17.6%) of the educators knew the correct answer. Most people (31, 60.8%) thought that a European roe deer (doe) was pictured (Figure 13).

What do you see in the previous picture?

51 answers

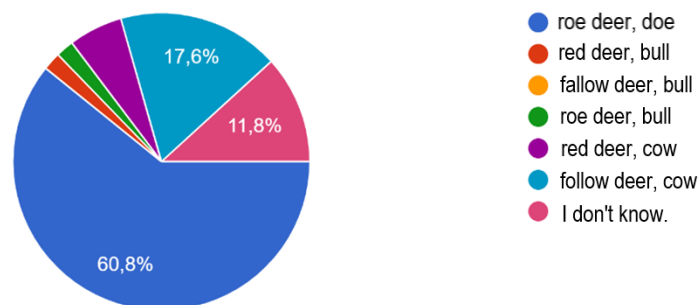


Figure 13: Recognition of fallow deer (doe)

In the following, the question focused on the breeding period of red deer. The breeding period of red deer lasts from late August to late October (Faragó, 2012). This answer was chosen by 8 people (15.7%). Most thought it lasts from early September to late November (24 people, 47.1%) (Figure 14).

When is the red deer 's breeding season?
51 answers



Figure 14: Breeding season of red deer

The next question was: “What is the usual litter size of a European deer?” Does typically give birth to two-spotted fawns, but since they have occupied agricultural areas with more favorable feeding conditions, there may be three or even four fawns, ie. the quality of the habitat affects the litter size. They give birth once a year (Fragó, 2012).

32 respondents (62.7%) know that the European female deer gives birth once a year. Among these 32 respondents, 8 (15.7%) knew that giving birth to two fawns is typical, 11 people (21.6%) marked the “I don't know” option (Figure 15).

In general, what is the litter size of a roe deer?
51 answers

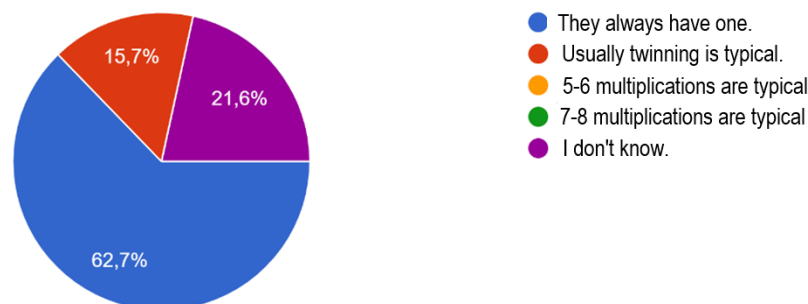


Figure 15: European deer litter size

Those who filled in the questionnaire had the opportunity to express their opinions and comments on the topic. Some of these are:

- “Today's children have insufficient basic knowledge about environmental education curricula as well. This will be a problem !!”

- “I don’t know either: it shows that the 1st and 2nd classes don't have to be stuffed with this either. (We were at the Wildlife Park this week ...)”
- "I feel I have insufficient knowledge about wild species."

5. Discussion and Conclusion

As a result of this research, it can be stated that all three hypotheses were confirmed. Based on the results, it can be said that the introduction of the NAT 2020 had a negative impact on the subject of environmental education, according to the teachers of environmental education. The majority of educators have a negative opinion that teaching and transferring knowledge of environmental education were limited to 3-4. class.

The majority of respondents consider the topic of wildlife to be important. According to educators, the wild animals included in the 2012 NAT (crucian carp, pike, egret, white stork, anglewings, common cockchafer, starling, blackbird, common vole, deer, and fox) are not discussed in sufficient detail in textbooks (habitat, feeding, reproduction, exact name of species). According to the NAT, the wild animals listed above are discussed in the 3rd and 4th classes. Nevertheless, the deer and fox listed above are in the 2nd class textbook. A 3rd and 4th class textbooks have not been re-edited, so the mentioned wild species are going to disappear completely from the curriculum.

It can be stated that the 51 environmental education teachers who completed the questionnaire do not have adequate knowledge of the Hungarian deer species. The questions asked in the questionnaire were composed in line with the knowledge required of lower-class students. Their tasks were to recognize the exact species and individuals in pictures and answer questions regarding the reproduction of species. According to the results, it can be stated that the topic of the main wild species should be included in the training/aids of the educators, as this enables them to provide appropriate/accurate knowledge to their students.

6. Summary

The aim of getting better acquainted with wild species and game management is to bring more educators to the labour market in order to transfer more accurate knowledge in this field. The most important thing is to get to know the local values that are part of our everyday lives. We need to preserve these values and then pass them on to the growing generation. The cultural situation around us determines our way of thinking. This is also the case for children: if they

are in an environment on a daily basis, where the teacher is nature-loving, eco-conscious, knows and likes nature, children also form similar attitudes. The role of parents is not negligible either, as the child socializes not only in kindergarten but also at home. The child's emerging environmentally conscious, nature-loving behaviour helps to reach out to parents. The environmental education and practice of environmental knowledge would be a routine in case it could take place not only within the classroom but also as an opportunity to visit forest schools and game parks. In this manner, children could get to know wild animals personally.

According to NAT 2020 children do not have environmental education in 1st and 2nd classes. Teaching is implemented in 3rd and 4th classes continuously, applied in an ascending system, so currently, in the school year 2020/2021 the first-class students do not but the second-class students learn the above-mentioned subject.

This raises a problem in several aspects. A 3rd and 4th classes textbooks were not re-edited, so the curriculum for the first two years disappeared in entirety. As a result of previous research (Mesterházy, 2021), it can be declared that most of the curriculum related to major wildlife species is being taught in the second grade of elementary schools. This will completely disappear from next year.

The 2020 NAT explains the cancellation of the subject of environmental education in the first two classes, that the same knowledge can be imparted to children within the Hungarian language and literature subjects. The new NAT currently does not contain such tasks and goals within the subject of Hungarian language and literature, which is also a large-scale problem.

The right resources can be the right tools for educators to have accurate, credible knowledge that they can use in their lessons. We believe that lifelong learning provides an opportunity for all educators to acquire, expand, and deepen their knowledge through successful lessons through lexicons, encyclopedias, nature films, and online resources.

In today's world, which is not exactly nature-centered, removing children even more from nature and the environment will result in an unsustainable world. Within the subject of Hungarian language and literature, of course, it is possible to mention an animal or a plant. However, real, accurate knowledge, species-specific aspects, body composition, nutrition, habitat, and reproduction cannot be replaced by the knowledge of the above-mentioned subject. These methods are not suitable for children to get to know their environment, nature and to acquire the necessary knowledge effectively.

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Positive psychology in the school, the case of the ERASDG project's Innovation camp

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Abstract: *This study demonstrates the effect of positive psychology in the school, as well as the possibility of competence development in vocational education through the ERASDG project. The study pays special attention to the idea that positive psychology places the emphasis on the strengths of the individual and on discovering virtues. This study evaluates the ERASDG project's innovation Camp event and the incorporation of positive psychology in the initiative. Based on the findings of my study it can be stated that the project develops language skills, as well as creativity and problem-solving skills. Communication is also developed by the project because on the one hand, students need to communicate effectively with each other, as well as with teachers. At the same time, it also develops external communication, given that the participants also had to contact external bodies in the course of the project.*

Keywords: *positive psychology, competencies, ERASDG project- Innovation camp*

1. Introduction

This study discusses the effects of positive psychology in the school, as well as the possibility of competence development in vocational education through the ERASDG project. ERASDG stands for Education Requires Application of SDGs. ERASDG, therefore, uses SDGs. They took into consideration the 17 sustainable development goals contained in the Agenda 2030 documents. Furthermore, the project paid special attention to SDG no. 12 on Consumption & Production and SDG no. 13 on Climate Action.

The author participated in the Innovation Camp of the ERASDG project in May, 2021. This study evaluates the event and the incorporation of positive psychology in the initiative. The Innovation Camp is a 21st-century educational method, with multiple advantages. The project took place online, on Microsoft Teams, where the participants participated as an observant. The author's reason for joining the event was to get familiar with this method of teaching, that I could then incorporate into my own teaching process.

As discussed later, the ERASDG project aims to promote among the students the following notions, while considering the SDGs no. 12 and no. 13 (Homoki et al. 2017): the need to be

aware of the situation, the need for international cooperation, the individual is an integral part of the solution. The potential lies in the youth and the education; therefore, we need to develop the quality of vocational training regarding the topic, in this sense international cooperation offers an outstanding opportunity for the teachers too.

The main aims for achieving these are student-focused, authentic, and innovative educational methods and approaches (Tepriks et al. 2015), obtaining positive experiences through cooperation while solving problems, creating the necessary conditions so that the students can keep the learned competencies. As a result of the project the 4 innovative topics Innovation Camp, Living lab, Gamification and Team learning, and the connected practices, if they are to spread in Europe, the quality of vocational training in the environmental sector, can develop further.

2. Literature review

2.1. *Positive psychology in the school*

Before jumping to positive psychology in school, I would like to discuss positive psychology on its own. The idea of Positive psychology was born in the 1970s. The new school of psychology freshly placed emphasis on knowledge, development, self-prompted joy, rewarding practices, self-initiation, and curiosity (Pléh, 2004).

Positive psychology was developed in the United States of America following World War II, in the 1950s. Positive psychology was in fact the answer to the existing models, that regarded psychology as a discipline that focuses on the exploration and correction of mental damages, pathologies, and problems. In this view, the human was seen as the passive subject, the endurer of, for example, childhood traumas. On the other hand, positive psychology focuses on the active decision-making nature of the individual and it emphasizes the positive sides of existence (Seligman and Csíkszentmihályi, 2000). „For positive psychology, the human is self-determined individual, capable of exploiting their own potential, constant growth and development” (Oláh, 2012, pp. 6).

Positive psychology focuses on the strength and virtue of the individual. (Sheldon and King, 2001). Regarding strength, it can be stated that these include future-oriented mindset, courage, optimism, fairness, etc., personality traits developed through evolution, which help to facilitate the perfection and happiness of the individual and the collective (Park et al. 2004).

This part discussing positive psychology in the school. Positive psychology is used in positive attitude teaching in the educational system (Wehmeyer, 2002). The main goal of positive

attitude teaching is developing the competencies of students. Competence in this sense regards “the degree of successful use of individual and social skills while solving problems. Individual competence requires healthy confidence or the ability to apply strategies for struggles. Social competence, on the other hand, consists of interpersonal skills, that help the individual in adapting to the social surroundings, groups, characterized by new, that is, changed rules and norms.” (Hamvai and Pikó, 2008, pp. 72)

The self-detected competencies of the individual are of utmost importance, for example, if the individual regards themselves as clumsy or stupid, there is no opportunity for demonstrating good skills, which could result in the individual choosing tasks, that they are deemed to fail. In this way, their incompetence is not revealed, neither by really easy nor by extremely hard tasks. While if the student’s detected competence is high, they are more likely to succeed even at harder tasks. Therefore, it is important to present the students with real challenges (Pajor, 2015). At the same time, it is important to note that the reward should be linked to competence. The punishment the rewarding should in every case bear different functions. A typical case of this would be a teacher who motivates the students by allowing them to play games if they have finished their tasks. In this case, the reward is the game itself, which fulfills a motivating function. This results in the student expecting a reward as a consequence every time. Therefore, the intrinsic, self-generated motivation does not evolve in them. The evaluating or feedback functions regard the individual’s success. By telling a student that he or she solved a task excellently, therefore they deserve a good mark, then the reward is connected to the high quality of the finished task. In this case, the student gets feedback on his or her competence. This contributed to the development of intrinsic motivation. The importance lies in the application of the reward, that is, the link between reward and performance should be emphasized. The distinction between intrinsic motivation and controlling function is also highly important. Controlling function regards the ability of the individual to perform under pressure. For example, by telling the student that whoever finished the task receives a good mark, the emphasis is on the competition of the task rather than on the quality. Due to the developing pressure, the task now feels like work, taking away the aspect of enjoyment. Positive psychology also suggests that in the case when motivation is already present in the individual, rewarding or controlling are in fact not necessary. If there is no internal motivation, the rewarding function should only be taken away gradually, when it is in use. Internal motivation can be a booster when it contributes to the achievement of the goals (Pajor, 2015).

It is highly important to use positive psychology in schools, as it is in fact point of view since positive psychology focuses on our strengths, and it aims to prevent problems. Therefore, it is a method of prevention.

Students spend a waste amount of time in school with their teachers and fellow students, their time spent studying constitutes a major part of their lives. In this sense, this era is a lasting experience for them. The focus should be on the goals that help them achieve individual and social wellbeing. While this form of prevention for the sake of wellbeing in the school is of utmost importance, it is also central to note the school's purpose, which is to provide the necessary means for effective learning processes and achievement of positive performance (Fodor and Kolényi, 2019).

Possibilities for the use of positive psychology should not just promote mental health protection, but also give space for the development of study motivation, flow-experience related to the study process, and the evolvement of creativity and skills. (Fodor and Kolényi, 2019, pp. 21-22).

In 1998, when he was elected as the president of the American Psychological Association, Seligman determined the three main fields of positive psychology.

1. Positive feelings,
2. personal features and strengths,
3. studying positive institutions.

Furthermore, Seligman emphasized the establishment of the study on human strengths, which indicate the central character of strengths (Seligman, 1999). One of the first findings of positive psychology was the studying of character strengths and its related concepts. Character strengths bear particular importance in the school. Peterson and Seligman (2004) found that for an individual to be in dispose of a 'good character', all six main virtues should be present in the individual, at least to a notable extent. The six virtues consist of altogether 24 character strengths, that are in fact the different forms of the distinct virtues. The six virtues are as follows:

1. wisdom,
2. courage,
3. decency,
4. justness,
5. temperance,
6. transcendency.

While the virtues are somewhat abstract, character strengths are present in practice. An example of this would be when one shows empathy towards work colleagues. In this case “kindness” is the manifestation of character strength and the component of the virtue “decency”.

It is important to use character strengths in the school. The development of character strengths results in the development of skills connected to studying, self-efficiency, the choice of reasonable goals, and a positive attitude towards colleagues. (Fodor and Kolényi, 2019, pp. 27). As discussed in this part of my study, the introduction of positive psychology to the school environment is very beneficial, as it is equally important to nurture talent and to develop positive traits as to eliminate the existing problems and faults (Hamvai and Pikó, 2008).

2.2. *The development of competencies in vocational training*

The most important elements of positive psychology are positive feelings, deepening of feelings, intellect, performance, and the formation of positive social connections. Thanks to this point of view and thanks to the project we can improve the competencies of students in vocational training in a way that also prepares them for the challenges they are to face later on. As of the academic year 2021/2022, it is possible to teach the sustainability subject in one lesson a week. In the framework of freely planned lessons, it provides the possibility for teaching the topic and developing the necessary skills in the 9th and 10th grades. The focus of the program lies in environmental sustainability, also paying attention to the financial and economic aspects, giving the whole complex picture on the issue, taking into consideration the real-life nature of the cause. It also aims not to merely pass on the lexical knowledge but to lay the foundations for and develop a positive environmental attitude, as well as to increase environmental insistency.¹ Schools, where a variety of teaching methods are in use, are more effective and successful. If we were to analyze the different teaching methods used in different types of schools, we would find that project-based teaching is most common in private schools (Simonyi and Homoki, 2020).

The transformation of vocational training implies a change in which project-based learning gets more emphasis. The young generation needs to be able to work with this method. Furthermore, complex approaches help them in performing in the world of work. The goal of Professional training 4.0 is to help the young generation acquire the skills and competencies throughout their school years, which can help them in performing even in the world of the changed function of

¹ Kék Bolygó Alapítvány (2020): *Fenntarthatósági nevelési - oktatási program* <https://kbka.org/tankonyv/>

jobs as the effect of the fourth industrial revolution (Innovative Training Support Centre, 2020). Project-based learning develops these skills and competencies.

Project-based learning especially promotes the social skills of the students, as they work together on projects, providing the possibility of cooperative work (Teperics et al. 2015). The students need to learn how to accept help as well as to be able to offer help. If we use project-based learning in vocational education, students get a chance to develop social techniques while their empathy, tolerance also changes for the better. It is then fair to state, that project-based learning promotes the development of the community, while traditional teaching models promote individualism (Ádám and Bódis, 2013).

Teachers must devote more time to using methods that help students to not just understand, but also to solve different environmental, societal, political, economic issues (Simonyi and Homoki, 2020). Teachers should lay a firm foundation for the student's ability to possess environmental morality and social-environmental responsibility. This requires new teaching and learning strategies, that take into account the differences of individuals, and open the door for every child to acquire the competencies connected to environmental culture (Paksi, 2013). In 2015 193 member states of the United Nations have adopted a new framework for integrated sustainability development, Agenda 2030 (official name: Transforming our world: The 2030 Agenda for Sustainable Development), drawing on ideas of the abolition of poverty, the overcoming of inequality. And the protection of our environment.

2.3. *The ERASDG project*

The ERASDG project was inspired by the sustainable development goals and the framework of Agenda 2030 (Homoki et al. 2017). In 2015 193 member states of the United Nations have adopted a new framework for integrated sustainability development, Agenda 2030 (official name: Transforming our world: The 2030 Agenda for Sustainable Development), drawing on ideas of the abolition of poverty, the overcoming of inequality. And the protection of our environment. The new framework, unlike the previous plans of cooperation for development, is characterized by the adaptation of a more comprehensive approach for sustainable development. The Agenda prescribes tasks and goals for each country and region. In the center of the Agenda lay the Sustainable Development Goals (SDGs). They apply to each and every member state, with the intent of "leaving no one behind". The Agenda identifies 17 goals, divided into 169 sub-goals and 230 indicators, that aim to measure and monitor the extent of sustainable development until 2030 (KSH, 2020).

The ERASDG places the emphasis on three main problems: to teach the students to believe that they are able to solve problems, changes are necessary in the point of view as in action, solutions are only possible if we work together with a society-centered view.

The aim of ERASDG's four projects is to demonstrate through project-based learning with its innovative and student-centered approach, the importance of the use of positive psychology. Students should receive experiences, ideas for approaches, and solutions that the students can use to grow in the future.

Eight countries took part in the ERASDG project: Denmark (project leader), the Netherlands, Spain, Finland, Austria, Romania, and Hungary. The countries work in pairs: one demonstrates a well-functioning teaching method, the other one tests and evaluates it. Nevertheless, the other countries are also not excluded from the testing and the development of the distinct teaching methods, as all eight countries take part in the demonstration of the teaching methods. Following this, the refined teaching methods get adapted by the different countries later.

Hungary is represented by the Agricultural Educational Centrum of Central-Hungary. All four schools participating in the project chose a topic for a workshop that they want to develop. Therefore, the following allocation will apply for the Hungarian teachers for working together with foreign teachers:

- Táncsics Mihály school topic: Innovation Camp (demonstrator: Denmark, tester: Hungary)
- Varga Márton school topic: Gamification (demonstrator: Spain, tester: Poland)
- Fáy András school topic: Team learning (demonstrator: Finland, tester: Romania)
- Bercsényi Miklós school topic: Living Lab (demonstrator: the Netherlands, tester: Austria)

The author joined the international project as an observer, set in a cooperation agreement. Due to the Covid-19 regulations, there was no opportunity to organize the project in real life. For the sake of the success of the project, several meetings took part, where the coordinators and the teachers participated. The training sessions and the Kick-off meeting took place between the 25th and the 29th of January 2021 on Canvas, in the organization of the Netherlands. The Innovation Camp itself took place between the 17th and the 21st of May 2021 on Microsoft Teams, in the organization of Denmark. The working language was English. There were 52 participants of the event, 27 students, 25 teachers, and 2 facilitators from Aeres University. The topics were chosen step-by-step through the teaching method demonstrated by Aeres University. With the help of teachers, the task of the multi-national student groups was to find

innovative and sustainable solutions to real-life problems. The solutions had to be presented on the last day of the event for a professional jury. Through the students as well as the teachers established international connections, their skills and competencies developed significantly.

3. Data and methods

3.1. Participants of the ERASDG project, location and time

While collecting the data the units of analysis were the 6 groups taking part in the Innovation camp. In total, 27 students in vocational training took part in the project week. In my study, I used observation and surveys. In my observations I took notes. As an observant, I did not take part in the events. I received access to the chat rooms from the organizers of the project week. I jumped from group to group while they were working together without having told them beforehand when I would observe them. The survey was also distributed through the internet. The limitation of this could be the question of whether I used the most fitted forms of questions and whether I was clear enough, as I was surveying students from different nations. On the positive side, students were more likely to answer honestly to the questions as they filled out the survey completely individually. Analysis was conducted on the basis of the answers received to the survey questions.

3.2. Observations and experiences in the ERASDG project's Innovation Camp

As already stated, I joined the Innovation Camp of the ERASDG project as an observer in May 2021. The event took part online, on Microsoft Teams. It is important to note that the teaching methods discussed in the last part of my study, were developed by Danish professionals. These methods are already in use with significant success in the Danish vocational training system. The Innovation Camp event of the ERASDG project was organized for the first time online.

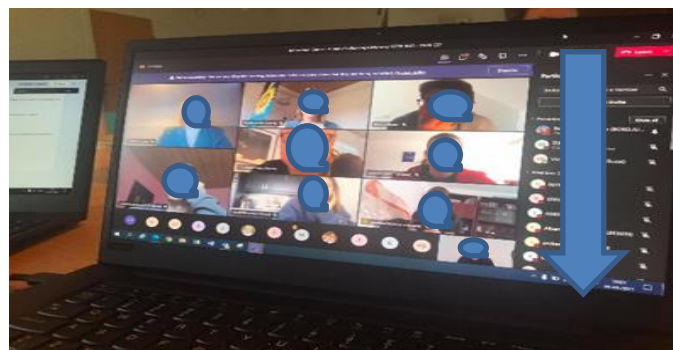


Figure 1. The Innovation camp on Microsoft Teams (own source)

The author was very satisfied with the organization of the event. Multi-national groups of 3-4 students worked together for 5 days, to find a solution to a concrete environmental issue. Following these sessions, they gave a presentation on the last they of the event.



Figure 2. Scene of a real problem to be solved (Green Academy, 2021)²

The working language at the event was English, therefore the Hungarian students, as well as the students of all other nations (Denmark, Spain, Poland, Finland, Romania, the Netherlands, Austria), and the teacher, had to speak English during the event. This was an excellent opportunity for the students to develop their English language skills too. I think that the idea that a professional jury evaluated the work of the students on the last day, was also an excellent idea. This way they received feedback on their work and achievement.

Looking at the scheduling of the project week, we can state the following. Every day started with a group work session at 9 am. The opening event was on Monday and the closing event was on Friday.

The schedule of Tuesday, Wednesday, and Thursday was similar, they went as follows: From 9 am to 11 am group work, from 10 am to 11 am consultation, from 11 am to 12 am group work, from 12 am to 12.45 am lunch break, from 12.45 am to 1.30 pm training, from 1.30 pm to 2.30 pm group work, from 2.30 pm to 3 pm group work (information session and debrief for the students), from 3 pm to 4 pm meeting for the teachers.

Monday started with an opening ceremony from 9 am to 10.30 am. The topics of the opening event were goals, schedule, getting to know each other, working environment. Then from 10.30 am to 11.30 am the challenge took part, when the students could ask questions and get answers. Following this, from 11.30 am to 12.30 am brainstorming, followed by a lunch break. From 12.45 am to 1.30 pm group work, from 1.30 pm to 2.30 pm group work again, from 2.30 pm to

² Green Academy (2021): *Innovation camp challenge* <https://storage.net-fs.com/hosting/7125024/0/> (obtained on: 11.30.2021)

3 pm group work again (information session and debrief for the students), and finally from 3 pm to 4 pm meeting for the teachers. The goal of the project was to solve real environmental problems. The goals were achieved through the teaching methods developed by Aeres University.

On Friday the greeting of the participants took place at 8.45 am, then from 9 am to 10 am the students gave their presentations. 6 groups presented in 8-8 minutes each (3 minutes of presentation and 5 minutes of questions and answers). From 10 am to 10.30 am Kim Falkenberg's presentation took place. From 10.30 am to 11 am there was a break, while the jury was discussing the presentations. From 11 am to 11.30 am the jury gave general feedback (15 minutes), and then every participant filled in an evaluation form (15 minutes). From 11.30 am to 12 am the closing event took part, where awards were given. Finally, the project week was concluded with a meeting for the teacher from 12 am to 12.45 am.

Teachers were present at the event to observe and help the students. From my side, the coaching method was a new experience, that I have never used in my own teaching before. Following the project, I will also apply the method in my teaching.

We can state that the Hungarian team's participation was satisfactory while working together with the Danish, Dutch, Finish, Polish, Austrian and Spanish teams. They did encounter difficulties at the beginning (especially with regards to the working language, English), however, by the end of the five-day project, they managed to overcome the difficulties, and communicate efficiently.

3.3. Results

Drawing on feedback (21) from students and participants, I would like to demonstrate what causes difficulties for the students throughout the project (table 1), and the skills and competencies that the project developed in the students (table 2). At places, we have results over a 100%, because some participants gave multiple answers.

Table 1. Obstacle encountered by the students in the Innovation Camp of the ERASDG project

1. working language (English) – language barriers	70%
1. time-consuming method – time management	55%
2. task division	49%
2. cultural differences	37%

Using table one, we can see that the biggest difficulty for students (but also for the other students) throughout the project was the working language, English, as it was not their mother tongue. After struggling in the beginning, they managed to overcome the language barrier by the 3rd or 4th day, as they kept practicing. The second difficulty was the time-consuming nature of the method. The right scheduling and use of time are really important, to ensure that everything fits in one week. Therefore, task division is really important. The fourth difficulty was the cultural difference between the different nations. This because especially obvious when the Hungarian and Eastern-European (the Polish, and the Romanians) students wished to stick more to the specific tasks determined by the project, while the Western-European students (the Dutch, the Austrians, etc.) were much more flexible.

Table 2. Skills and competencies, promoted by the Innovation Camp of the ERASDG project

1.	language skills	68%
2.	creativity	57%
3.	problem-solving	55%
4.	organizing	48%
5.	planning	41%
6.	discipline	38%
7.	communication	36%

Regarding table 2, it can be stated that the project undoubtedly develops the language skills, because the working language is English, it also promotes creativity and problem-solving. The project also develops planning and organizing competencies too, the different roles form inside a group, for example, one oversees organizing and the other is in charge of planning. Discipline is present throughout the whole project as the setting resembles a work environment where the students have to work together in Microsoft Teams. Communication skills are also promoted by the project as the students have to communicate with each other as well as with the teachers, and even third parties because they have to contact companies as part of the project. If the project did not take place online; Denmark would have hosted the event.

4. Discussion

The Agricolous Educational Centrum of Central-Hungary has three main strategical aims on the international level:

1. Providing up-to-date vocational training using international practices
2. Developing international collaborations

3. Constant development of the professional and personal competencies of participants using foreign experiences and observations. (Agricolous Educational Centrum of Central-Hungary, 2020).

While conducting the project the collaborations are strengthened between countries, schools, students, and the partner, Green Man company. All participants receive new experiences and practices, resulting in the constant development of competencies. In my opinion, the ERASDG project's Innovation Camp contributes to the realization of all three strategic aims.

This new teaching method is applicable in vocational education too. It develops the student's creativity and problem-solving skill. The only "problem" with the method is that it is time-consuming. It requires a week of work, as the execution of such a project takes more than one or two days. Nevertheless, a project week every semester could also be implemented in the Hungarian teaching system too, in which the students can take an active part.

5. Conclusion

In my study, I demonstrate the different possibilities for the use of positive psychology in the school and its manifestation in the project. As we could see, positive psychology places the emphasis on the strengths of the individual and on discovering virtues. Positive psychology is used in positive attitude teaching in the educational system, with the main goal of developing the competencies of students. It is also important to demonstrate how the development of competencies is done in practice in vocational training.

In my opinion, the ERADG project's Innovation Camp was a success, and it became clear that the future of vocational training lies in project-based learning, because it develops the students' competencies with the tools of positive psychology. For example, language skills, working in a group, creative approaches, planning, and organizing skills, and finally, the results show that constant improvement is possible if the will to productivity is present. These are essential to the success of professionals. The future should be built on the new experiences and data found through the project. It is important that students can reach results in an international setting (online or in real life) through the simulation of real situations with the tools of group work, perception, and detection, which is not possible in normal teaching settings. Furthermore, it is important to realize that the use of positive psychology and a firm knowledge of its basics is important to reach these results. I am looking forward to the next steps of the project. Depending on the outplay of the pandemic, this event might take place in person or online. Furthermore, based on the feedback of the teachers an evaluation will take place. Following the evaluation,

the project will be applicable in any other country. For me, the project helped to gather international experiences, contributing to my own teaching methodology.

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“Fertő land along the border project”-curriculum for the complex natural science subject

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Abstract: *A profession-specific curriculum and syllabus have been produced with new methodology and content for the Complex Natural Science subject introduced in Hungary in the September of 2016. The one year experiment was conducted with year 9 pupils in Aladár Porpáczy Vocational Training School in Fertőd. The basis was given by Mária Kováts-Németh’s work “Forest Pedagogy Project”. The first module of “Fertő Land along the border” as study material is “The natural wildlife and development of Fertő Land”, which serves to present the geology and climate of Fertő Land. The second, “Place identity and cultural behaviour”, discusses the cultural values and local customs typical of Fertő Land. The third part, “Healthy lifestyle”, deals with local medicinal herbs and the dishes, medicinal waters, farmers, and folk healing practices characteristic of the region. Part of the project is presented in the article.*

Keywords: *Project; Module; Complex Natural Science Subject; Environmental Pedagogy; Forest pedagogy*

1. Introduction

The Complex natural science subject was introduced in vocational high schools in the September of 2016. Its legal background is the MHR Decree 22/2016 (VIII.25.) amending MHR Decree 51/2012 (XII.21.) on the system of issue and approval of general curricula. In Hungary, natural science used to be treated as separate subjects in primary and secondary education. Physics, chemistry, biology and geography were taught in all types of schools. The interest of students in the natural science subjects, however, was constantly falling. A car mechanic did not want to learn biology or geography, because they did not need these for their profession. Those studying economics or tourism did not see any sense in the subjects of biology, physics or chemistry (Schüttler, 2006). On the other hand, due to accession to the EU, in order to teach in institutions in a similar way to in the west, the names and study materials of subjects had to be changed, and new subjects had to appear. They wanted to create the subject of natural science on the foreign (science) pattern. These processes did not take place from one

moment to the next, but they have been gradually appearing up till the present day. Introduction of the subject did not go smoothly. Research also indicated that no textbook on the subject had appeared on the market, there is no further training for teachers or consultations on methodology (www.nefmi.gov.hu, 2010; Sági and Szemerszki, 2021). Verbal briefings at the beginning of the academic year did not offer sufficient indications and the educators teaching the subject were left with some doubts. The greatest discontentment was caused by stopping natural science subjects in secondary schools, of which only the subject promoting the school's profession could remain (Csorba, 2020). The goal with the new subject was for the students to be as comprehensively informed as possible, and become familiar with natural science research fields. For them to be able to find cause and effect correlations between what they learnt and the phenomena seen and experienced in the world. In the Skills/development requirements section, the General Curriculum offers ample opportunity for making employer's lessons as exciting as possible for each profession group. The attainment of deeper knowledge was not the primary goal with this subject, but just for the world to open up before the students, prompting them to experiment and make investigations independently. Thus opening the way to lifelong learning (netjogtar.hu; Szákovicsné Bérczy and Schläffer, 2017; OFI, 2016).

2. General curriculum expectations and goals

The basic goal of the Complex natural science subject is to shape attitudes. One reason why the natural science subject has been attacked, is that according to teachers, science must be handed on, there is no time to get students to love it, or to get bogged down in interesting points. The attitudes of teachers need to be changed, so that the teachers do not want to teach the text book, but they should be able to accommodate to what the students find interesting. (Varga, 1992; Rác-Varga, 1997; Schüttler, 2006). By shaping attitudes, they want to help the students to know, when preparing for professional life, how they should study, where they can obtain extra information, and for them to be able to plan and move forward in their field of work. The subject furnishes them with skills that are indispensable in the modern world. The teachers should be able to demonstrate the relationship between research and everyday life (Havas, 2001; OFI, 2016).

Based on the wording of the General Curriculum, the most important goals are for the students to become open to the world around them, thus being able to recognise cause and effect correlations and to draw conclusions. They should know the fundamental natural laws and be able to produce and interpret diagrams for these. They should know the structure of the world

from the lowest level up, as well as recognising the effect of these on living organisms. They should be aware of man's activity in shaping the environment, and the consequences of this. They should be able to reason in the interest of the state of their environment and their own health, taking scientific fundamentals into consideration (netjogtar.hu 2016).

With the achievement of these goals, the students will get to know the world around them. They will prepare for fulfilling their duties as citizens, so that others will not be able to exploit the natural environment of their homeland. They will learn to appreciate and value the rich wildlife of the Carpathian Basin, which is our cultural heritage. Their inclination to pursue an environmentally aware lifestyle will increase, with which they will prepare for sustainable management and a sustainable life (Havas, 2001; OFI, 2016; Szákovicsné Bérczy, 2017).

3. The complex natural science subject and project education

One of the expectations of the General Curriculum, is for students to see cause and effect correlations, and to be able to solve the problems arising critically and constructively. The goal is to establish a society of nature lovers, which pursues an environmentally friendly lifestyle, committed to sustainability.

The complexity of the Complex natural science subject is demonstrated by the fact that the students are given a working knowledge and a broad overview of the world around them. This also means that they will be capable of working together with others in their future jobs, that they will be open, creative and empathetic. They should be able to acquire skills independently. For this, they should be able to plan ahead properly, be capable of selecting from the information obtained, and of correcting their results, so as to be able to give the most perfect answer possible to problems arising (Havas, 2001; Hegedűs 2002; Estefánné Varga and Szikszay, 2007; Kováts-Németh, 2010; OFI, 2016).

The following expectations are laid down in the General Strategy for National Sustainable Development: "In the 21st century, the requirement for the convertibility of basic skills, abilities and acquired expertise needed on the labour market makes it necessary for young people coming out of public education to leave the school system with comprehensive basic qualifications, and to be capable of constantly renewing and updating their knowledge" (NFFK, 2013, p.104).

The General Curriculum sets the target of attitude formation, which covers not only the field of the natural sciences, but also demonstrates broad links with the arts, homeland and folk studies,

mathematics, and a healthy lifestyle. With this procedure, the subject also meets the expectations of environmental training (Havas-Széplaki-Varga, 2004). The Project thematic unit is set at 15 lessons, in order to make the teaching of the subject practice oriented. During the teaching, there is thus opportunity for the students to make fuller independent investigations, to go on study trips and to expand their skills.

Adjusting to these expectations, the Complex natural science subject cannot be taught with traditional educational organisation. Project education, used for so long by environmental educators, must be brought to the fore for this subject too.

In the summary by M. Nádasi (2010), the criteria for project education are as follows:

1. “The starting point should be the question of problem identification by the students, planning should be done jointly.
2. The solution to the project should be linked with real situations through the activity.
3. It should provide means for individualised work.
4. It should provide means for group work.
5. It should be worked out over an extended, continuous, longer time period.
6. The goal should apply to familiarity with or making changes to a situation outside of school.
7. It should be characterised by interdisciplinarity.
8. The educators and the students are equal in rank, though they work together as partners with differing competencies.
9. The students should make decisions independently, and they should be responsible for their own decisions.
10. The educator should retreat into a stimulating, organising, consulting function.
11. The relationships between the students should be strong and communicative” (M. Nádasi, 2010).

Project education is the teaching strategy of environmental education. Environmental education is an integrated science, which together with its companion sciences, is looking for answers to global challenges. The sciences of ecology and pedagogy help the individual to look for constructive answers in order to be able to sustain the ecological balance. Among the expectations and goals of the Complex natural science subject are primarily the shaping of

environmentally aware, responsible conduct, thus a parallel may be drawn between the goals of the subject and environmental education (Rókusfalvy, 2000; Kováts-Németh, 2010; Szákovicsné Bérczy and Schläffer, 2017).

4. Fertő land along the border project

Our school is located in the town of Fertőd. One of the specialisations of our institution is tourism. The Complex natural science subject is part of the curriculum for year 9 entrants, which broadens the students' meagre knowledge of the natural sciences. Most of our pupils live in this area, but they are not familiar with the place where they live. This became clear to us from the preliminary questionnaire, which we had the pupils from the entrant year complete. The first group of open-ended questions applied to the formation of Lake Fertő. The second group of questions were in connection with Fertőrákos Quarry. There were also questions on the questionnaire about the past and folk customs of Fertő Land, as well as about Fertő Hanság National Park. Of the 58 pupils, only 14 were boarders. Of the local pupils, for instance, only 29% had been to the Quarry. Even less than these had attended events organised by the Fertő Hanság National Park. A total of 5 wrote that they had attended some event, this being 0.08% of the whole group.

After evaluating the questionnaire, we compiled the work plan and curriculum for the year in reference to Fertő Land and appropriate for the professional group. We started from Vásárhelyi's assumption (2010), according to which personal involvement has an educational effect. Széplaki's studies (2002) also indicate that pupils' environmentally aware action is best influenced by familiarity with and taking care of local environmental treasures. Kováts-Németh Mária's Forest Pedagogy project work and environmental pedagogy methodology system framed in 1995 served as a basis when compiling the study materials. This latter effectively promotes recognition of the pupils' personal goals, independence and working together, making learning into an experience (Kováts-Németh, 1998, 2006, 2010). The Fertő Land along the border project has been produced on this basis. In a similar way to the Forest Pedagogy project, among the modules appear the natural environment, healthy lifestyle and place identity. We have expanded the Fertő Land along the border project in making the central problem the town and cultural landscape, also including the school building, as well as the natural landscape.

The pupils walked around a central problem, the Fertő Land, with practice-oriented tasks in the course of the year. Which modules we worked with, and within the modules, which module units we formulated, are shown in Figure 1.

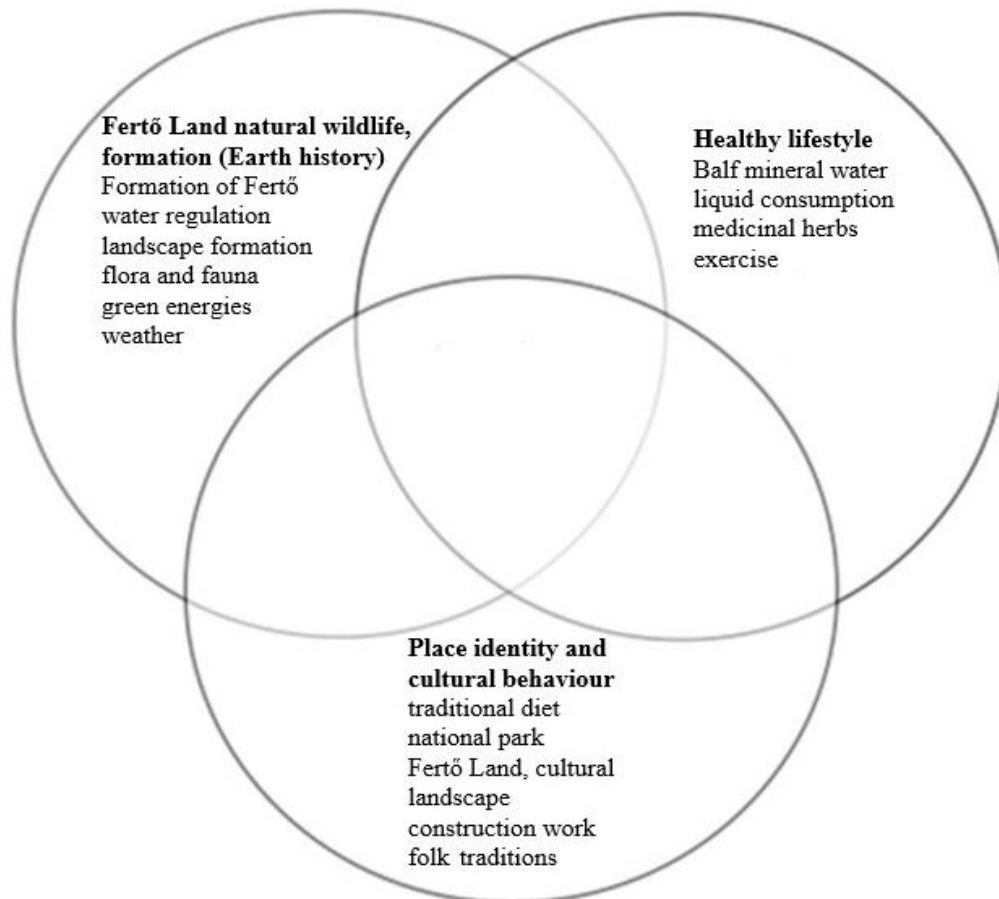


Figure 1. Module units for the Fertő Land along the border project

Fertő Land is a cultural landscape. UNESCO added the region to its world heritage list in 2001. “The landscape, which is our territory, our dwelling space, our workplace, an attractive tourist destination, a witness to bygone times and cultures, is of inestimable value, a cultural treasure created by human hands and natural features arising over millions of years, the destruction of which would mean a severe and irreplaceable loss for the whole of humanity” (Taschner, 2013, p. 6).

Fertő Land plays a key role in the lives of those who live here. They use it mainly for tourism purposes, without even thinking of the diversity of the cultural landscape. In the spirit of environmental education, we also need to deal with the future of the area, the vision for the future of those who live here, and the formation of this. Inherent in these is the preserving power of the cultural landscape (Havas-Széplaki-Varga, 2004).

4.1. *The connection between the General Curriculum and the modules in the “Fertő land along the border” project curriculum*

The curriculum includes recommendations of the General Curriculum, which have been assigned to the given landscape and the instructed profession (tourism) (table 1). In the study materials, we have highlighted the peculiarities of Fertő Land, such as legends, Earth history or simply the medicinal herbs to be found there.

Table 1: Connection between the General Curriculum and the Fertő Land along the border project

Title of thematic unit in General Curriculum	Content of curriculum for topic framed for Fertő Land based on the development requirements of the General Curriculum
Getting into full swing, orientation in space and time	Legends, reality and mysticism of Fertő Land, folk customs, formation of Fertő, beginnings of drainage operations, learning about arguments and discussions, the old landscape, map reading
From where to where?	Earth history on Fertő Land, Fertőrákos quarry, Fertő, rock strata, minerals, building materials
Sets	Atmosphere, atmospheric phenomena in Fertő Land, effects of the atmosphere on local plant covering, protected plants in the Fertő-Hanság National Park, effect of Fertő regulation on the microclimate
Forms and materials in nature	Mineral composition of Balf, viticulture, wine production, proteins, carbohydrates, fats, hydrocarbons in the Hanság Basin, formation of saline soils, chemicals used in the household and their effect on wildlife and man

4.2. *Details of the curriculum*

We will choose one of the topic titles featured in table 1, and analyse it in terms of the curriculum. We show how the General Curriculum recommendations can be adapted to the given professional group and landscape unit. A description of the methodology can be read in the article entitled: Application of the “Fertő Land along the border project” to the complex natural science subject (Bérczy, 2019).

We will deal with the selected topic in the Landscape formation module unit belonging to the module Fertő Land natural wildlife, formation (Earth history).

“Title of thematic unit: From where to where? Sidereal, geographical and biological evolution. Human social behaviour.

General curriculum development tasks: “Observation of connections and correlations between various fields and phenomena, discovery and formulation of similarities and common features. Deepening knowledge of time and space concepts, developing temporal orientation during cognition of processes of differing scale” (netjogtar.hu).

Timeframe: 8 hours

Lesson titles and topics we use:

Looking into the depths of the Earth

Rock strata – the “building blocks” of the Earth

Development and earth history of Fertő Land

Examining rock strata and minerals

Fertőrákos quarry

Building customs of Fertő Land – what did they used to build with?

Geological structure of Hanság Basin

What do I know about the region?

4.2.1. Curriculum content, study materials

Looking into the depths of the Earth: Formation of the solar system and planets, geological evolution of the Earth, mountain range formation and destruction, volcanism.

Building blocks of the Earth: Mountain range formation and destruction, volcanism, rock strata, limestone

Formation and earth history of Fertő Land: Fertő Basin, Fertő, Balf Block, fossils, evolution

Examining rock strata and minerals: external environmental factors affecting rocks, (man, air pollution, soil pollution), examining strata, mineral recognition (according to local features)

Fertőrákos quarry: earth history of the quarry, human intervention, study of discovered fossils, Roman times, present day, labour camp

Building customs of Fertő Land: appearance of human civilisation on Fertő Land, utilisation of nature, destruction and abuse of nature,

Geological structure of Hanság Basin: Formation of Hanság, peat, peat harvesting, effects of man, draining, damage to nature, reconstructions

What do I know about the region? : systematisation of what has been learnt so far, discussion on human effects

Connection points: Fertő Land plays a very significant role in the life of our school. It appears in every subject. It is a primary criterion for the teachers who teach here, that the pupils should become familiar with the town of Fertőd and the life and past of Fertő Land. In the following, we present how the cultural landscape appears in various subjects.

In the literature subject, they talk and read about the quarry. They study and analyse writings and legends about Fertő. They watch a film, then process their knowledge, for instance, of the film *Eighty Hungarian hussars*, or *Nameless castle*.

In the grammar lesson, they analyse archaic speech and dialect words.

In the history subject, Fertő Land often comes up in chronological order, so it is mentioned in the Roman times, as well as in World War II, in connection with labour camps. They also learn about people groups of the given region.

In mathematics, they calculate the dimensions of the quarried stones, for instance.

In geography, the region is mentioned when studying earth history and rock strata, as well as the minerals and fossils to be found there.

In foreign language lessons, the culture of the region is treated.

The lesson topics have been produced in reference to local peculiarities, using the General Curriculum recommendations. We have used the internet, reference books found in the library, and the learning of people living in the area, in order to acquire knowledge. In the lessons, the pupils worked in groups. The pupils are encouraged to do independent research outside the lessons, so we always ask questions in connection with the material for the following lesson. Learning based on their own experience is important, so they will have their own results, based on their own research. We therefore reach the goal that they feel the things they learn are their own, they come closer to the study materials, and alongside these, to the landscape. A valuable component of the Fertő Land project is that we dedicate 15 hours to excursions, in order for pupils to observe the treasures in reality that they have learnt about in the classroom. We assign 3 hours from this time allocation to walking around the Fertőrákos Quarry, and we also look round the mineral museum located in the vicinity.

At the end of the year, we have final tests written by the two classes of pupils (58pupils) who took part in the experiment (Control group and Experimental group). The Experimental group

(26) studied with the methods of environmental pedagogy, and we applied the Fertő Land along the border project, whilst the Control group (32) took part in traditional, frontal education and we only taught the General Curriculum recommendations. Meaning that we did not draw their attention to the peculiarities of the landscape. In can be seen in Figure 2, that the class which studied with the project model obtained better average results for the class. The class average for the tests of the Experimental group was 4.54, the class average for the tests of the Control group was 3.69. The Experimental group performed +0.85 better. It was proven that education with the project model is more effective than frontal work.

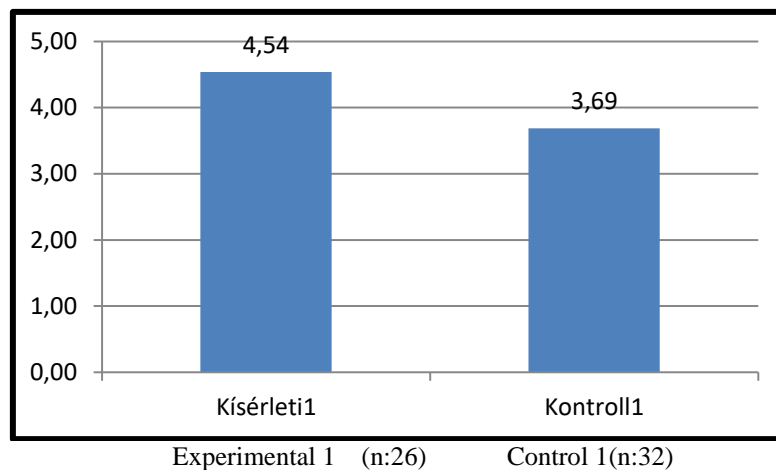


Figure 2. Class averages for the end of year

5. Summary

The module units of the “Fertő Land along the border” project promote the pupils’ constructive life skills in their own living environment. The project method was suitable for our pupils to master the study materials. The topics and the elaborated curriculum help the pupils in the real environment, to get to know and love their surroundings, which is Fertő Land. The content of the study materials is inherently linked to the tourism profession. With integrated education, they acquire usable knowledge. With the aid of the Project thematic unit, they achieve the ability to see and experience in reality what they have learnt in the classroom. They can thus associate the studied concepts with real phenomena. The study materials are thus internalised, because besides acquiring knowledge, they can see and experience their everyday lives, treasures of the past and present, and all this in the light of natural science. The difference between the average results of the tests written at the end of the year confirmed to us that the Experimental group, who studied the material for the year in project education within the

context of the Fertő Land along the border project, acquired usable knowledge in the natural sciences, which they could connect with phenomena seen in everyday life.

The Complex natural science subject can be made profession specific with this solution. Meanwhile we enable the pupils to get to know and love their profession and their immediate environment.

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