



HOW TO LEARN IN THE CLOUDS Digital Learning to Overcome School Failure

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Foreword

We do not know what the future will look like. But we can be sure about one thing - it is the future for which we have to learn, and in which we continue learning. The world is changing dramatically and constantly. The top 10 in-demand jobs in 2010 didn't exist in 2004. We are currently preparing students for jobs that don't exist yet, and students of today will possibly have more than 10 jobs by the age of 38¹. Emerging new technologies along with new industries reshape the way we think about education and learning. The demand for quality learning is high, and it is up to us - educators, parents, educational researchers, policy makers - to look for better ways of education.

This is nothing new. Many of us regularly learn online, attend after-work lessons, send children to specialized courses and programmes - still there are communities in our nearest vicinity, within European countries and neighbourhood, with limited access to even very basic education. The communities we worked with belong to this category.

https://teachingandlearninginhighered.org/2013/07/15/preparing-students-for-what-we-cant-prepare-them-for/

This publication is the story of a project, where we have tried to develop innovative educational practices for the most vulnerable Roma communities in Europe. How it came about and what of our experience can be used in your daily practice, is what you can take from this publication.

Below we have summarized the outcomes of a three-year effort of a consortium of seven partners in five countries lead by the Vienna University of Technology in implementing a strategic partnership in the field of school education. This Erasmus+ project dealt with the prevention of early school leaving, the development of basic and transversal skills and the enhancement of digital education in the context of minorities, mainly Roma. Educational disadvantages and exclusion lead to lacking integration in the labour market and exclusion from society in general, which is a vicious circle this project aimed to break.

In three locations in Slovakia, Romania and Kosovo the project implemented an innovative educational approach with more than 100 participating children and youth. In their afterschool and youth programmes educators used tools and specifically designed learning materials to engage children and youth in their own learning process. We started from the educational model of SOLE. These letters stand for Self-organized Learning Environments² and represent a widely recognized alternative educational method that supports an individual learning process according to student's abilities, needs and interests.

2 <u>https://en.wikipedia.org/wiki/Self_Organi-</u> sed_Learning_Environment This project was made possible only due to the support of the European Union within Erasmus+ Strategic Partnership Programme as well as cooperation and support of our partners, namely Technical University Košice, GAIA, Verein Offenes Lernen, Fundatia Crestina Diakonia Filiala Sfantu Gheorghe, Súkromná Základná Škola and SCIO, as well as our sponsors Verband Österreichischer Software Industrie, LieberLieber Software, Sparx Systems, Pedagogische Hochschule Schwyz and Oesterreichische Computer Gesellschaft.

At this point, we would like to thank all supporters and partners, and also encourage others to set on a journey to find ways to improve education of children in the 21st century.

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Picture taken during project kick-off in Vienna in 2016. Photo credit: Head in the Clouds.

Background

In this picture you see the hand of a boy (let's call him David) from an excluded settlement of Valea Crișului near Brasov in Romania. He's 10 years old and the statistical science already knows he's most likely to have a similar fate like a number of his relatives and acquaintances - he'll never go to high school, he'll never learn English, and he'll never learn to calculate interest rates. But what is worse - he will stay functionally illiterate (below OECD PISA literacy level 2).

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How do we know this?

The recent OECD studies (e.g. PISA 2015)³ have shown that socio-economically disadvantaged students across OECD countries are almost three times more likely than advantaged students not to attain the baseline of proficiency e.g. in reading or science.

Additionally, a recent McKinsey study⁴ lists Romania among countries where socioeconomic background heavily influences educational performance. Hence, if you are unfortunate enough to be born into a family with low social or economic background, the Romanian formal education strand will not help you to break out of this vicious circle of poverty. This applies to many other educational systems as well.

David and his parents know that. So why should he go to school at all?

Some people might think that such cases are rare in Europe. However, the opposite is true. Our belief in solitariness of formal education gets broken down with every further research conducted such as PISA, PIRLS and others. Our traditional system of formal education – with a teacher or professor in front of a classroom of passive listeners, backed up with a blackboard and lots of chalk – is becoming increasingly unfit for the very purpose of learning. What's more, the needs of specific groups of people (such as David and his friends) are not met in the current system. In some countries, the dependence of learning outcomes on socioeconomic status is still increasing.⁵

Europe is increasingly accommodating new people from different parts of the world who have little or no experience and background in traditional formal schooling. This means that such families do not know how/cannot support their children on their formal educational path. On average across OECD countries, and after taking their socio-economic status into account, immigrant students are more than twice as likely as their non-immigrant peers to perform below the baseline level of proficiency.⁶

As can be seen from the chart below, countries like Romania, Bulgaria, Slovakia, Kosovo or Greece offer children from vulnerable communities insufficient assistance in overcoming educational difficulties. These difficulties are not related to the cognitive abilities of the children but only to their socioeconomic backgrounds.

Considering this, the question may be raised whether in today's Europe we offer equal educational conditions for all children and if not, what we can do to overcome this challenge.

^{3 &}lt;u>http://www.oecd.org/pisa/pisa-2015-results-</u> -in-focus.pdf

^{4 &}lt;u>https://www.mckinsey.com/~/media/mc-kinsey/industries/social%20sector/our%20insights/drivers%20of%20student%20performance%20insi-ghts%20from%20europe/drivers-of-student-performance-insights-from-europe-the-book.ashx</u>

^{5 &}lt;u>https://ec.europa.eu/education/sites/educati-</u> on/files/monitor2017-summary_en.pdf

^{6 &}lt;u>https://www.oecd.org/pisa/pisa-2015-results-</u> -in-focus.pdf



A child from Sepsikőröspatak. Photo credit: Head in the Clouds.

Making sure all students have *equal* access to resources is an important goal. All students should have the resources necessary for a high-quality education. But the truth remains that some students need *more* to get there. Here's where *equity* comes in. The students who are furthest behind — most often low-income students — require more of those resources to catch up, succeed, and eventually, close the achievement gap.

Below you can see a chart overtaken from PISA 2015 results, showing how socioeconomic background influences student achievement in European countries.

When we look at the position of Romania, Slovakia and Kosovo - countries where implementation took place, we can see that Kosovo and Romania score below OECD average (in this particular case in science), while Slovakia is still in the average strand. What's more alarming is the fact that both Slovakia and Romania are countries with one of the highest impacts of socioeconomic background on performance. Kosovo does better in this aspect as the socioeconomic background factor plays a less significant role, however the overall performance is the lowest in Europe. This means in plain words that if you are a David in any of our implementing countries, you are very likely not to achieve the same performance you would achieve in Finland or Estonia.

Chart 1: HOW SOCIOECONOMIC BACKGROUND INFLUENCES PERFORMANCE



Degree to which socioeconomic background determines score (% of variance explained by PISA's index of economic, social, and cultural status) Let's have a look now at the very key skill which is reading:

Chart 2: PERCENTAGE OF STUDENTS AT EACH LEVEL OF PROFICIENCY



Countries are ranked in descending order of percentage of 15-year-olds in Levels 3, 4 and 5. Source: OECD PISA 2003 database, Table 6.1.

If we look at the OECD data on the distribution of reading levels among European countries, we can see a great between-countries disparity in level distribution that cannot be explained by normal Gaussian probability distribution. If we compare the number of students listed in lower levels in Slovakia with the same strand in Finland – there is a significant difference. Hence if our David was born in Finland, his chances of becoming a diligent reader would have been much higher. This is a serious threat to the further development of many European countries where up to a third of 15-year-olds have serious deficiencies in their ability to use reading literacy as a tool for the acquisition of knowledge and skills in other areas. After 8 or more years of regular school attendance. These people will be hardly employable in the era of industry 4.0, the constant shortening of the innovation cycle and the increasing influence of information and disinformation. Disparities are therefore observable in and between countries.

Traditional formal education systems in some of our countries were built on the assumption that the family, neighbourhood, or community would provide sufficient learning assistance. Where this help was available, the traditional model of formal education has worked fairly well. However, in a situation where family or community surroundings do not have such capability, the traditional model seems inadequate, not providing for the necessary equality.

In some of our countries modern schools were transformed into all-day schools, however the socioeconomic disparities persist as we've seen in the charts above.

Boundaries becoming blurry

This growing trend of interest in education has strengthened the importance of learning that goes beyond the traditional school environment. Many educational professionals around the world have been looking for new ways to streamline teaching methods. In families, in schools, at work, in communities. What we learn in formal settings (schools, colleges, training centres etc.) is only one part of acquiring knowledge and skills. Learning one set of skills at school, a vocational/ technical college or at university is no longer sufficient preparation to equip people with the knowledge, skills and competences they will require for the duration of their working lives.⁷We learn in non-formal and informal settings too (e.g. in community learning clubs, sports associations, within the family, when playing videogames, in daily community life).

Many educational specialists and reformers, such as the Next Generation Science Standards (NGSS), Common Core State Standards Mathematical Practices (CCSMP), and Partnership for 21st Century Learning (P-21) challenge educators to provide students better fit-for-the-purpose learning with experiences that address the needs of learners in today's society. These new standards represent a paradigm shift taking us away from the meticulous at-school-only content memorization of the era of enlightenment, toward more dynamic learning opportunities addressing the whole learner at various places and times: at home, work, school - everywhere. The traditional division of learning between formal, non-formal and informal education is becoming obsolete and boundaries seem rather blurry.

^{7 2007} OECD Policy Briefing.

Slumdog millionaire or a light at the end of the vicious circle?

There are millions of children like David in the world. Some of them go to school, others don't. However, as can be seen from the OECD data shown above, the efficiency of such formal education (as measured by standardized tests) is significantly lower than in the case of children coming from more affluent backgrounds.

If formal schooling fails, does it mean they Davids are not able to learn? A similar question was raised years ago by Sugata Mitra, a programmer and scientist from Calcutta who invented his experiment known as The Hole in the Wall. The experiment was fairly simple: we place a computer connected to the internet in an Indian slum in a hole in the wall and then watch what is going to happen. So what happened? Apart from the fact that his experiment inspired the author of the book, which was later used as a basis of the film Slumdog Millionaire, the children from the slum without the prior knowledge of English and computer science soon learned how to use the computer without the need for any adult intervention.

Mitra has repeatedly carried out his experiment at various places in India and claims that children are able to learn things that no one would ever guess they could ever learn, such as how a neural network works or how DNA replicates. These experiments gave rise gradually to an educational method called SOLE, an abbreviation for the Self Organized Learning Environment. The essence of SOLE is to support the natural curiosity of children by asking them a suitable non-trivial question or an interesting topic and providing them with rich resources where they can find the answer (which obviously does not mean that we put a book open on the reply page right below their nose). Then let them talk to each other. So the educator acts here as a facilitator or guide rather than a pure transmitter of readymade knowledge.⁸

8 See eg. <u>https://www.theschoolinthecloud.org/</u>

Of atoms and men

Mitra's approach has earned millions of supporters and opponents around the world. One of the frequent objections is that it makes no sense to let the children look for answers themselves if we can tell them all we need and it will be much faster. Some admit that teaching children without educator guidance makes sense in Indian slums, where educators may not be readily available. But does it make sense to do it in Europe, where an educator can tell her children if Hamlet eventually decided to be or not to be?

Maybe it depends on what you want to put emphasis on in education.

We can show it with the example of an atom. If you want your child to master the structure of the atom quickly, you can explain to her how such an atom looks. But when you think the aim of learning is something other than just to know what an atom is composed of, that is, to be able to deal with a situation where e.g. CERN researchers confirm the existence of particles that we have not yet explored, it seems that the SOLE and other similar methods based on constructivism and self-directed learning could be very useful.

When using such approach, children may acquire a given piece of knowledge at a slower pace, but gain an invaluable bonus - learn to learn independently, in other words develop their learner autonomy.



Makey Makey lesson in Slovakia. Photo credit: Head in the Clouds.

Project

Mitra's experiments have earned millions of fans around the world. In 2013 he received the TED award of \$1,000,000 for his famous video.

However, numerous critics often point out that the SOLE method lacks empirical evidence, studies, analyses. Does the SOLE method really work? Can it be used in European countries? Can it be adopted in non-formal settings in countries as diverse as Kosovo, Slovakia or Romania? And in schools? Should it be modified? Does the SOLE method help develop learner autonomy or other skills? Can it be utilized en masse in our countries? Can it be adopted by local communities? Can it help overcome barriers built by socioeconomic burdens? Eventually, will David benefit from such education?

These questions needed to be answered and that's why we created our project Head in the Cloud.⁹ To research what can be done in order to help these children.

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Approach

Although we were inspired by Sugata Mitra's experiments, it is worth pointing out here that our approach differs greatly from them. In the course of the analysis of needs, we found that application of the method in an unchanged form would be difficult in our locations and would potentially not lead to the intended goals. That is why we chose a customized educational approach and materials only initially inspired by the SOLE method. Internally we call this approach MINIMAX, aiming at *minimal teacher*

invasion and maximum learner autonomy, yet using some elements of directed or semidirected instruction. This approach proved to be appropriate in the given circumstances. In the following, we always refer to the modified form of SOLE, not to the original work of Sugata Mitra.

Our approach was largely driven by the intention to develop and research the concept of learner autonomy, that will be described later.



Consortium

In order to reach our goals we have established an international partnership.

The consortium consists of organizations with sufficient experience with project management and IT and digital literacy (Vienna University of Technology), designing new pedagogical methods and tools (Verein Offenes Lernen), educational measurement (SCIO), work with vulnerable groups (Technical University of Košice) and especially those who are directly present in communities on day-to-day basis and whose participation is fundamental and irreplaceable: Súkromná základná škola in Košice (Slovakia), Fundatia Crestina Diakonia Filiala Sfantu Gheorghe (Romania) and Gaia (Kosovo).

Diverse experience and expertise along diverse approaches and possibilities enabled through the cross-sectoral aspect of the project consortium (2 universities, 1 SME, 2 NGOs, 1 school, 1 foundation), proved to be very beneficial in reaching common efforts of this project.



Consortium representatives at the meeting in Košice in 2017. Photo credit: Head in the Clouds.

Communities

In all three localities, we have worked with communities that are commonly referred to as Roma by their neighbours. However, it must be borne in mind that these communities are very heterogeneous. While in Slovakia Romany is the language of the first choice, and children and their parents often consider themselves to be Roma, most of the population in our target group in Romania consider themselves to be ethnic Hungarians. Knowledge of Romani is practically non-existent and the language of the first choice is Hungarian. In Kosovo, the situation is even more diverse. Three communities live together: Roma, Ashkali and Balkan Egyptians, using their own ethnolects of Romani. There are clear social boundaries between the three communities, supported also by differences in religion. These boundaries and specifics were taken into account.

Locations

Romania

The Head in the Clouds program took place close to Sfântu Gheorghe (capital city of the Covasna County located in central Romania), in the village of Valea Crisului. Our local implementing partner was Fundația Creștină Diakonia - Filiala Sfântu Gheorghe (CFD). The CFD organizes an after-school programme for children from age 8 to 13. These students come from a community of over 100 members whom all refer to themselves as Hungarian and communicate in the Hungarian language they do not have proper knowledge of the Romanian language. Their location of



Children of Sepsikőröspatak. Photo credit: Head in the Clouds.

residence can be described as a ghetto-like environment. The educators work with the students from 12h to 16h30 every day and dedicated one session per week to the Head in the Clouds boxes. Although closely related to school activities, the work of the after-school programme can be regarded as non-formal education with a more or less stable number of learners.



Children of Sepsikőröspatak. Photo credit: Head in the Clouds.



Children of Sepsikőröspatak during project work. Photo credit: Head in the Clouds.



Children of Sepsikőröspatak during Ekopolis lesson. Photo credit: Head in the Clouds.



Children of Sepsikőröspatak during project work. Photo credit: Head in the Clouds.

Slovakia

The implementing partner in the Slovak Republic was Súkromná Základná Škola (SZŠ), a school that includes a Roma language curriculum. 200 Roma children attend the school and are from a poverty-stricken community in the Lunik IX settlement. The settlement was built as an ABC—the abbreviation stands for Armada (army), Bezpecnost (security or police), and Cigani (Gypsy or Roma)—housing estate for the Roma around 1974. Estimated inhabitants were 2500 at the time, however, it has grown

three times as large since then. According to the school's report the per capita household income of the segregated Roma is one third of the general population's while only 7 percent are employed and 49 percent of those above the age of 15 have never worked. Almost 38 percent of those above the age of 16 have difficulty reading and writing. The school embedded Head in the Clouds programme into its regular formal curriculum, allowing for up to 2 hours a week of learning.



Children of SZS during lesson. Photo credit: Head in the Clouds.



Children of SZS during IT 101 lesson. Photo credit: Head in the Clouds.



Children of SZS during Ekopolis lesson. Photo credit: Head in the Clouds.

Kosovo

GAIA was the implementing partner in Kosovo. The organization's activities focus on education and the integration of marginalized minorities, mainly the Roma, Ashkali, and Balkan Egyptians. Approximately one third of this population lives in absolute poverty according to GAIA reports. The organization believes that the enrollment rate for compulsory education is above 84.9 percent while it drops to 30 percent for secondary education. The lack of inclusive and quality education for Roma, Ashkali, and Balkan Egyptians is an indication of low literacy rates among this population.

Highest completed level of education	Albanian	Serb	Roma	Ashkali	Egyptian
No completed education	5.8%	6.3%	31.8%	32.9%	24.4%
Primary education	10.0%	11.2%	24.9%	27.4%	27.7%
Lower secondary	39.9%	28.2%	32.5%	31.1%	38.1%
Upper secondary	34.7%	44.5%	9.4%	8.1%	8.7%
High school	2.5%	4.4%	0.7%	0.3%	0.5%
Faculty, bachelor	6.2%	5.1%	0.6%	0.3%	0.6%
Master	0.7%	0.3%	0.0%	0.0%	0.1%
PhD	0.1%	0.1%	0.0%	0.0%	0.

Chart 3: OVERVIEW OF EDUCATIONAL ATTAINMENT BASED ON ETHNICITY

Overview of educational attainment based on ethnicity in Gračanica. Age 15+. Source: Gaia.

Security concerns, lack of financial means, distance to educational facilities, and cost of school supplies such as notebooks, pencils, and clothes are some of the reasons this minority population claims to prevent them from attending school or drop out at an early stage of their education. Roma children generally attend schools with the Serbian curriculum while the Ashkali and Balkan Egyptians attend schools with the Albanian curriculum.

GAIA set up a non-formal education centre called Imaginatorium offering a school

preparatory programme (ages 5 to 7), a language club (ages 7 to 9), and homework assistance (ages 7 to 15) to a group of 20 to 100 students. Within Head in the Cloud, GAIA facilitated a weekend programme aiming at incorporating as many children as possible. The numbers of children have fluctuated significantly depending on season, situation in families etc. The children were absolutely free to join or refuse activities offered by the Centre.



Children of Gračanica. Photo credit: Head in the Clouds.



Children of Gračanica during project work. Photo credit: Head in the Clouds.



Children of Gračanica during project work. Photo credit: Head in the Clouds.

Project timeline



Themes

From the beginning, we were aware that it was not possible to take ready-made educational materials created for children elsewhere and to place them in a local European context. On the contrary, considering the local context and needs are a key prerequisite for success. Therefore, our partners in each of the localities (Slovakia, Kosovo, Romania) conducted an analysis of educational needs in order to identify themes and objectives that will meet the needs of children, communities and educators.

The themes were carefully selected after needs assessment, encompassing various domains like programming, environmental thinking, film making, music, English, basic literacy etc. Next to the educational content - such as vocabulary, IT skills, recycling etc. - the emphasis was equally put on the development of transversal skills, such as collaboration, critical thinking, digital literacy and learner autonomy.

The themes were later transformed into six boxes – physical products full of rich educational material and tools.

Each box was implemented for a time period of 2 months in each of the three implementing partners locations in Kosovo, Romania and Slovakia.

In October 2016 Fundatia Crestina Diakonia Filiala Sfantu Gheorghe, GAIA and Sukromna Zakladna Skola started to use the developed educational material with the children and youth. The last box reached the children in late 2017.

Here is the overview of the six boxes created.



Designing Programming Box. Photo credit: Head in the Clouds.

Videobox

The first educational box worked with the topic of video making. The aim was to train kids and youth how to use mobile devices and computers as well as to understand the functionality of these devices and make use of the internet in order to solve tasks.

Our David has never worked before with such devices, therefore he had to learn it before he could go on with other activities.

Typical activities facilitated learning of how to:

- Handle a mobile device, tablet, smartphone
- Work with QR-codes, online apps

- Search for information on the internet
- Make a video / short film (storybook writing, taking and editing of pictures, interviews...)
- Give and receive feedback

This box was the first because we thought that children can use the skills learnt in Video Box throughout the project duration. The box itself includes the challenge for kids to create a storybook, take pictures and videos, edit them to short videos, do interviews and encouraged the students to improve interpersonal competencies when introducing how to give constructive feedback.



Screenshot from a horror movie produced by the children of Gračanica.

IT 101 Box

In our daily lives digital literacy is becoming the main transversal skill that every person needs to have. For this reason we prepared tasks for the children in which they playfully developed an understanding and skills in the field, e.g. knowledge on how a computer is assembled, first programming skills, how to use different online services and for which purposes. To do so the IT 101 Box includes tasks such as assembling and connecting a Raspberry Pi¹⁰, connecting to WiFi, using Google applications and other online platforms, understanding and making folder systems, writing letters, using the calculator, do's and don'ts of the internet or using Scratch.

Our David has never worked with a computer yet. Therefore, he may have distorted perception of what computers can do and what they cannot do. That's why it was good for him to get a better picture of the real possibilities of computers.

Typical activities facilitated learning of how to:

- Assemble a Raspberry Pi computer
- Use (Open) Office Programs (text processing, emailing)
- Online services (Google, Google Maps, Wikipedia, YouTube)
- Elementary level computer programing skills using Scratch

10 https://www.raspberrypi.org/



English Box

In the initial needs assessment knowledge of English was identified as a transversal competence that could support the children and youth in their future. For this reason the English box includes various activities and materials to develop and improve English language skills, as well as interest, starting at the very basics: spelling, pronunciation and how to make a sentence. For more advanced children other tasks were created, including tasks with the aim to construct family trees, record messages with mobile devices and to discuss "big questions" of general education. Many relatives of our David emigrated abroad. Many of them live in England or other countries. He can very well understand the importance of it and is willing to learn it.

Typical activities facilitated learning of how to:

- Basics of English (vocabulary, building sentences, spelling, pronunciation, tongue twisters, family trees, describing a friend, recording audio messages etc.)
- Communicate with other participating students
- Retrieve information online (e.g. how many people speak English and in which countries?)



 Listen to the tongue twister https://soundcloud.com/user-266082158/kitten-eatingchicken and read it aloud.

It looks like this written:

"I saw a kitten eating chicken in the kitchen."

- Repeat the tongue twister really fast and make a video of it.
- Upload the Video



Ekopolis Box

Based on the fact that environmental education was one of the fields that both educators and youth workers unexceptionally wanted to cover within the project, the Ekopolis box provided children and youth with the opportunity to do so. Ekopolis is a board game developed by the project partner SCIO. It playfully teaches young people about ecology and sustainable cities and towns. At the same time the box introduces kids to many new ecological and urban space concepts as well as related English vocabulary.

Ecology for our David does not mean just recycling. It's also a need to get habits that can save the health of him and his family. David does not yet know that bathing in the polluted lake next to his village can be dangerous. The same applies to David's peer Muhamet and the water reservoir of the coal-fired power station in Gračanica.

Typical activities facilitated learning of:

- Pollution, environment, sustainability, waste reduction, recycling, ecological footprint
- Raise awareness for the impact of human actions and stimulate discussions
- Get to know hometowns (e.g. draw a map etc.)

The Ekopolis Box teaches about environmental issues based on a board game with a whole variety of created follow-up activities, exercises and hand-on tasks covering associated topics. The box includes topics such as understanding the basic concept of "environment", sources of pollution and how to avoid pollution, a short insight into energy generation as well as buildings and areas we can find in our environment, town our city, what are the purposes of these buildings and how do they impact our environment, the ecological footprint, the topic of recycling etc.



Sample Ekopolis Box task involving new vocabulary both in English and Serbian.

Programming Box

Already as part of the IT 101 box children started to develop first programming skills. The programming box allows them to become more confident and to deepen their knowledge and skills. The box is divided into four parts, working with MaKeyMaKeys¹¹, Minecraft¹², Ozobots¹³ and WeDos¹⁴.

David has already become familiar with computers in IT101 Box. Here he can make his first steps on the road to acquire basic understanding of how a computer works.

- 11 <u>https://makeymakey.com/</u>
- 12 <u>https://minecraft.net/en-us/</u>
- 13 <u>https://ozobot.com/</u>
- 14 <u>https://education.lego.com/en-us/training/</u> wedo

Typical tasks included hands-on ICT activities using different tools and software:

- Makey Makey boards
- Scratch
- Ozobot robots
- Lego WeDo
- Minecraft

Students took part in hands-on programming and engineering activities, learn about electric circuits and engaged in handicraft work – e.g students developed banana pianos. By working with the included materials, the programming box aims at triggering and fostering students' creativity, logical and computational thinking skills as well as problem-solving competencies.



Real Life Box

The development and materials of the Real Life Box were based on the feedback from children, youth, parents, local stakeholders, educators and youth workers with regards to the work done until then. The tasks were designed to fit the needs of the children and youth in fields that have been observed as challenges. Activities of this box include Roma culture, history, customs and traditions, personal hygiene, functioning of different relationships, repairing stuff, first aid, going on a trip, how to behave in a restaurant etc. The activities demand and foster creativity, team spirit, sensitivity to others and communication skills.

Real life is full of difficulties for David. This Box helps him to get habits and skills that can make his life easier.

Typical activities facilitated learning about:

- How to repair things
- Going on a trip
- Personal hygiene (bacteria and viruses, doctors, physical activity, vitamins, water drinking, drugs, first aid basics)
- Relationships (different levels of relationship, friendly and unfriendly behavior, bullying)
- Roma culture (history, traditions, role models, language...)



Ethics

During the project we were aware that we are working with children and communities and we come into contact with personal and other sensitive data. Therefore, from the beginning, we have incorporated the possibility of using anonymization into the data collection methodology where children have passed on their information under a picture they have chosen without mentioning a specific name.

We also deemed it important to inform children, parents and the wider community about what we were doing with participating children and youth.

Our partners in the three locations have done a great job of taking great care by circumventing individual families, informing the community, organizing events where local community leaders were gathered, and were provided with true and previously undistorted information about the project and were given a chance to freely support or reject it.

It is also important to mention that the project was carried out on a voluntary basis, i.e. every family and child had the opportunity to refuse participation in project activities.

Furthermore, we followed an internal rule of thumb that the interests of the child and community outweigh the interests of the project and research. E.g. when setting up the evaluation system, it turned out that an academically appropriate way would be to split the group into two, A and B, with one group participating in the project, and the other not. This, however, proved to be ethically unacceptable, as we would harm some children and community. That is why we have consciously given up this method.

In the development of the materials we also learned that translating the boxes also to Albanian and Romanian as originally planned was unnecessary for our target group, as they did not speak those as primary or secondary languages. We therefore decided to use extra time with the children and producing more tasks with them instead of translating.

Implementing partners committed to getting consent forms from the parents, therefore pictures displayed in this publication have been published with their approval.



Meeting with the community in Romania, explaining all aspects of the project to parents. Photo credit: Head in the Clouds.

Documentary

Paraphrasing an old saying, we'd say "It's better to see something once than to read about it a thousand pages."

Therefore we decided to produce a documentary about the project. In order to provide an objective picture, we equipped the communities with cameras and trained them how to record movies documenting all the joyful and the frustrating learning moments children and educators have experienced throughout the project. All those interested in the movie are welcome to see it online <u>here</u>. It lasts 22 minutes.
Training outline

The project "Head in the Clouds" included two international training events with the general objectives of:

- acquainting the implementing teachers and youth workers with the approaches and tools,

- ensuring a close connection between developers (ICT and educational material) with implementing teachers and youth workers,

- giving the chance to plan the transnational connections of our educational boxes,
- giving the chance to teachers and youth workers to exchange experiences and ideas,
- letting teachers and youth workers experience learning with our educational boxes themselves,

- giving teachers and youth workers the chance to try out the methods from the learners and from the educators point of view,

- giving the chance for SCIO and Verein Offenes Lernen to train the teachers in the evaluation methods and in the usage of the hand-it-in application,

- giving the chance for GAIA to train the teachers in the creating of materials for the documentation,

- the second training also gives the opportunity to disseminate the outcomes of "Head in the Clouds" to further interested teachers and youth workers within the partners, and to reflect on and inspire each other how to keep working with the approach and the materials.





Participants during first training in Romania in August 2016. Photo credit: Head in the Clouds.

Participants during first training in Romania in August 2016. Photo credit: Head in the Clouds.



Below you find first the training program for the first training week, which took place a month before the start of the implementation in August 2016 in Romania, and then of the second event in April 2018 in Slovakia, which took place after the implementation with the purpose to train further teachers and youth workers and update those who already implemented the developed materials on the changes, based on the evaluation and feedback of the trial implementation run.

PROGRAM OF THE FIRST TRAINING WEEK

Day 1	Day 2	Day 3	Day 4	Day 5							
Get-to-know;	Structure	Ekopolis box	Programming	Hand-in-App							
Hopes, fears and	and		Box								
contributions;	handouts of										
Group	boxes										
agreement											
Coffee break											
Presentation of	English Box	Ekopolis	Programming	Evaluation							
the program and			Box	methods							
project;											
Teambuilding		Communication	Organising								
Getting to know		(between teachers	transnational								
all the partners		and box-team)	sessions								
within the		during the project									
project;		0 1 /									
Erasmus+											
		Lunch									
Video making	Testing the	IT Box	Video Box	Evaluation							
	box in the			methods							
	afterschool										
	program										
		Coffee break									
SOLE	Evaluation of	IT Box	Public	Answering final							
	the test		presentation	questions,							
				organisational							
				points							
		Documentary		Final							
				evaluation;							
				Certificates							

PROGRAM OF THE SECOND TRAINING WEEK

Day 1	Day 2	Day 3	Day 4	Day 5
Get-to-know;	Evaluation	Trial experience	Public Event	Changes in the boxes 2 - 4
Hopes, fears and	methods and	 trying tasks 	(including	
contributions;	hand-in	with children	hands-on	
Group agreement	application		sessions)	
		Coffee brea	k	
Presentation of	Role of the	Evaluating the	Public Event	Sustainability: Lessons
the program and	teacher/ youth	experience	(including	learned from the project for
project;	worker		hands-on	our educational styles and
Teambuilding;			sessions)	organisational work
Erasmus+				
		Lunch	•	
SOLE and our	Sharing	Sharing	Evaluation	The work continued: how will
adaptations	experiences	experiences	outcomes	we all continue implementing
	from the work in	from the work in		and spreading the project's
	Slovakia	Romania		results and methodologies?
		Coffee brea	k	
Structure, task	Sharing	Free afternoon	Changes in the	Final evaluation; Certificates
sheets and	experiences		boxes 1 – 3	
handouts of boxes	from the work in			
	Kosovo			

If in your organization or institution you are planning a training for the educators working with you who will use the materials of "Head in the Clouds", you will probably have a different program based on your target group, the setting and the possibilities e.g. based on time constraints. We want to give you here some general recommendations:

The content of such a training should consist of 3 different aspects:

Teambuilding, evaluation and similar activities:

For leading the group through the training together you will need to use some NFE games and methods. This means that you let the participants introduce themselves and their experience, share their knowledge and form collaborations. The trainer is simply present to facilitate this process.

The "MINIMAX" educational approach:

In the same way, make sure that roles, approach and background of the approach are explained with the usage of engaging and experiential learning methods, such as theatre, simulation games, research, group work, interactive presentations, arts, silent discussions, visual harvesting, barometer, world café, etc.

A central topic of the methods developed in "Head in the Clouds" is to understand the roles, duties and responsibilities of the educators and learners, and how they interact with each other. To really go into detail we suggest a process in 3 parts/activities:

a. presentation of the key words – <u>from teacher to facilitator</u>: through the formal school system we are in many countries still

used to a teacher role in which the teacher transmits the learning content directly to the students through explanations and examples. He or she has a clear idea of what the learning outcome will be, gives the input and controls how far and in which direction it goes.

In our approach the educator assumes rather the role of a facilitator of learning than a provider of information. He or she has the task of giving initial tasks/ short input if needed and then let the learners engage in their own learning process, only supporting if needed. This means that the educator gives up a part of the control he or she has over the content, the level and direction of learning for the sake of learner autonomy.

E.g. in the big questions of the English box we have some questions for which the learners in their research can reach very different conclusions when answering them. These differences will have to be accepted by the educators, and only through questions can they direct the student, if they see someone really leaving the path, not through giving information. Such questions can be "Are you sure the picture you are looking at is a crocodile?" instead of saying "This is a monkey, not a crocodile."

In other tasks, such as in the IT101 box, a clear outcome needs to be reached, such as the assembling and connection of tools. This can be done only in one way and therefore the learning outcome will be clearly defined, but instead of the educator explaining and showing how to do it, he or she will trust that learners have the ability to figure the steps out themselves, letting them try it. The understanding of how to do it will be higher, as the learners experienced the assembling process themselves and reached the conclusions of how to do it themselves.

Accepting this new role is very essential for our educational boxes to work. One of the educators in the implementation of the project made this statement in the evaluation: "Me and my colleague tried for a day to assemble the Rasbperry Pis and did not manage. We called the technical contact, our contact at the Vienna University of Technology, and even with his support we did not manage. Finally, we asked one of the children to try. He was done after 5 minutes and everything was working." Many times we as educators will also have to accept and enjoy the fact that we can learn a lot from the learners we are working with, and maybe they know something better than us. In such a way teachers can become role-models for life--long learning.

b. creating theatre plays in which the educators can show each other how they understood this through demonstration, which will give the trainers and other educators a chance to give each other feedback and to acquire an even deeper understanding of the roles of educators and learners, reflecting on aspects that are not clear;

c. a barometer discussion with concrete situations or questions that the educators have to take a position on: these depend on the setting in which you will later use the materials and serve the purpose of the educators to further understand their role. Such statements can be: "When a learner is facing a problem, it is my role to solve it for him/ her", "What children learn from their own effort is better, so you just need to give them the tools". The statements will be made aloud and the participants will have to position themselves on a line in the room according to how much they agree (between 100% yes and definitely no). After they have positioned themselves let them exchange on why they chose their location. If an argument convinces them to move they can also change their location and explain why.

The educational materials:

Let the participants of the training – the educators – experience the tasks themselves. First let them do tasks the way children would do them, by trying to fulfill them and entering the answers online.

Then only after all have finished their tasks and feel like they went through all the steps their learners will go through, let them discuss and reflect in smaller groups or the plenary: What did you like? What did you not like? What is not clear? Where did you struggle? Did you manage to overcome the struggle and how?

Before you as a trainer give the solutions to questions, first let the educators try to answer each other's questions. In the whole group they might have all the solutions already and just need to share them with each other.

The following topics should not be missing in the training:

- Learner-centred education approaches
- Structure of tasks and boxes
- Evaluation methods
- Hand-in application
- The role of the educator
- An overview of the boxes
- How does the approach fit the target group

• Which boxes and tasks are most needed and should be implemented Exchange on experiences and expertise the educators can add to the project and where they can learn from each other.

Additionally to this, you need to decide how much time to dedicate on teambuilding and internal structures for working together, evaluating and reporting during the usage of the materials.



Session during first training in Romania in August 2016. Photo credit: Head in the Clouds.

Evaluation approcach, outcomes and recommendations

During the Head in the Clouds project, students engaged in various activities and solved different tasks. The work they did was tracked via QR codes printed on every task. This way, it was possible to evaluate which tasks they engaged in, how they approached them and what "hard skills" they learned. However, the main focus of the evaluation weren't "hard skills", but the so-called learner autonomy, i.e. the ability to learn autonomously and efficiently.

The main research questions of the project were:

- Did learner autonomy improve in the course of the project?
- Is the level of learner autonomy correlated with certain personality traits?
- Is the level of learner autonomy related to the activity undertaken?

The evaluation plan was designed in such a way so as to provide answers to these questions while respecting the limitations and challenges of the locations where the project was taking place.

The main limitations were personal and technical. In an ideal world, we would have a control group, i.e. we would divide children into two groups with similar starting levels of learner autonomy. This way, it would be possible to determine how much the learner autonomy changed thanks to the participation in the project itself and how much it increased due to other factors such as children's natural mental development. Unfortunately, this would mean denying half the children the opportunity to participate in an enriching and unique experience the project offered, so we decided against this approach. On top of that, dividing the children into two non-overlapping groups might not even be practically possible since they all know each other and live near each other.

Another factor that complicated our research was the fact that the sample size was quite small. This was, once again, caused by the nature of the locations. Children who participated in the project often had other obligations (e.g. they needed to take care of younger siblings), therefore they sometimes skipped the project sessions. Some children from the community could not join at all. The project was all conducted on a voluntary basis, so no children could be forced to participate.

In addition, there were many technical limitations (such as slow wi-fi connection and lack of computers), which we also needed to take into account when designing the evaluation manual.

To sum up, the evaluation needed to be a compromise between the desire to stick to rigorous academic methods (good sample size, detailed data, control groups) and practical reality of the locations where the project was taking place.



Sepsikőröspatak. Photo credit: Head in the Clouds.

What is learner autonomy

The opinions on what exactly the learner autonomy is and what it consists of differ – there is no clear, unified definition. In addition, learner autonomy is typically defined in the context of language learning so the literature on this matter is limited.

Therefore, as a first step, we needed to define the concept of learner autonomy that was going to be used in the context of the project as there was no definition in the literature that would suit our needs. Our definition was based on the papers and books listed at the end of this document.

After studying the resources mentioned above, we defined the learner autonomy as a concept consisting of seven domains. These domains were chosen in such a way so as to be easily observable and measurable, because the evaluation was going to be done by external (teacher) observation. This list of domains is essentially a compromise between the need to have a straightforward, easily observable concept and the desire to capture the learner autonomy in its complexity. The seven domains are as follows:

- 1. the ability to set meaningful and achievable goals
- 2. the ability to find ways to reach a goal
- 3. the ability to identify a source of failure
- 4. the ability to learn from one's mistakes
- 5. the ability to see mistakes as an opportunity for improvement
- 6. the ability to work independently towards reaching a goal
- 7. the ability to evaluate if a goal has been reached

These domains are described in more detail in the following section.

Evaluation approach

The evaluation consisted of:

(1) Quantitative data (task accomplishment and 3 questionnaires on learner autonomy, personality and accomplishment administered on a regular basis, each of which is described below).

(2) Qualitative data (live observations, interviews with children and educators, and written reports from educators). In addition, demographic data (age, gender...) was collected during the initial needs assessment stage prior to the beginning of the evaluation.

Children must be given the opportunity to have their data collected anonymously. In our project, we used personalized stickers. Each child chose a sticker with a symbol (flower, bird etc.) that was then used to identify which child took a particular video, photo or did a certain task etc. Children simply included the sticker in the photo, video etc. or picked it on the website of the hand-it-in app.

The following explanations give you an overview of what we aimed to do, what we did and what we recommend you to do.

Questionnaires

LEARNER AUTONOMY QUESTIONNAIRE

The goal of this questionnaire was to track students' progress in their level of learner autonomy.

WHEN

The original plan was to administer this questionnaire four times throughout the project. However, it has been shown that the level of learner autonomy varies greatly depending on the activity undertaken. Therefore, we would recommend teachers to administer the questionnaire after each box and to evaluate the level of learner autonomy with respect to the activities in that particular box.

In the case of our project, each location approached the evaluation in a slightly different way. The reason was not only the nature of the locations, but also the fact that the instructions regarding the evaluation were presented more as a recommendation than as an order. Our aim was to support the evaluation, not to enforce it, so the locations were given the freedom to deviate from our recommendations if they believed they had a reason to do so.

In Slovakia, teachers filled in six autonomy questionnaires, one after each box. In Romania, they filled in the questionnaire five times throughout the project and the evaluation wasn't necessarily linked to any particular box. In Kosovo, it was soon clear that quantitative evaluation is not the best approach due to the nature of the location so qualitative evaluation was used instead.

HOW

The learner autonomy, as we defined it, consists of seven domains. Teachers should evaluate children by filling in the corresponding Autonomy questionnaire. Their evaluation should be based on the observed behaviour of the children while they were working with the respective box. The Autonomy questionnaire is an Excel file which contains 7 sheets, one for each domain. On each sheet, there is a description of the domain and a 4-point scale. Teachers should carefully read the description of the domain and type "x" into the field (cell) on the scale that, in their opinion, best describes each student's behaviour when they were working with the respective box.



Sample autonomy table

For each domain, there is detailed description of what to focus on during observations. There are always two sides, left and right. Teachers need to decide if the child's behaviour can be better described by the left description (and then put an "x" to the Almost always or Usually cell on the left side), or by the right description (and then put an "x" to the Almost always or Usually cell on the right side). These sides are as follows:

1. The ability to set meaningful and achievable goals

Ask the child about their short-term (for that particular day) and long-term goals.

• Left side: The child sets no or only unreasonable goals. They cannot come up

with goals they want to reach or activities they want to do on that day themselves. If they do come up with a goal, it tends to be unattainable / unrealistic.

• **Right side:** The child sets reasonable goals. They can come up with goals they want to reach or activities they want to do on that day themselves. They can evaluate whether a goal is attainable and realistic.

2. The ability to find ways to reach a goal

After a goal has been chosen or a task has been set, ask the child how they are going to complete it.

- Left side: The child needs to be told how to reach a goal. The child does not come up with ideas on how to complete the task. They need to be told what to do. They cannot make links between tasks, activities and goals. They jump from one thing to another. They repeatedly and considerably overestimate or underestimate their abilities.
- **Right side:** The child is able to determine how to reach a goal. The child comes up with one or more ideas on how to reach the goal or complete the task. The child can evaluate several strategies and pick the most appropriate. They have a good sense of how a task, activity or goals are related to one another. They make realistic estimates of work, time and effort needed. They have a good sense of causality patterns ("ifthen").

3. The ability to identify a source of failure

When the child makes a mistake, ask him/her why it happened.

• Left side: The child doesn't know what went wrong. They cannot distinguish between "correct" and "wrong". They tend to blame themselves for mistakes ("Because I am stupid.") or others ("You are wrong, I did it right. You don't like me. You are giving me a task that is too difficult.").

• **Right side:** The child understands what went wrong. They can easily distinguish between "correct" and "wrong". They can explain what went wrong (e.g. "I didn't know how exactly I should do this part of the task."). They have a good sense of estimating their own abilities and external factors.

4. The ability to learn from one's mistakes

Observe whether the child tends to make the same mistakes over and over again.

- Left side: The child repeats the same mistakes. They keep making the same mistakes. They only seem to focus on mistakes when they have appeared or have been pointed out.
- **Right side:** The child learns from past mistakes. They try to avoid past mistakes. They try to anticipate possible future mistakes. They come up with ideas on how to avoid / remedy possible problems.

5. The ability to see mistakes as an opportunity for improvement

Observe the reaction of the child when they make a mistake.

• Left side: The child is frustrated by mistakes. They look sad, disappointed and frustrated. They become quickly

disappointed and frustrated when informed about an error. Their frustration hinders them from further work / progress. The child tends to stop doing whatever they are doing. Teacher's intervention is needed to persuade the child to start working again. Sometimes a change in activity is necessary to calm the child down.

• **Right side:** The child keeps thinking about how to improve. They seem determined to do better next time. They seem to be thinking about how to improve. The child says things like "I messed it up so next time I am going to do it better." The child wants to keep working. When informed about a mistake, they do not become frustrated.

6. The ability to work independently towards reaching a goal

Observe the child when trying to complete a task / reach a goal.

- Left side: The child needs to be pushed. They need a push to get started. When left alone, they fool around or become disruptive. They are easily distracted. Their attention span is below average for the given age.
- **Right side:** The child works independently towards reaching a goal. They do not need a push to get started. When left alone, they work smoothly on their own. They can handle distractions. Their attention span is appropriate / above average for the given age.

7. the ability to evaluate if a goal has been reached

Monitor if the child has accomplished the task which they set before.

• Left side: The child cannot determine if a goal has been reached. They cannot assess themselves if a task has been completed or

not. The child does not admit they did not complete a task. If reminded that the task is not complete, they don't know what it takes to complete it. They tend to present results very fast, believing they are correct, without having the slightest idea they are wrong.

• **Right side:** The child can determine if a goal has been reached. They can assess whether a task is completed or not. They can explain why. If explained, they can admit they did not complete a task. If a task is not completed, they come up with ideas how to complete it.

Students can get 0 to 3 points for each of the seven domains, which means their total autonomy score is on a scale from 0 to 21.

Accomplishment questionnaire

The goal of this questionnaire was to track students' opinion on the boxes and their content.

WHEN

This questionnaire should be filled in after each box.

HOW

For each student, fill in his or her attitude towards the boxes regarding how difficult it was for them, how much they learned and how much they liked the box. Fill in the questionnaire based on your observations of the students while they were working with the boxes.

THE TASK WAS DIFFICULT					THE TASK WAS EASY
	8		NAME/NICKNAME	\odot	 1
		x	SAMPLE_NAME		
				18	
				<u>.</u>	
				<u>.</u>	
				2.	
				9	
				<u> </u>	

Sample accomplishment questionnaire

Fill in this questionnaire using an Excel table with three sheets:

Personality questionnaire

The aim of the personality questionnaire was to determine whether the level of learner autonomy is related to a child's personality.

WHEN

This questionnaire should be filled in during or after each box. Originally, we planned to only have one personality questionnaire as we assumed personality traits were rather stable. However, teachers pointed out that children can act very differently depending on the task undertaken: with some tasks, they may prefer working in a group, while with other tasks, they may prefer individual work. That is why we decided to administer one personality questionnaire with each box.

HOW

The Excel questionnaire consists of 4 sheets. On each sheet, there is a list of students' nicknames, a pair of personality traits (systematic vs. spontaneous, prefers working alone vs. prefers working in a group, likes to win vs. likes to play, likes to think vs. likes to act) and a 5-point scale. For each student, the teacher should type "x" into the cell which best reflects the behaviour of the student when working with the box directly preceding the evaluation.

For example, if the teacher believes a student is very systematic, they should type "x" into the cell on the left. If they believe he/she is a bit more spontaneous than systematic, they should type "x" into the second cell from the right. Note that the two adjectives describing personality traits are always related but none of them is superior to the other.

These "x" are consequently transformed to a number on a scale from 0 to 4. The closer the score is to 0, the better the student is described by the left adjective, and the closer the score is to 4, the better they are described by the right adjective. It needs to be stressed out once

NICKNAME		PI	ERSONALIT	Y QUESTIO	NNAIRE 1		
SAMPLE NAME		х					
SAMPLE NAME 2					x		
							s
	atic						eou
	em						tan
	Syst						nod
	•						S
						1 1	

Personality questionnaire table

more, however, that a higher "score" in this case does not mean a better score. It is simply a number describing how well the student can be described by the right adjective.

Time plan

The following table contains a summary of the recommended evaluation process.



Learning analytics

The aim was to find out what activities the children performed and how these were related to competencies. It was important for us – accordingly to John Hattie – to make the learning of the children visible.¹⁵

In order to do so, we had to find a way to track the children's activities. As the project proposal suffered budget cuts that concerned mainly the IT equipment, we had to refrain from the original idea that most of the activities would happen online and we had to find a way to track tasks that were performed offline.

We came up with the decision to deliver the learning material as well as the assignments in the form of "tasksheets" and print a QR-code on each sheet.

Hand-it-in-App

The Hand-it-in-App is an online application that allowed children to "hand in" their work by scanning the QR code of the related task sheet.

When following the QR code on a specific task sheet, kids reached a page that contained the digital version of the task. In the user interface, the children could identify themselves by choosing their personal icon (sticker). Then they could provide results (answer questions, upload pictures, provide links to videos), write feedback and tick a smiley to indicate how much they liked the task.



15 <u>https://visible-learning.org/</u>

QR-code on each tasksheet

The website

Competency framework

We decided to use an existing competences framework instead of inventing a new one. As the boxes covered quite a large variety of topics and transversal skills, we chose the "21st century skills" framework of the University of Melbourne¹⁶, which is very general and holistic. We liked its approach to not only include knowledge but also skills and attitudes. Our boxes covered about two thirds of its categories, and we added six more to cover all our boxes.

The 15 most often used competencies were:

	Top 15 competencies - most often included in the boxes
1.	Follow instructions (e.g. tutorial video or instruction manual)
2.	Develop, implement and communicate new ideas to others effectively
3.	Infer, query evidence, conjecture alternatives and draw conclusions
4.	Use technology as a tool to research, organize, evaluate and communicate in- formation
5.	Improve handicraft skills
6.	Analyze how parts of a whole interact with each other to produce overall out- comes in complex systems. Examine ideas, identify and analyse arguments
7.	Ability to concentrate for extended as well as short periods of time
8.	Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
9.	Be open to non-familiar, unconventional and innovative solutions to problems and ways to solve problems
10.	Confidence when speaking in public
11.	Prioritize, plan and manage work to achieve the intended group result
12.	Logical thinking (programming) – formulate algorithms in various forms
13.	Monitor, define, prioritize and complete tasks without direct oversight
14.	Know when it is appropriate to listen and when to speak
15.	Work effectively in diverse teams

However, as not all the tasks were actually performed (the locations were free to select which tasks they wanted to offer), the list of actually addressed competencies was smaller. The top 15 of this list are shown in the following table. Qualitative feedback of teachers confirmed an overall increase of these competencies in their groups.

The 15 most addressed competencies in locations:

	Top 15 competencies – most often addressed in the locations
1.	Ability to read and understand different texts, adopting strategies appropriate to various reading purposes (reading for information, for study or for pleasure) and to various text types
2.	Sound knowledge of basic vocabulary, functional grammar and style, functions of language
3.	Ability to concentrate for extended as well as short periods of time
4.	Know a wide range of idea creation techniques (such as brainstorming)
5.	Know when it is appropriate to listen and when to speak
6.	Speak with clarity and awareness of audience and purpose. Listen with care, patience and honesty
7.	Act responsibly with the interests of the larger community in mind
8.	Follow instruction (e.g. tutorial video or instruction manual)
9.	Analyze how parts of a whole interact with each other to produce overall out- comes in complex systems. Examine ideas, identify and analyse arguments
10.	Be open to non-familiar, unconventional and innovative solutions to problems and ways to solve problems
11.	Improve handicraft skills
12.	Ask significant questions that clarify various points of view and lead to better solutions
13.	Be open to new and worthwhile ideas (both incremental and radical concepts)
14.	Create new and worthwhile ideas (both incremental and radical concepts)
15.	Develop, implement and communicate new ideas to others effectively

Evaluations

As we knew for each task which competencies it addressed, we could easily produce charts that showed an overview of student's addressed competencies, like the one in the following table.

CloudLearning_Ecop_ko Be open to new and worthwhile ideas (both incremental and radical concepts) Know a wide range of idea creation techniques (such as brainstorming) 1.1_{K} Create new and worthwhile takes (hold incremental and radical concepts). View failure as an opportunity to learn - understand that creativity and innovation is a long-term, sydical process 1.1.5 1.3 A 2.1 A 2.4 A Consider and evaluate major alternative points of view. Be open to non-familiar, unconventional and innovative solutions to problems and to ways to solve problems 2.4 K Ask significant questions that clarify various points of view and lead to better solutions 2.5_A 2.8_5 Ask meaningful questions that clarity various points of view and lead to better solutions. Explain: Staling results, justifying procedures and presenting arguments. Ability to concentrate for extended as well as short periods of time. 3.2 S Ability to communicate as part of the learning process by using appropriate means (intonation, gesture, mimicry, i 3.4.5 4.3.5 Ability to read and understand different texts, adopting strategies appropriate to various reading purposes (reading Sound knowledge of basic vacabulary, functional grammar and style, functions of language. 5.1 K Know when it is appropriate to listen and when to speak Work effectively in diverse team 5.1 S Speak with clarity and awareness of audience and purpose. Listen with care, patience and honesty 5.6_A 6.1_A Act responsibly with the interests of the larger community in mind. Progeneity to use information to work autonomously and in teams - critical and reflective altitude in the a Use technology as a tool to research, organize, evaluate and communicate information. Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social 6.7 8 6.8 8 Monitor, define, prioritize and complete tasks without direct oversight 9.7.5

The other evaluation shows which tasks were already done by which students:

CloudLearning_Ecop_ko																
Bitchiel	Student1	Student2	Student3	Studen14	Student5	Studentő	Student7	Student8	Student9	Student10	Student11	Student12	Student13	Student14	Student15	Student16
BOX: 5_Ecopolis - TASK: 5c1-5.4 - Advantages & Disadvantages																
BOX: 5_Ecopolis - TASK: Sci.1 - Brainstorming - On my way to school	*		4			4	4	4		4					*	4
BOX: 5_Ecopolis - TASK: Sc1.2 - Brainstorming - On my way to school			4	4			4								*	4
BOX: S_Ecopolis - TASK: Sc1.3 - Brainstorming - On my way to school			1													
BOX: 5 Ecopolis - TASK: Sc2.1 - Map - My way to school	1	4	4								4	1	1		*	
BOX: 5 Ecopolis - TASK: 5c3-2.2 - People Work - Worksheet																
BOX: 5_Ecopolis - TASK: 5c3 4.2 - The super Jobs - Worsheet																
BOX: 5 Ecopolis - TASK: 5c3-6.1 - Work - Worksheet																
BOX: 5_Ecopolis - TASK: 5c3-7.2 - What Will I Be When I Grow Up - Wor																
BOX: 5_Ecopolis - TASK: 5c3-8.2 - Kitty's-Dream-Job - Worksheet																
BOX: 5_Ecopolis - TASK: 5c3-9.1 - My Dream job																
BOX: 5 Feopolis - TASK: 5:3.1 - Green, Blue and Bed Buildings in my hor		1												1	1	

Competency evaluation for EKOPOLIS Box

Performed tasks in EKOPOLIS Box

This helped the teachers to keep an overview of what was done and showed students how much they have already done and how much they still could do. (Sometimes these sheets were put on the wall.)

Limitations

Although this system of tracking activities and evaluating competencies theoretically worked quite well, it showed some major weaknesses:

- Incompleteness of data: All three locations often had to deal with unstable or unavailable internet. If the hand-it-inapp was not available, then the teachers would have to manually take notes and enter the data later, as soon as the internet was available again. In this process, data was often lost.
- Too little added value: In the end, the evaluations did not produce enough added value to justify the additional effort of the hand-it-in-app (for teachers as well as for students) especially under weak internet conditions (see above). We had several ideas how to improve the visualization of the learning progress in order to improve student's motivation but did not have time to put it into practice.

Due to these limitations it was not possible to meaningfully link the data with the rest of the evaluation. However it strengthened the interpretation of the other outcomes.

Interviews

One of the most efficient methods to receive feedback from the locations was to conduct interviews with the educators and teachers. These were already planned in the original project plan and proved to be beneficial even more during the implementation. The reasons were as follows:

- As mentioned before, we couldn't collect all the quantitative information we had intended to collect, so the interviews were the most efficient way to fill in lacking information.
- They provided vital background information (regarding children, locations, communities cultural and social aspects) for the evaluation as well as for further development of the boxes.
- They provided information that is not directly visible in the data and which otherwise might get lost or misinterpreted.
- Interviews with children further provided undistorted information on how children perceived the boxes personally and to which degree the boxes were beneficial to them.
- They provided a second point of view the viewpoint of the children.

In retrospective the qualitative inputs helped to overcome the drawbacks of the small sample size of the quantitative data and helped with the interpretation.

Evaluation results

In this section, we present the evaluation results for each of the three locations.

It is important to point out that each location was very different, which meant that the evaluation approach needed to be different as well. Let us provide a main summary of the character of the locations.

In Slovakia, the project took place in a school, so the environment was quite structured and systematic, and the group of the kids was very stable. Teachers involved in the project worked with the same kids during standard school lessons, so the kids were used to asking the teachers for help, explanation etc. In other words, most of the day, the interaction between the kids and the teachers was in the form of frontal teaching - not at all like our pedagogical approach, which was inspired by the SOLE method. Therefore it was harder for teachers and kids to switch to our approach. The kids who took part in the project were around the same age (14 years old). Unlike in the other two locations, the kids do not feel like they "belong to a community". Their home environment is characterized by a lack of rules and mutually understood norms. When asked what they are going to do when they grow up, they typically say they are not going to work - for this reason, they feel little motivation to learn new skills because they don't think they are going to need them anyway.

In Romania, the project took place in an afterschool day centre. The kids were of different ages, but in general they were younger compared to Slovakia (8-13 years old). The environment was much more informal and less school-like. Normally, the kids would come, have a hot meal, do their homework and then engage in the project. Similarly to Slovakia, the group of kids in Romania was quite stable. One marked difference compared to Slovakia was that the kids all came from one community (the Koros Parak village) where the families know each other and where certain mutually accepted rules are still kept, so the children know where they belong and what is expected of them.

In Kosovo, the environment was the least structured out of the three locations. The project took place in Imaginatorium, a centre for children which provides a range of different activities. Normally, children would come and go as they wanted, on a voluntary basis, so the group of kids involved in the project was very unstable. The Kosovo location is also marked by a strict adherence to unwritten rules and social norms (for example, girls are treated differently from boys, one child in the family is usually "the favourite one", the oldest child is required to take care of younger siblings, girls are "sold" to be married for a certain amount of money etc.).

In all of the locations, children lack basic facilities (electricity, clean running water, let alone internet connection).

Slovakia

Slovakia provided us with the biggest amount of data. By deviating from the original plan (instead of filling in autonomy questionnaires four times throughout the project, they filled in six questionnaires, one after each box), they offered invaluable insights into how much the learner autonomy actually correlates with the task itself.

There are 18 children for whom we have consistent data throughout the project (7 girls and 11 boys). Then there is one more boy and one more girl for whom there are some missing data.

Learner autonomy by gender

Let us first discuss the development of learner autonomy of the Slovakian children. The first figure shows the average level of learner autonomy for boys and girls for each of the boxes. It can be seen that contrary to original expectations, the learner autonomy did not grow steadily – it fluctuated, depending on which box the students were working with. We were happy to see that a girl called Lívia showed interest the IT Box. Before, she did not like activities that required active thinking and logic. She didn't usually participate in such activities.

Jozef and Alexander were usually very indifferent and complaining about everything you wanted from them. They became very attentive to Lego while working with the programming box. They wanted to work alone and to have the opportunity to sit for an hour and a half to focus only on modelling. Alex even started programming the lego (before, he would always refuse to program) and he was good at it. In the end, he even programmed brick models for other children.

> When working with the video box, girls were making great effort to take beautiful photos. It was nice to watch how they were giving instructions to each other to have a perfect pose (with a nice background, from the right angle..) and how satisfied they were with the final result when the photo was improved with various effects, text...



Fig. 1: Average learner autonomy score by gender (Slovakia)

Individual learner autonomy development

The second graph shows individual scores in learner autonomy for each of the children for whom we had complete data. In this graph we can see as well that the learner autonomy does not grow steadily – it fluctuates.

When we compare the learner autonomy at the beginning and at the end of the project, there is an average improvement of 2.3 points. Unfortunately, since we didn't have a control group, we don't know how far this improvement was caused by our approach and how far it is a result of other factors, such as:

• the nature of the very first and the very last box, to which these autonomy scores are related;

- the fact that the children participated in various interesting activities and tried out new things;
- natural mental development.

However, it is important to mention that the average improvement in learner autonomy between the first and the last box among the children with low starting levels of learner autonomy (less than 10 points, which applied to 8 children) was 6.25. This increase is quite large, and it leads us to believe that our approach has indeed helped children with poor starting learner autonomy, but we do not have enough evidence to conclusively confirm or reject this hypothesis.



Fig.2: Individual learner autonomy scores (Slovakia)

Learner autonomy by domain

The next table shows the average score (across genders) in each of the learner autonomy domains, which are as follows.

- 1. the ability to set meaningful and achievable goals
- 2. the ability to find ways to reach a goal
- 3. the ability to identify a source of failure
- 4. the ability to learn from one's mistakes
- 5. the ability to see mistakes as an opportunity for improvement
- 6. the ability to work independently towards reaching a goal
- 7. the ability to evaluate if a goal has been reached

The highest possible score in each domain is 3. We can see that the scores across domains are roughly comparable. The lowest score was obtained in the ability to work independently towards reaching a goal, suggesting this may be an area to focus on. By "independently", we mean "without teachers", not "without other children". We made sure that teachers understood what is meant by "independently" and that they supported cooperation and group activities.

Poy				Domain			
DUX	1	2	3	4	5	6	7
video	1.60	1.60	1.89	1.75	1.75	1.50	1.60
English	1.60	1.55	2.15	1.80	1.75	1.60	1.80
Ekopolis	1.95	2.10	2.15	2.35	2.05	1.85	1.80
IT	1.80	1.30	1.90	1.85	1.95	1.75	1.70
Programming	1.95	2.10	2.40	2.40	2.10	2.15	2.15
Real Life	1.95	2.10	2.00	1.75	2.00	1.60	1.95
mean	1.81	1.79	2.08	1.98	1.93	1.74	1.83

Fig.3: Average learner autonomy score by domain (Slovakia)

Learner autonomy by personality traits

The table below shows the correlation matrix between different personality traits and learner autonomy. The personality traits were as follows:

- preference of individual work vs. preference of group work (the higher the score, the stronger the preference towards group work);
- systematic vs. spontaneous approach (the higher the score, the stronger the preference towards spontaneity);

- the desire to "just play" vs. the desire to win (the higher the score, the stronger the inclination towards the desire to win);
- preference of acting (i.e. "doing something") vs. preference of thinking (the higher the score, the stronger the inclination towards thinking).

The correlations of these traits with the total learner autonomy score can be found in the first column of the following figure. All the available input data (for each child, each box) were used to calculate these correlations.

In Slovakia, there is quite a strong correlation between the level of learner autonomy and spontaneity (the *less* spontaneous the child, the *higher* their level of learner autonomy) and between the level of learner autonomy and the inclination to thinking (the higher the inclination to thinking, the higher the level of learner autonomy).

However, let us mention again that these conclusions are based on quite a small sample size.

	Learner autonomy	Preference of group-work	Spontaneity	Inclination to "winning"	Inclination to "thinking"
Learner autonomy	1				
Preference of group-work	-0.14	1			
Spontaneity	-0.58	0.27	1		
Inclination to "winning"	0.07	-0.49	-0.10	1	
Inclination to "thinking"	0.64	-0.11	-0.69	0.01	1

Fig.4: Correlation of learner autonomy and personality traits (Slovakia)

Learner autonomy and box content

The graphs below show how the level of learner autonomy is related to how the children perceived the boxes, as given by the results of the Accomplishment questionnaire, namely:

- how easy the box was (the easier, the closer the score to 3);
- how much they learned (the more they learned, the closer the score to 3);
- how much they liked the box (the more they liked it, the closer the score to 3).

Everything was based on teacher observation and evaluation.

In the first graph, we can see that the box children liked the most was Ekopolis, followed by the Programming box. They also learned most using these particular boxes (as stated by teachers – children's knowledge was not tested in any way). We can clearly see that how the children perceived the boxes is related to the level of learner autonomy they displayed. The correlations are as follows:

- the correlation of learner autonomy and how easy the box was -0.69 (i.e. if the tasks in the box were more difficult, the children displayed a higher level of learner autonomy);
- the correlation of learner autonomy and how much the children learned using the box was 0.59 (i.e. if the children learned more when using the box, they also displayed a higher level of learner autonomy);
- the correlation of learner autonomy and how much the children liked the box was 0.78 (i.e. if they liked the box more, they also displayed a higher level of learner autonomy).



Fig.5: Results of the accomplishment questionnaire (Slovakia)



Fig.6: Learner autonomy score (average values across genders) (Slovakia)

The graphs clearly show that the variations among the boxes are substantial when it comes to the learner autonomy and the enjoyment of the boxes. Unfortunately, the graphs only tell us that it happened, but they do not tell us why. Therefore, a qualitative analysis in the form of an interview with the teachers was needed to clarify these variations (see below).

NOTES FROM INTERVIEWS WITH THE TEACHERS

- Teachers said that the drop of learner autonomy seen with the IT Box was mainly due to the nature of the box. They had many technical problems with RaspberryPi, which didn't work as it should have, was very slow and often got stuck, so it was quite frustrating for the kids. Then the kids moved to Scratch and to tasks such as "look up what the EU is", but they were simply not interested in these activities. They did like MaKey MaKey though.
- Some children were able to stick with a task even through obstacles. However, most kids couldn't do this and gave up very soon. Children were constantly encouraged to work on their own, to have patience etc., not only during the project, but during school lessons as well. But when the task didn't make sense to them or wasn't interesting enough, they simply wouldn't do it. Let us remind that most of the children think they are never going to work, so lots of things they are asked to learn simply doesn't make sense to them. However, if they like something, they are indeed able to learn on their own, for example some children learned to play musical instruments on their own and are very good musicians.
- It is important to bear in mind that children's performance and focus may be affected by various issues such as problems at home or the fact that they are hungry. Children need to feel safe and have a good self-esteem in order to learn efficiently which is not always the case. Basic needs (food, safety...) and poor self-esteem are definitely issues to be addressed.

• Fortunately, the project did help to raise some children's self-esteem. For example, there was a boy who never worked much. However, one day another boy, who typically did most of the work, was missing, so the boy in question tried a programming task and to his surprise, he found out the he could do it. From then on, his self-esteem and willingness to engage in activities increased considerably.

Kosovo

In Kosovo, the collection of quantitative data turned out to be quite a challenge, mostly due to the nature of the location: the group of children kept changing throughout the project and so did the staff (mostly volunteers) and the environment was much less structured.

Therefore, in Kosovo, fewer questionnaires and more interviews, focus groups and field visits would have been beneficial, which is more or less the case of all the three locations. Based on this experience, we recommend always discussing the evaluation approach with the teachers beforehand. If the teachers feel the proposed evaluation plan is not feasible or appropriate, then it should be modified to better reflect the nature of the location.

As a result, in the case of Kosovo, we omitted the quantitative analysis entirely due to having too little data to work with. Instead, we opted for qualitative summary of the project and its benefits. This summary was provided by local teachers.

What did the children learn using the boxes?

Most of the participants of Imaginatorium [note: the place where the project took place] have never had a Smartphone in their hands. Most of them had never used a ruler to draw a straight line or had never been outside of mahalla [note: local neighbourhood] except to visit family members in other mahallas of nearby villages. Most of them had not been offered any logical or fine motor skills development exercises while growing up, and most of the time is spent in the streets under the watchful eye of a family member or a neighbour. Since the beginning of the Head in the Clouds project, we have constantly had 20 to 30 younger members of the community either engaged in the project or as observers. During the implementation of all the boxes, many children and youth had the opportunity to try or see something for the first time (for example, some of them saw the map of the world or the mobile phone for the very first time in their life), to engage in processes and tasks they couldn't do anywhere else before, while also addressing values and ways to do so in a peaceful, cooperative, sharing and supportive environment. Although we don't have quantitative data to support our hypothesis, we assume that their skills did improve.

We cannot say they succeeded to follow them through with ease or to include girls in all the activities, but we can say with certainty that in general, the whole group, even the ones not involved in the tasks directly, benefited from the program greatly. The dynamics of the group changed, impulsive behaviour decreased and the children were more engaged in the tasks at hand.

They benefited the most in the ability to handle tablets and smartphones. Not just at the Imaginatorium centre, but in the whole mahalla. Phones started to be given out to the kids by the parents, if not personal, then they would share, like the most. Directing them and teaching them some useful daily life things that can be solved or be done using the phone was highly influential. At the end of the implementation, the used SOLE-inspired approach worked perfectly to get the participants interested in the tasks, but not always to keep them learning. For that we needed to provide additional help.

Did the kids do the tasks completely on their own, or did the grown-ups help them? To what extent? In what way?

Only a couple of Imaginatorium participants would be able to perform some of the tasks on their own, for the limitations are many. A lack of general knowledge about the world and Kosovo systems, lack in basic (worldly accepted) children experiences, poor reading and writing skills (for more than half nonexistent), financial, social and religious limitations leave them at the level where following the task seems like an impossible thing.

We as educators or volunteers who visited, needed to assist, translate, read, lead by example, motivate and even push them a bit into some tasks or activities they rejected without even trying. We introduced some of the simple tasks and let the kids do what they felt should be done (like drawing maps in Ecopolis, but the maps were not maps at the end, or did not resemble Gracanica at all). On some occasions we had parents visit and engage in the tasks, especially older men with Makey Makey tasks of which they approve, because they were connected to future job prospects.

Were there any kids who were not able to do the tasks on their own or who disliked our approach?

As mentioned before, many could not do the tasks, and the ones that disliked them did so for a few basic reasons. Either it was too difficult for them, meaning they could not read the task, understand it or envision what they needed to do, or it was not interesting, reminding them of games for children which, even though slightly interested, they still won't engage in because they don't want to be seen as ,a kid' by the peers around them.

Also, free time activities in the mahalla are usually self-initiated versions of cheap and non-productive fun activities in the streets, and with Imaginatorium opening this changed greatly. The Imaginatorium centre, which works every day, and offers various programs to these youth and kids, changed their perspective of how to use their free time. And most of the time, participants have the right to choose what they want to do or leave if they want to. This leads them to do other things and activities Imaginatorium and mahalla offer and these may sometimes be more interesting than what the Head in the Cloud project offers.

However, the Head in the Clouds project, together with other activities and classes during the week, motivated many kids to engage in some type of learning or skill practicing. During a session, one group took speakers to fix, later they engaged in fixing bicycles, movies and movie making.

On the other hand, there have been many children who felt that our reserved educational approach was not the right one. They demanded to be assisted, demanded us to draw, read or write instead of them. Most lost patience and interest after reaching the first ,barrier' of the task and many decided to quit the moment they saw the amount of text on the task sheet.

Did the activities affect children's performance at regular school or their opinions on school?

We cannot say this with certainty, because cooperation between NGOs and schools is

difficult to achieve, but we had parents coming to report better marks at school (English). As for younger kids (preschool and school beginners), who mostly stood by, watched, were occasionally engaged or were doing something else in the background, we noticed a more responsible attitude towards school and the Imaginatorium centre develop over time. Most of them know more about language and maths than their siblings did at their age (and some of them even now).

Could our approach, in your opinion, completely replace "normal" school education?

Taking in consideration the current education system, we doubt there will be enough pressure and efforts to incorporate this method, but we believe that, amongst other good practices, it should be introduced as an option. As an organisation, we believe in strong impacts of diverse and numerous approaches and methods. Therefore, we see our approach as one of the models, for some children the best one, and for others not so effective.

Romania

In Romania, we have data for about 31 children (16 boys and 15 girls). We received the learner autonomy questionnaire five times throughout the project and, unlike in Slovakia, it wasn't always necessarily clearly linked to one of the boxes. We also received four accomplishment questionnaires and six personality questionnaires.

Compared to Slovakia, it is therefore more difficult to link these questionnaires together and come up with clear conclusions.

(on a scale from 0 to 21) at different times of the project, namely average scores for boys and for girls. Just like in Slovakia, we can see that there is no steady increase. The level of learner autonomy seems to fluctuate. We can assume that similarly to Slovakia, the extent to which the children were able to learn autonomously was affected by the particular task or tasks during which the observations took place. Nevertheless, an interesting fact is that girls consistently showed a higher level of learner autonomy compared to boys.

Learner autonomy by gender

The graph below shows total autonomy points



Fig.7: Average learner autonomy score by gender (Romania)

The project had an impact on children's performance at regular school. Before, children did not get any homework for several years, and since the project started, teachers from regular school have been giving them homework like to the other children. So the children learnt a lot even if they might not have noticed that change.

Individual learner autonomy development

The graph below shows the development of learner autonomy for each of the Romanian children. The development is similar to Slovakia: rather than growing steadily, the learner autonomy fluctuates.

The average increase between the first and the last observation was 1 point, which may be attributed to either a "true" increase in the ability to learn, or to the nature of the tasks undertaken during the measurement.

For the children with low starting levels of learner autonomy (below 10 points, which

applies to seven children), the average increase was 3.5 points.

In other words, those who worked quite well already at the beginning of the project did not seem to improve so much in terms of learner autonomy, but those who were at risk of being left behind did in many cases improve quite considerably and were able to catch up with the rest of the group. We may therefore assume the project might lead to greater equity and equality.



Fig.8: Individual learner autonomy scores (Romania)
From May to September boys have to work in the field, and girls have to take care of their sisters. The drop in Autumn 2017 can be explained by the fact that many boys left in May. As for the outlier – the boy with a big drop in autumn 2017... In the beginning of the project, he started to perform very well. In one year he considerably changed his behavior. And he started to be given homework, which is a good sign. But he is a cow shepherd, so every May he goes to work on a farm, in Kalnok, the nearest village from Korospatak, and he only comes back in Septemberoctober. So he wasn't really present for most of the time preceding the evaluation in autumn 2017.

Learner autonomy by domain

The table below shows the average score (across genders) in each of the learner autonomy domains, which are as follows.

- 1. the ability to set meaningful and achievable goals
- 2. the ability to find ways to reach a goal
- 3. the ability to identify a source of failure
- 4. the ability to learn from one's mistakes
- 5. the ability to see mistakes as an opportunity for improvement
- 6. the ability to work independently towards reaching a goal
- 7. the ability to evaluate if a goal has been reached

The highest possible score in each domain is 3. We can see that the scores across domains are roughly comparable. Interestingly, just like in the case of Slovakia, the lowest average score was obtained in the sixth domain – the ability to work independently towards reaching a goal.

Вох				Domain			
	1	2	3	4	5	6	7
winter 2016	1,94	2,16	1,77	1,74	1,61	1,42	1,55
summer 2017	1,84	2,23	1,84	1,81	1,48	1,48	1,48
autumn 2017	1,84	1,61	1,39	1,19	1,87	1,19	1,32
winter 2017	1,84	2,06	1,97	1,74	1,81	1,77	2,00
spring 2018	1,84	1,61	1,71	1,97	2,29	1,90	1,94
mean	1,86	1,94	1,74	1,69	1,81	1,55	1,66

Fig.9: Average learner autonomy score by domain (Romania)

Learner autonomy and personality traits

The table below shows the correlation matrix between different personality aspects and learner autonomy. The personality aspects were as follows:

- preference of individual work vs. preference of group work (the higher the score, the stronger the preference towards group work);
- systematic vs. spontaneous approach (the higher the score, the stronger the preference towards spontaneity);
- the desire to "just play" vs. the desire to win (the higher the score, the stronger the inclination towards the desire to win);
- preference of acting (i.e. "doing something") vs. preference of thinking (the higher the score, the stronger the inclination towards thinking).

The correlations of these traits with the total learner autonomy score are in the first column. To calculate these correlations, we only used data that we obtained at roughly the same time (sometimes, we obtained a personality questionnaire way sooner than the autonomy questionnaire, so we assumed they were based on observations at a different time and should not be correlated).

In Romania, the correlations are weaker compared to Slovakia.

	Learner autonomy	Preference of group-work	Spontaneity	Inclination to "winning"	Inclination to "thinking"
Learner autonomy	1				
Preference of group-work	-0.07	1			
Spontaneity	-0.27	0.23	1		
Inclination to "winning"	0.26	-0.18	-0.44	1	
Inclination to "thinking"	0.13	0.02	-0.16	0.22	1

Fig.10: Correlation of learner autonomy and personality traits (Romania)

The comparison of learner autonomy with the results of accomplishment questionnaires are not included as we do not have consistent data like from Slovakia (in Romania, these questionnaires were often sent at different times).

NOTES FROM INTERVIEWS WITH THE TEACHERS

- Similarly to Slovakia, there were issues with RaspberryPi, so children did only very few tasks.
- Their performance and focus fluctuated for various reasons. Children are very moody. Something might have happened in the family or there might have been a fight among boys or a child might have had a bad experience at school and did not join the project in the afternoon, for example.
- The project helped with the behaviour of the kids. They went from group work

to individual work, which is something very unusual and astonishing for Roma children. This doesn't mean they wanted to avoid other children: it means they became confident enough to tackle issues and solve tasks by themselves without relying on external help from their peers or teachers. They even asked teachers for more tasks. Girls would often come and ask for tasks which they then worked on individually.

 Children learned to use tablets, make movies, videos, photos, slow motion, download games, search in English etc. When there was a problem with MaKey MaKey just before a public event, children were able to solve it themselves. They were also able to solve problems with RaspberryPi. Since teachers couldn't solve the problem too, children simply had to find a way themselves.

If a girl makes a mistake, she gets beaten by an older sister or brother. That's why they keep asking for approval all the time. It's rooted in the culture. So if children work individually it means that they feel confident.

Conclusions

Let us now answer the main research questions of the project.

• Did learner autonomy improve in the course of the project?

In the course of the project, we couldn't conclusively prove that our approach increases the level of learner autonomy. However, we have quite a lot of evidence that supports the fact that learner autonomy is directly related to the task that is being undertaken, i.e. the same child may display high levels of learner autonomy if they like the task at hand and feel they are learning something new.

- Is the level of learner autonomy correlated with certain personality traits? We didn't find any clear link between the level of learner autonomy and personality traits. In Slovakia, the level of learner autonomy was positively correlated with being systematic and with an inclination to "thinking" (as opposed to "doing") but in Romania, all the correlations were quite week. There wasn't any link between the level of learner autonomy and the preference of group work (as opposed to individual work).
- Is the level of learner autonomy related to the activity undertaken?

Yes, the data clearly indicated the level of learner autonomy is linked to the properties of the activities undertaken such as difficulty and subjective enjoyment of the task. An interesting finding is that the degree of difficulty of the task is positively correlated with the subjective degree of enjoyment and learning, although one might expect the contrary, i.e. children subjectively prefer more difficult tasks. However, it is common knowledge in pedagogy that children enjoy being challenged and in consequence of this joy achieve better learning results, which is reflected in our data also for this specific target group.

Other conclusions:

- The evaluation revealed that out of the 7 domains that were defined in the concept of learner autonomy, the most difficult one was the ability to work independently towards reaching a goal. This was discussed later on with our implementing partners, who confirmed that this is most likely due to the lack of self-confidence and selfesteem, which is rooted in the social and cultural particularities of the target group and becomes negatively reinforced by the formal educational system. Addressing these lacks might be a promising way towards overcoming hurdles in education.
- To foster learning it is necessary to create a "safe-space" in which children and youth do not fear consequences in form of negative reaction from their peers and in which they can try out new behaviour that varies from established standard behavioural patterns and rules.
- The need for self-esteem and having confidence in one's abilities, and the need for safe space are necessary prerequisites for any creative activities to take place, as can be seen from the following representation of Maslow's hierarchy of needs. Ensuring basic physiological needs, creating a safe space for children, fostering friendships and building self-esteem are therefore all very important goals to work towards as only when these needs are met, children can fulfil their true learning potential.



Fig.11: Maslow's Hierarchy of Needs / https://www.simplypsychology.org/maslow.html

Remarks and further suggestions

- We recommend involving all partners with the definition of the evaluation aims and research questions. By doing this you ensure that the needs of all partners are met and they will participate actively as they experience and see clearly the added value of the evaluation process. If the evaluation techniques are too complicated or too time-consuming, they are not likely to be effective. We strongly recommend sticking to simple and easily measurable concepts (for example, keeping the learner autonomy concept simple and straightforward) and using simple measurement tools (short questionnaires etc.).
- If possible, we recommend using Excel sheet questionnaires (learner autonomy, personality, accomplishment), ideally after each box is finished. If not possible, qualitative evaluation might be an option.

These sheets may help capture children's progress in learner autonomy and their opinion of the boxes. As for the usage of the hand-it-in application, we recommend ensuring that using them is possible (the locations might not have stable internet connection). If not, we recommend looking for other options to track children's activities.

• In challenging environments with limited internet access, we recommend putting less emphasis on quantitative evaluation and instead incorporating qualitative evaluation techniques such as field visits, skype interviews etc. Due to the nature of the locations, this may paint a much more comprehensive picture of the benefits and drawbacks of the project while also being more accessible and comfortable for teachers and students. Additional evaluation ideas for future implementations:

- Structured interviews The goal is to get in-depth information about everything related to students' interaction with the boxes. This can offer invaluable insights into how a chosen approach works in practice. To conduct these interviews, it is necessary to have a list of questions and arrange regular skype or face-to-face sessions with the teachers.
- Demographics questionnaire Additionally basic demographic to information (name, age, gender), it might be useful to collect information on the number of siblings, mother tongue, status within the family (e.g. is the child a favourite within the family and receives more attention than his or her siblings?) and history of formal learning of the children or any further data that might be obtainable. This could be then linked to the learner autonomy as well.
- Hobbies evaluation It might be useful to find out if working with the boxes has an impact on students' hobbies and interests. For this purpose, the hobbies evaluation should be done at the beginning and at the end of the project. Students should be told to draw a picture of a "FUN LAND" - a land where they can do any activity they enjoy. They should be told to imagine they can spend a week in this land – what things would they like to have there? This way, it is possible to see if they include different things at the end of the project compared to the beginning. Of course, this wouldn't necessarily mean their hobbies changed due to the project – the change might also reflect natural development.

• Free time evaluation - The goal is to get some information about the students' lifestyle and about the amount of free time they have, as the amount of unstructured free time may affect a child's learning outcomes. The children could be given a camera for a day or two. They will certainly take lots of pictures, and as the camera stores the time when pictures are taken, these pictures will show what a typical day of the students looks like.

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