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Continuing professional development of librarians in Croatia: participating in STEM revolution

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Abstract:

The role of information professionals changes with the technological development and progress: they take the responsibility to be (pro)motors of digital change in their communities and to initiate digital transformation for Smart societies. In that context professional training is crucial.

Croatian Training Centre for Continuing Education of Librarians (CSSU) conducts a program of lifelong learning and continuing education of librarians and information professionals. Every year new courses are included in the program to provide support for librarians and information professionals from all types of libraries. Although educations of building information professionals' competencies in the digital skills domain were held, an increased need for new digital skills, especially in the STEM technologies, was recognised.

The opportunity to collaborate with the non-profit organization Institute for Youth Development and Innovativity (IRIM), which started Croatian Makers movement, was a good start for a systematic

education of librarians in the new technologies and STEM field. It is also noteworthy that IRIM provided equipment and organized the workshops and CSSU valorised the workshops through its system in terms of getting points for professional promotion.

The collaboration is a part of the newly founded Digital Laboratory of the National and University Library in Zagreb that will serve as a point of reference and support for libraries across Croatia in implementing STEM and other technology based services.

This paper presents the results of the statistical data obtained from evaluation questionnaires filled out by attendees of the workshop „Advanced micro:bit and introduction to BOSON“ with the purpose of conducting a qualitative analysis. The gathered data will be used in a longitudinal study (first one a year from the first workshop) to develop a comprehensive picture of the impact a STEM workshop has on a local community and to serve as a guide in organising further similar educations.

Keywords: Training Centre for Continuing Education of Librarians in Croatia (CSSU), digital transformation, digital competences, STEM technologies, libraries.

Training Centre for Continuing Education of Librarians in Croatia as a support in professional training of librarians, information specialists and heritage professionals

The national Training Centre for Continuing Education of Librarians conducts lifelong learning programmes for librarians from all types of libraries, library assistants, students of library and information science and vast community of specialists from heritage institutions. The Centre was established in 2002 as an Agreement on cooperation, rights and obligations was signed between four founder institutions: Faculty of Philosophy and Social Sciences, Zagreb City Libraries, Croatian Library Association and National and University Library.¹ Thereby, mutual relations regarding training Centre between them were regulated. The Programme board, that consists of two members from each founder-institutions, is responsible for the assessment and adoption of yearly educational programmes.²

The main goal of the Centre is to develop and provide comprehensive and methodical educational programmes of continuing education for librarians and information specialists all over Croatia. Consequently, the availability of the programmes is very important. The Centre tries to organize at least one free education for participants in every Croatian county every year with the support of the Croatian Ministry of Culture. The Centre continuously cooperates with main county libraries, academic libraries, library associations and other partner institutions interested in professional training for their employees. In 2018 free webinars were introduced to its educational programmes to enhance and equalize the possibility of professional training.

The Centre constantly endeavours to include actual topics and eminent experts to its educational scheme. Currently, there are more than 90 lecturers in the programme of the Centre, which is organized in eight thematic modules: Intellectual freedom, ethical and legal issues of library and

¹ Sporazum o međusobnoj suradnji, pravima i obvezama osnivača Centra za stalno stručno usavršavanje knjižničara u Republici Hrvatskoj. Zagreb, 2002. [Internal document].

² *The members are professionals related to different fields of library and information science and they have a mandate that lasts for two years with the possibility of one consecutive reelection.*

information science, Library services, Building library collection, Bibliographic control, Evaluation, research and project management, Electronic information resources and systems librarianship, Publishing and Digitisation in libraries. Currently, attendees can choose between more than seventy different courses, lectures and workshops as well as between five webinars and occasional guest lectures. A certificate issued by the Centre after participation serves for the purpose of registering lifelong learning activities and for professional advancement. The yearly average is about 1000 participants in Centres' educational programmes.

Development of professional skills and competencies after obtaining a university diploma is crucial not only for quality task performance but also for the competition in the labour market.

Education in STEM technologies for librarians through CSSU and partnering with the Institute for Youth Development and Innovativity (IRIM)

According to contemporary trends in librarianship, libraries tend to become centres of knowledge, education and exchange of ideas, which means that their role is changing with the use of new technologies. Digital skills, especially in the STEM field, are more and more required and even expected from librarians as they have to make a shift from responding to predicting future needs of the patrons. Librarians have to be trained and skilled to be able to accept these new roles - not only to keep up with the changing times but also to be immersed in the process of change and innovation and to take inclusiveness in consideration as an important matter as well. The educational programmes of the Centre tend to provide strong support for its participants in that context, especially since partnering with the Institute for Youth Development and Innovativity (IRIM) in 2019.

IRIM is a Croatia-based non-profit organization (private foundation), which has developed and implements an extracurricular STEM programme called the Croatian Makers movement.³ NSK partnered with IRIM in two of their projects: *STEM Revolution continues – Libraries and Digital citizen: Regional project of transforming public libraries into digital making spaces in Croatia, Serbia, BiH and Kosovo*. Aimed at advancing libraries to become digital competencies centers through these projects, IRIM donated coding devices called micro:bit and sets of modular electronic building blocks BOSON kits to 100 public libraries in Croatia.

3D printers were also a part of the donations for 10 public libraries as well as for the National and University Library in Zagreb. IRIM also held free workshops for the libraries that were included focusing the educational part of the projects on skills needed for using the donated equipment.⁴ CSSU joined the IRIM – NSK partnership in March 2019 in the second phase of the Digital Citizen project on the „Advanced micro:bit and introduction to BOSON“ workshops which are analyzed later in this paper using the results from online questionnaires filled by the participants after the workshops. CSSU recognised that empowering librarians with these skills is vital for ensuring quality future implementation of these technologies in programmes of the included libraries which is what the main goal of the project was.

The CSSU Programme board accepted the idea of introducing new topics and technologies to its educational scheme. It should be pointed out that IRIM funded and organized educations which were

³ Croatian Makers (2019) [online] Available at: <https://croatianmakers.hr/en/home/> [Accessed 6 Feb. 2019].

⁴ *Educations were organised and financially supported by IRIM*

validated the same way any other education is validated through the Centre - by issuing the certificate for registering lifelong learning activities and for professional advancement. In other words, it meant that national Training Centre for Continuing Education of Librarians recognised and equalized traditional skills such as cataloguing with digital skills for the new technological age like microcomputer programming and 3D printing.

Project technologies used in the analyzed workshops: *Micro:bit and BOSON kit*

The history of the micro:bit started in the 1980s with the introduction of the BBC Micro, a series of microcomputers and associated peripherals designed and built by the Acorn Computer company for the BBC Computer Literacy Project which was operated by the British Broadcasting Corporation (BBC).⁵ It has introduced many children in the United Kingdom to computing for the first time in the 80s and it is doing so again today for children all over Europe and the world but adapted for the new digital age.⁶

The BBC micro:bit is a handheld, programmable micro-computer that offers two modes of coding. One is more simple using the The MakeCode Editor provided by Microsoft which makes it fairly easy to program the micro:bit with blocks and JavaScript.⁷ It is intended to introduce the students with the logic of programming, more than anything else. The other mode is for those with advanced programming skills called the Python editor powered by the global Python Community. The micro:bit device itself is constructed to be simple enough to allow a quick start on programming but powerful enough to create more complicated applications. Educational materials and examples are a core segment of the project as well meant to provide well-curated and well-presented material. The emphasis of the micro:bit is on engagement, imagination and creativity.⁸

The micro:bit can connect to other sensors, actuators and devices. It is intended as a companion rather than a competitor to devices such as Arduino, Galileo, Kano, littleBits and Raspberry Pi, acting as a spring-board to more complex learning. Here the BOSON kit comes in picture. BOSON kit⁹ is a set of modularized electronic building blocks designed for young inventors and STEM educators with a platform that has more than 50 different modules, including sensors, actuators, logic gates and more.

Impact and reach of the micro:bit

On the October 19, 2016, the Microbit Educational Foundation was launched in London with the aim of „continuing the micro:bit experience in the U.K. and roll it out to Europe, and then the world, to inspire a global generation of young inventors“¹⁰. The Micro:bit Educational Foundation has built on

⁵ Computer literacy project 1980-1989 (2019). BBC Computer Literacy Project Archive. [online] Available at: <https://computer-literacy-project.pilots.bbcconnectedstudio.co.uk/> [Accessed 6 Feb. 2019].

⁶ Microbit.org. (2019). Our History. [online] Available at: <https://microbit.org/history/> [Accessed 6 Feb. 2019].

⁷ Microbit.org. (2019). Meet micro:bit. [online] Available at: <https://microbit.org/guide/> [Accessed 6 Feb. 2019].

⁸ Ball, T. [et.al.] (2016). Microsoft Touch Develop and the BBC micro:bit. IEEE/ACM 38th International Conference on Software Engineering Companion (ICSE-C), pp.637-640 Available at: <https://ieeexplore.ieee.org/abstract/document/7883359/references#references> [Accessed 21 Jan. 2019].

⁹ Dfrobot.com. (2019). Boson STEM Educational Kit for Kids, Coding Free - DFRobot.com. [online] Available at: <https://www.dfrobot.com/boson> [Accessed 28 Jan. 2019].

¹⁰ Rogers, Y., Shum, V., Marquardt, N., Lechelt, S., Johnson, R., Baker, H. and Davies, M. (2017). From the BBC micro to micro:bit and beyond. *interactions*, 24(2), pp.74-77. Available at:

initial research in the UK and is now working in 50 countries gathering more evidence through its partnerships. In 2018. The British Council commissioned an IPSOS Strategic Marketing report which showed the positive impact of the BBC micro:bit amongst students and teachers in the Western Balkans. The report was commissioned as part of the British Council's '21st Century Schools' programme in the Western Balkans. It has the objectives of imparting critical thinking and problem solving skills to students aged 10 to 14, alongside digital and coding skills. The results were summarized as: "Teachers see micro:bit as an innovative and useful tool which is inspiring for students and which gets them more interested in computing and coding, while it also positively affects their motivation and cooperation between each other. When it comes to students, the micro:bit is seen as an interesting tool which enables them to turn their ideas into reality, through endless possibilities. The fact that the micro:bit is something physical, which they can touch, take with them and see results of their work on it is extremely motivating for them."¹¹

Analysis of the Poll Results from evaluation questioneres

Advanced micro:bit and introduction to BOSON is the second round series of workshops, carried out as part of the Digital Citizen project, with which began the collaboration between IRIM and CSSU. A total of 33 workshops were held in 30 cities and towns across Croatia, from 18 March till 5 April 2019. Each workshop lasted for 90 min. The number of participating librarians was 174. Since the workshops were intended primarily for librarians working in public libraries, 86.78% of the participants were coming from public libraries.

Each workshop was followed by an online poll in the form of an evaluation questionere. 86% of the workshops attendees (N = 150) filled in a questionnaire containing 18 questions.

Apart from (1) the participants' professional characterization, the questionnaire also covered three aspects of the use of micro:bit and BOSON (these two project technologies were the topic of the workshops): (2) the participants' self-assessment regarding their previous knowledge of the mentioned technologies, (3) the participants' assessment of their experiences with the project technologies at the workshop, and (4) the participants' assessment of the usefulness of the workshop and the future implementation of the project technologies (perception of usefulness in terms of workshop outcomes).

1. The participants' professional characterization was covered by 4 questions. They were as follows: education, years of service, the type of library and the level of interest in taking part in the project.¹²

Results: 67.33% of the participants have a degree, 86% of the participants are coming from public libraries, 78% of the participants have up to 15 years of service, 92% of the participants have expressed high to very high interest in taking part in the Digital Citizen project.

http://discovery.ucl.ac.uk/1546735/1/Rogers-Y_BBC%20Micro%20to%20micro%20paper_2017.pdf [Accessed 21 Jan. 2019].

¹¹ Microbit.org. BBC micro:bit shown to increase teacher confidence and student team work across the Western Balkans (2018). [online] Available at: <https://microbit.org/assets/documents/microbit-teacher-confidence-impact.pdf> [Accessed 25 Jan. 2019].

¹² Questions 1 - 4. See the Questionnaire.

2. The participants' self-assessment regarding the initial knowledge was covered by 3 questions. They concerned their knowledge of micro:bit prior to taking part in the project, previous experiences in programming, and their knowledge of use of the project technologies prior to the workshop.¹³ Results: Over two thirds of the participants (74.67%) answered that they were acquainted with micro:bit before they took part in the project. Yet, although more than a half of the participants (57.33%) answered that they had programmed before, less than 10% of them answered that they had done it often. Their knowledge about the use of the project technologies before the workshop was low, i.e. over 50% of the participants rated it as very low or low.

3. The participants' assessment of the work at the workshop was covered by 2 questions in which they were asked how easy it was for them to use microcomputers¹⁴ and how simple were the examples on which they worked at the workshop.¹⁵

Results: 64% of those who took part in this survey answered that the microcomputers had been very easy to use, and 63% of the participants answered that the practical examples they had worked on at the workshop were very simple to simple. The general opinion of the participants, regardless of whether they had programmed before or not, was that the microcomputers were easy to use and that the project examples were simple.

4. Assessment of the usefulness of the workshop was covered by nine questions. They concerned the participant's opinion about his or her ability to use the project technologies after the workshop, the influence of the participant's work with micro:bit on his or her attitude to programming during the workshop, the general attitude of the participant to programming upon the completion of the workshop, the participant's rating of his or her ability to use micro:bit in future projects or activities, the readiness of the participant to hold workshops for the users, the participant's familiarity with IRIM's *Izradi!* web portal for educational purposes, and whether he or she would recommend the workshop to his or her professional colleagues.¹⁶

Results: Whilst prior to the workshop taking place, solely 13% of the participants assessed their knowledge of the use of the project technologies as very high, after the workshop as many as 68% of them assessed it as high to very high.

85% of the participants were convinced that micro:bit had helped to show them that "everybody can programme" and that "programming is not as difficult as they previously thought". Upon the completion of the workshop more than 60% of the participants (completely) agreed that programming is simple.

42% of the participants expressed the belief that, if they wanted to use microcomputers for new projects or activities, they could do it easily or very easily. More than 50% of the participants, and almost 40% of those who had not programmed in the past, felt ready to conduct workshops for the users.

55.6% of the participants were acquainted with *Izradi!* web portal before they had attended the workshop, while 39.33% of them answered that they had never visited it but that they were planning to do it.

¹³ Questions 5 - 7. See the Questionnaire.

¹⁴ Even though used interchangeably in the survey, the micro:bit is not synonym with microcomputer - it is a type of microcomputer (others include Raspberry Pi, Arduino, etc.)

¹⁵ Questions 9 and 10 See the Questionnaire.

¹⁶ Questions 8 and 11-18. See the Questionnaire.

The participants who felt ready to hold workshops if helped by the organizers or partner organizations (N=33) offered three answers about the way in which this help could be provided: as additional education, as a long-term support and in the form of a collection of exercises for independent work. Out of those 33 participants 18 had not visited Izradi! web portal yet, but were planning to do it. All of the participants have answered that they would recommend the workshop to other members of the profession.

Discussion of results:

From all that has been said it can be concluded that the participants of the survey carried out after the completion of the *Advanced micro:bit and introduction to BOSON* workshops had a positive opinion about the use of micro:bit, BOSON and programming in general, regardless of whether they had previous programming experience or not. Since the questionnaire contained solely questions concerning the participants' (subjective) assessment, on a scale of 1 to 5, of their knowledge about the use of micro:bit and programming before and after the workshop, it would be interesting to investigate, in more detail, the prior knowledge of these who claimed that they had programming experience (e.g. by organizing a test prior to the workshop). Also, it would be interesting to see how much they really did learn at the workshop (e.g. by giving them another test, upon its completion), and how successful those who had expressed readiness to run a workshop by themselves really were, and whether they use actively micro:bit and BOSON in their libraries.

Longitudinal study as a way of ensuring sustainability

Considering the many open questions this analysis left open as well as the fact that the evaluation questionnaire was created by IRIM with CSSU only contributing with 4 questions¹⁷ mainly concerned with participants' professional characterization, CSSU is planning to conduct a longitudinal study concerning the impact of the 2019 workshops and efforts made by IRIM and CSSU. The first one will be distributed a year from the first workshop (in March 2020) with a consequent yearly survey in the span of five years. The aim of the longitudinal study is to get a comprehensive picture of the impact a STEM workshop has on a local community and to discover the role a central institution like the CSSU has in creating an environment of support to libraries so they can transfer their knowledge in a sustainable way. The main goal is to follow in which ways and in what numbers do the libraries involved in 2019 workshops implement gained knowledge and skills (and donated equipment) to empower their community for participating in the digital transformation and how the CSSU and Digital Laboratory NSK can better assist them in doing that. Even though IRIM already does a follow up report for the libraries included in their projects, the CSSU longitudinal study is intended to provide a more comprehensive picture and for a longer time period as well.

Since CSSU is planning to offer STEM focused educations (which will include new contents and lecturers) as a part of its yearly programme from the beginning of 2020, the conclusions from this analysis as well as the longitudinal study results will be a valuable resource in creating and organising these educations. The cooperation between CSSU and the newly founded organisational unit of the National and University Library in Zagreb - the Digital Laboratory NSK will play a crucial part in this since one of the most important goals of the Laboratory is to serve as a point of reference and support for libraries across Croatia in implementing STEM and other technology based programmes and services in their communities.

¹⁷ Questions 1, 2, 3 and 18. See the Questionnaire

Conclusion

To be able to undertake the role of (pro)motors of digital change in their communities and to initiate digital transformation for Smart societies, librarians have to be equipped not only with hardware and software but with skills to use them effectively and to transfer that knowledge in their communities as well. CSSU recognised that the problems and obstacles faced by librarians in trying to be active participants in the digital society of the future runs deeper than the pure equipment or even a one-time workshop. Librarians need constant education and validation as well as support and a reference point they could turn to at any time or level of their work involving these new technologies. The empowering impact of the analyzed workshops held through the Digital Citizen project is unquestionable and serves as a testament that lifelong learning is getting more important the more we embark on this voyage to a highly digitised world. And in that world programming is considered as the new core skill that reaches more and more professions and age groups. Schmidt (2016) compares it with learning a language which is seen as a cultural skill that lets a person use their verbal communication and written text effectively in a variety of contexts. Very similarly, he argues, understanding computing technologies, programming, and computational concepts has become a core skill much like reading and writing and allowing illiteracy in that regard will create a new major divide. So this becomes a question of inclusivity and social fairness as well which are all things that concern libraries. Only through partnerships with organisations like IRIM as well as inter-organisational collaborations between libraries and intra-organisational relationships like CSSU and Digital Laboratory NSK we will be able to answer these complex challenges that don't lie ahead us – they are already here.

The Questionnaire

1. Type of library:

School / Public / University / Special / NSK / other

2. Your educational qualifications:

High School Diploma / Bachelor's degree / Master's degree / Master's degree (of science) /
Doctoral degree

3. Years of working experience:

0-5 / 6-10 / 11-15 / 16-20 / 21-25 / 26-30 / more than 30

4. What is the level of your interest in participating in the project?

Very low – very high (1-5)

5. Did you know about micro:bit before you participated in the project??

YES

NO

6. Have you programmed so far?

Yes, often / regularly / Yes but rarely / No, never

7. Please evaluate the level of your knowledge about the use of project technologies before starting the workshop

Very low – very high (1-5)

8. Please evaluate the level of your knowledge about the use of project technologies after finishing the workshop

Very low – very high (1-5)

9. How easy it was to use a microcomputer at the workshop?

Very easy – Very complicated (1-5)

10. How simple were the examples you worked on at the workshop?

Very easy – Very complicated (1-5)

11. How much do you agree with these statements: I think that micro:bit has helped to show me that anyone can programm

I completely agree - I agree - I do not agree or disagree - I disagree - I completely disagree

12. How much do you agree with these statements: I think that micro:bit has helped to show me that programming is not as hard as as I thought it was

I completely agree - I agree - I do not agree or disagree - I disagree - I completely disagree

13. How much do you agree with these statements: Programming is simple.

I completely agree - I agree - I do not agree or disagree - I disagree - I completely disagree

14. If you would now like to use a microcomputer for a new project or activity, how easy would it be to do it?

Very easy – Very complicated (1-5)

15. Do you feel ready to hold workshops for patrons?

Yes

Yes, but I would need extra help (if this – new question – Please explain the ways the Organizer or partner organisation can help you implement the workshops)

No

16. Please explain the ways the Organizer or partner organisation can help you implement the workshops?

_____ (*open-ended*)

17. Do you visit Izradi! educational web portal?

I regularly visit the Portal - I have visited the Portal several times - I have not visited the Portal yet, but I plan to visit it - I have not visited the Portal yet and I do not intend to

18. Would you recommend the workshop to your colleagues in the profession?

YES / NO

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