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# **ENHANCING AND ADVANCING BASIC LEARNING AND EDUCATION IN BOSNIA AND HERZEGOVINA – ENABLE BIH**

## **ANNUAL WORK PLAN – YEAR IV**

**For the period September 25, 2019– September 24, 2020**

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## List of Acronyms

APOSO	Agency for Pre-Primary, Primary and Secondary Education of BiH
BiH	Bosnia and Herzegovina
CCC	Common Core Curricula
CD	Country Director
CSSP	Civil Society Sustainability Project
ECCD	Early Childhood Care and Development
ENABLE	Enhancing and Advancing Basic Learning and Education
EU	European Union
EWG	Expert Working Group
FYR(OM)	Former Yugoslavian Republic (of Macedonia)
HEA	BiH Agency for Development of Higher Education and Quality Assurance
IE	Inclusive education
INGO	International Non-Government Organization
KBE	Knowledge Based Economy
LO	Learning-outcomes
LoE	Level of Effort
MEAL	Monitoring, Evaluation, Accountability and Learning
MIS	Management Information System
MoCA	Ministry of Civil Affairs
MoE	Ministry of Education
MOU	Memorandum of Understanding
MWAI	Miske Witt & Associates
NWB	Northwest Balkans
OSCE	Organization for Security and Co-operation in Europe
OTC	Operational Teaching Curricula
PAB	Project Advisory Board
PISA	Program for International Student Assessment
PPDM	Pedagogy, Psychology, Didactics and Teaching Methods

RS	Republic of Srpska
SAA	Same as above
SAR	Special Administrative Region
SC	Save the Children
SLO	Student Learning Outcome
STEM	Science, Technology, Engineering and Mathematics
TE	Teacher Education
TIMSS	Trends in International Mathematics and Science Study
ToT	Training-of-Trainers
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WG	Working Group

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## I. PROGRAM OVERVIEW

The ENABLE-BiH project began in September 2016 and ends in September 2020. The overall purpose of the project is to contribute to the improvement of learning outcomes in primary and general secondary education in BiH. Phase I of the ENABLE-BiH was intended to help BiH students acquire key competences necessary to participate in the knowledge-based economy and become future drivers of the economic development of the country. Building on the program's phase I objective, phase II implementation has focused on advancing USAID's goals of improving STEM education in BiH by implementing the new Operational Teaching Curriculum in schools and rolling out new standards and guidelines for improved STEM teaching methods in pre-service university programs. The overall STEM approach is based on a desire to compete in the knowledge-based economy, therefore providing a direct link between education and the labor market, serving as a career-orientation tool at an early stage of schooling, and enabling students to acquire competitive and essential skills for the rapidly changing market.

ENABLE-BiH II (also referred to in this report as ENABLE) has two key components, Science, Technology, Engineering and Mathematics (**STEM**) and Pedagogy, Psychology, Didactics and Teaching Methods (**PPDM**). These address the need to change the approach of teaching and learning students in primary and general secondary education.

The need to shift the educational paradigm away from teacher lectures and student memorization towards a student centered, critical thinking approach is particularly important when it comes to cognitive and meta-cognitive skills, communication, and practical hands-on skills which enable individuals to actively participate and work in the STEM subjects and respond to the needs of a growing STEM industry. Only this advanced learning and support for learning will prepare BiH students to participate in the competitive labor market.

The education process where students are the center, requires changing teachers' roles from those who "teach lessons" to those who facilitate learning. This will improve learning by encouraging students to develop a higher level of thinking, independent learning and problem-solving skills; ensure better engagement of students in the learning process and more quality interaction with their peers, teachers and learning content. It will also enable students to independently conduct research, inquire and find answers, think critically and apply what they have learned. By increasing teachers' PPDM competencies they will better use teaching methods and active approaches to help students gain knowledge, skills and attitudes and to improve learning outcomes. ENABLE will strive to increase and harmonize quality standards and to align in-service and pre-service training programs for future STEM teachers while increasing the quality of the educational-pedagogical process and ultimately improving student-learning outcomes.

Phase I of the project focused on developing a policy framework for STEM and PPDM through development of key documents, the current phase focuses on implementation in STEM-PPDM through targeted activities.

### **Phase 2 STEM-PPDM activities:**

- Training for STEM-PPDM Master Trainers / Mentors
- Replication of STEM-PPDM trainings in 12 model schools in 4 model areas (the Sarajevo Canton, the Herzegovina-Neretva Canton, the Brcko District, and the RS)

- Equipping 12 model schools with modern STEM equipment to support teaching and learning in a practical manner
- Establishment of cooperation with three STEM universities in BiH (Faculties of Natural Sciences and Mathematics in Sarajevo, Mostar and Banja Luka)
- Equipping 3 STEM universities with STEM-PPDM equipment to support their becoming university centers of excellence
- Establishing cooperation with the business sector with the aim of providing pupils and students with internship opportunities to gain practical experience in the job arena
- Organization of STEM fairs to demonstrate STEM achievements from both the education and business sectors and as a forum for linking education and business

## A. Educational Context in BiH

### *International testing and education quality*

To improve the quality of education, many countries participate in internationally recognized testing. The internationally standardized tests TIMSS (Trends in International Mathematics and Science Study)<sup>1</sup>, PIRLS (Progress in International Reading Literacy Study)<sup>2</sup> and PISA (Program for International Student Assessment)<sup>3</sup> assess students' abilities to understand content designated by a curriculum and apply knowledge in relevant fields. Indirectly TIMSS monitors teaching methods, its quality, textbook content quality, as well as the results of additional teachers' training. Thorough analysis of testing data enables a country to identify potential weaknesses within the system and make appropriate adjustments.

In 2007 BiH participated in TIMSS testing for the first time<sup>4</sup>. The score achieved, 465.5 points, indicated were below the international average score is 500 points.<sup>5</sup> Only 1% of students have attained the advanced, highest level of mathematics knowledge.<sup>6</sup> Approximately 10% of BiH students attained the high level, as opposed to the international average of 15%.<sup>7 8</sup> Moreover, the TIMSS study and its secondary analysis focused on the teachers' role in teaching and learning<sup>9</sup>. The findings indicated that additional and quality training of teachers in PPDM was necessary, and the number of PPDM university classes need to increase to improve student

<sup>1</sup> <http://timss.bc.edu/>

<sup>2</sup> Ibid.

<sup>3</sup> <https://www.oecd.org/pisa/>

<sup>4</sup> Mathematics and natural sciences knowledge of 4,300 pupils from 150 schools was examined. Testing also indirectly assessed 150 school principals and 724 teachers. Final results indicated BiH ranked 27 out of 50 countries

<sup>5</sup> <http://www.cpu.org.ba/publications/the-advantages-of-timss-introduction-into-bih-educational-system/>

<sup>6</sup> Medium level was achieved by 42% of students; the international average was 46%. Most students (77%) showed a low knowledge level, 74% being the international average. As for the cognitive domain, students achieved a score of 478 from applying knowledge and skills, whereas lowest results are achieved from knowledge (score of 440).

<sup>7</sup> World Data on Education available at

[http://www.ibe.unesco.org/fileadmin/user\\_upload/Publications/WDE/2010/pdf-versions/Bosnia\\_and\\_Herzegovina.pdf](http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Bosnia_and_Herzegovina.pdf)

<sup>8</sup> TIMSS 2007 produced the only valid data on the quality of basic education in Bosnia and Herzegovina. Since it was conducted only with fourth grade students, there are no data on the overall quality of primary education.

<sup>9</sup> 724 math teachers and teachers of natural sciences, who daily teach 16,880 students, were included in the TIMSS study

performance. Teachers also need skills to develop teaching plans that enable students to think critically and proactively, comprehend the educational content, listen actively, learn in teams and exchange with other students, solve problems and acquire life-learning habits. The secondary analysis also found BiH was below the international average in regard to the percentage of students who stated they liked being at school. The main reasons behind this statement is found to be outdated curricula, teaching methods and knowledge transfer. Other reasons include poor school conditions, lack of technical equipment such as computers and projectors, inadequate buildings, poor hygiene and safety conditions<sup>10</sup>Over the period, September 2018 to August 2019, one of major developments in the education sector was related to quality and relevance of education. The Agency for Preschool, Primary and Secondary Education, BiH (APOS0 BiH) succeeded in completing the Common Core Curriculum (CCC) based on learning outcomes for all eight-education areas, including learning outcomes for preschool education. This long fought achievement was important for the whole country, as reform around quality and relevance and work on CCC based on learning outcomes started in 2011<sup>11</sup>. Work around CCC continues under ENABLE.

As announced in the Annual Work Plan September 25, 2018 to September 25, 2019, **PISA**<sup>12</sup> **2018** (Program for International Student Assessment) testing was completed by the APOS0 BiH for the very first time on April 4, 2018<sup>13</sup>. In preparation for the presentation of results and related communication efforts, major international agencies and organizations (UNICEF, U.S. Embassy, Save the Children, OSCE Mission to BiH and Open Society Fund) are supporting APOS0 in the development of a comprehensive Communication Strategy for PISA 2018 results. The Communication Strategy will ensure that PISA 2018 results and recommendations are well presented and shared widely with every possible fora, understanding that PISA results will inform further reform processes and developments in education.

In May 2019, APOS0 BiH also conducted TIMSS 2019 testing and started preparation for the Progress in International Reading Literacy Study (PIRLS) 2021<sup>14</sup>.

### *STEM and CCC in BiH*

ENABLE-BiH is also trying to demystify the growing misconception that STEM implies a simple Robotics program. ENABLE is demonstrating that STEM is much deeper, complex and covers different concepts, skills, principles and topics. ENABLE-BiH is laying STEM with an emphasis on applied learning and problem solving.

The main goal of STEM and the ENABLE-BiH project is to teach tomorrow's future innovators how to implement what they study in the classrooms and prepare students to solve real world

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<sup>10</sup> [http://www.unicef.org/ceecis/Bosnia\\_2010.pdf](http://www.unicef.org/ceecis/Bosnia_2010.pdf)

<sup>11</sup> Key international institutions, agencies and organizations such as EU, USAID, U.S. Embassy, UNICEF, Save the Children, OSCE Mission to BiH, JICA and Open Society Fund supported the entire effort throughout the entire period.

<sup>12</sup> PISA is the largest international testing of student achievements in the field of reading and mathematical literacy and literacy in natural sciences.

<sup>13</sup> Likewise, EU Delegation, UNICEF, Save the Children and OSCE Mission to BiH provided necessary technical and financial support to APOS0 BiH.

<sup>14</sup> <https://www.oecd.org/pisa/>.

problems. Therefore, it is vital to introduce students to more in-depth exploration of concepts such as chemistry, biology, decision analysis, design, simulation, problem identification and many more as foreseen within the STEM-PPDM concept and framework developed through ENABLE-BiH.<sup>15</sup> This is not a standalone project, it is the catalyst of national reform in BiH.

SC notes that challenges within the BiH education sector, require joint efforts of all relevant actors and stakeholders. SC has been actively involved in cooperation and coordination with the international community and institutional partners, particularly initiatives with the CCC. During 2018 and in the first half of 2019, SC staff took part in the Education Reform Coordination Group meeting established by the U.S. Embassy and OSCE Mission to BiH. During every meeting, coordination session, and special technical session participants discussed ways the international community members could better cooperate and coordinate in regards to the implementation of the CCC. This work centered on Learning Outcomes, the alignment of Current Curricula (CC) with Common Core Curricula (CCC) based on Learning Outcomes (LOs), and the introduction and integration of STEM (Science, Technology, Engineering and Mathematics) in formal and non-formal education throughout BiH.

#### *Broader socio-political challenges*

A continuing challenge has included negotiating/operating within the fragile political situation, the stagnating economic recovery, the drain of youth and potential working power from BiH and neighboring countries and the increase in poverty in the country. SC has implemented other projects during Ministry changes in the past and has always ensured that the technical staff from various institutions are involved to assure full support for project implementation. ENABLE will continue to work closely with government and institution technical staff who provide continuous support and leadership and monitoring of ENABLE progress.

In the case of the RS all project components (phases I and II) are completely aligned with the Strategy of Education Development of RS 2016-2021. They are: Improvement of working conditions of the school and modernization of the teaching process in primary education and training related to innovation of the teaching process; reduction of theoretical lectures and their replacement with other teaching models; active student involvement in the process, research and group projects aimed at practical application and acquisition of functional knowledge; matching education with labor market needs; developing students' entrepreneurial competences; developing knowledge-based society and economics; and improving the quality of initial education. However, implementation in RS continues to be slow relative to progress in other locations.

## **B. Overview of Year III**

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<sup>15</sup> <http://www.awnow.org/2016/05/09/stem-is-greater-than-programming-and-robotics/>  
<http://www.stemcenterusa.com/stem-robotics/what-is-stem/>  
[http://engineering.nyu.edu/k12stem/educators/?page\\_id=424](http://engineering.nyu.edu/k12stem/educators/?page_id=424)

\*For the purpose of uploading documents to the DEC, all personal information and pictures were removed and replaced with “XXX”



## I. Key Sub-activities

### a) Signing Memorandums of Understanding with the MoE and Culture of RS and the Faculty for Mathematics and Natural Sciences in Banja Luka, University of Banja Luka

A general Memorandum of Understanding – MoU (MoE and Culture of RS and Save the Children) was signed on February 14, 2019 in Banja Luka, RS. Additionally, a detailed MoU was signed with the Faculty of Mathematics and Natural Sciences also on February 14, 2019 in Banja Luka, RS. Final versions (after a range of consultations and alignments with the internal procedures of the institutions) of MoUs were signed with the Faculties for Mathematics and Natural Science of Banja Luka, Mostar and Sarajevo and Technological Park Intera from Mostar (February-July 2019).

### b) **Printing of STEM and PPDM Documents**

All finalized STEM and PPDM documents that were completed and printed in December 2018 were additionally uploaded onto 150 USB sticks. These sticks contained interactive pdf versions of the following STEM and PPDM key deliverables/documents: *Draft Operational Teaching Curriculum (OTC) for STEM proficiencies (based on the Common Core Curriculum defined on Learning Outcomes; Operational Guidelines for the Implementation of the OTC for STEM proficiencies and Teacher Training Manual* as well as *Standards for PPDM – Pedagogy, Psychology, Didactics and Methodic; Operational Guidelines and Resource Manual for PPDM University Professors* in official languages of BiH (Bosnian, Croatian and Serbian). The USBs were prepared for an event gathering experts from around BiH on April 16, 2019.

### c) 2nd, 3rd and the last round of Training of Trainer (ToT) Trainings **for the new group of STEM-PPDM master trainers / mentors**

Preparation and completion of the 2<sup>nd</sup> round of ToT Training for STEM-PPDM Trainers/Mentors took place in November/December. While preparation took place in second half of November 2018, the training was conducted from December 13-15, 2018 and December 20-21, 2018. Preparation and completion of 3<sup>rd</sup> round of ToT Training for STEM-PPDM Trainers/Mentors took place in January/February 2019, with training dates of February 24-28, 2019. In total, 96 professionals (STEM Trainers/Mentors) participated in and completed the three cycles of ToT training sessions of the STEM ToT Training/Mentorship Programme, of which 33 participants were from RS.

### d) **Replication of the STEM Trainings in Selected Model Areas**

In total 96 educational professionals and field practitioners (from the STEM model areas – the Sarajevo Canton, the Herzegovina-Neretva Canton, the RS, and the Brcko District) conducted 5-day replication trainings to increase the capacity of 196 teachers in 12 model schools. This massive educational experience created the foundation for the subsequent roll-out of the STEM program in the targeted model schools. The training introduced and detailed the integration of quality STEM applications in 7 out of 12 Model Schools (5 in Federation of BiH/ 3 in Herzegovina -Neretva Canton and 2 in Canton Sarajevo and 2 in Brcko District) and STEM teaching for 2,556 students of primary and secondary/gymnasium education.

**e) *Equipping STEM Model Schools***

SCNWB completed procurement (originally planned for Y3 but included in Y4 due to delays in MOUs and formal agreements with Centers of Excellence) of up-to-date STEM specialized furniture, equipment and materials for the 12 model schools in order to facilitate learning in STEM classrooms and began the establishment of STEM Laboratories. The official ceremonial openings of first two STEM Laboratories took place in December 2018. Challenges experienced included: the need to adjust the type of furniture for STEM LABs (SCNWB had to create STEM furniture)<sup>16</sup> and configure the laptops for supporting STEM teaching, which led to some implementation delays. In addition, the suppliers required an extended delivery period longer than initially estimated. As a result, STEM furniture, equipment and materials to 3 universities and a 1 technological park was completed in 2019 following MoUs and partnership modalities with the STEM faculties at the 3 Universities (Banja Luka, Mostar and Sarajevo) and the new Technological Park (Intera TP, Mostar).

**f) *Establishing cooperation and partnership with 3 universities in BiH and providing them with STEM and PPDM materials***

Save the Children worked intensively since November 2018 to establish strategic partnerships with the STEM related faculties (Faculties of Natural Sciences and Mathematics in Sarajevo, Banja Luka and Mostar) in order to model STEM introduction and integration at the pre-service level and promote practical application of STEM teaching and practice through trainings and established STEM-PPDM University Centers of Excellence. These Centers will begin STEM programs (undergraduate and graduate), that will serve as Career Orientation Centers and provide an entry point for secondary and university students to STEM industries. They will model best practices for effectively integrating PPDM-teaching methods into pre-service instruction for future STEM teachers. As mentioned this Y3 work is continuing in Y4 due to delays in MOUs and formal agreements with Centers of Excellence.

**g) *Development of STEM web-application and website***

Along with the electronic version of the OTC for STEM proficiencies, the STEM Web-Application has been completed and the BETA version was launched in mid-April 2019 (during the ENABLE BiH conference held in Mostar) ([www.enablebih.org](http://www.enablebih.org))<sup>17</sup>. The application is based on the STEM documents developed within the first project year, the STEM OTC, as well as the Implementation Guidelines and Teacher Training Manual. The Manual provided key practical examples and illustrations of STEM implementation in the classroom. The web-application aims at ensuring navigation among different parts of the STEM curriculum, maintaining a strong and direct connection with Knowledge Based Economy (KBE), and allowing users to find and extract particular STEM content. More concretely, ENABLE-BiH created a web-application that serves as a key platform and resource for STEM/PPDM and that provides support to wide audiences – educational professionals across all levels, academia, field practitioners, policy planners and

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<sup>16</sup> As SC struggled to purchase fabricated furniture, an overcome solution was to approach local company who designed and produced custom-based furniture (tables, chairs and shelves all handmade and locally produced furniture that corresponds to the needs and requirements of the STEM labs).

<sup>17</sup> The initial web-application was developed by the US project partner that has already done similar STEM web-applications within their other projects, 21PSTEM, while completion and functionality and launching was led by the ENABLE-BiH project team and an IT expert from the local IT Company from November 2018 –present.

decision-makers as well as professionals in the business sector. In addition to the online STEM OTC, the web-application aims to ease access to:

- STEM and PPDM documents developed in ENABLE-BiH phase I,
- Information and news about the project,
- A space for teachers' interaction and cooperation, with each other as well with parents

The BETA version was launched on April 16, 2019. Based on the trail, the delivery platform will be expanded to include a user manual video and a more user-friendly interface.

***h) Public event / conference to present developed draft OTC for STEM proficiencies based on CCC, Implementation Guidelines and Teacher Training Manual and PPDM Standards, Operational Guidelines and Resource Manual for the University PPDM Professors***

The greatest achievement was the preparation and implementation of the April 16-17 conference, held in Mostar, on ENABLE BIH, entitled *Connect, create, exchange, develop for tomorrow – BiH education and economy for the 21<sup>st</sup> century*. More than 130 representatives and highest officials from education, business, university, media, the international sector, and civil society attended this important event.

***i) Establishing cooperation with one technological park/center***

SCNWB identified and realized a strategic partnership with Intera TP, Mostar Technological Park, completing a detailed plan on how Intera TP will engage and contribute to expansion of STEM education in a non-formal setting, by focusing on developing cooperation with model schools and universities in the STEM industry. Save the Children continued collaborating with 'Robokids' by including them in all related activities such as the ENABLE BiH conference. ENABLE no longer provides funds to EXIT/Robokids due to the partner overpromising on deliverables. Because their commitment to children and youth in science remains strong, ENABLE will capitalize on its investment and past partnership to work with them while ENABLE directly implements planned activities. This will allow ENABLE to leverage its investment in EXIT/Robokids and strengthen their capacity to deliver activities in the future.

***j) Establishing cooperation and partnership with leading STEM companies in BiH***

In 2019, Save the Children started communication with the STEM business sector in BiH and initiated cooperation and partnership plans with several STEM companies (Atlantbh, BIT Alliance; others planned are PE Elektroprivreda of B&H, Telemach, Al Jazeera, Violeta, Bimal, m:tel, AS Holding etc.). All partnerships are expected to supplement school and university education and provide opportunities for real-life application of STEM proficiencies students obtain in schools / universities. SC plans to build partnerships with about 27<sup>18</sup> leading STEM companies in the selected model areas or nearby to provide students with opportunities to attend internship / traineeship programs and gain practical experience in STEM industries.

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<sup>18</sup> The initially planned number of companies was 12 as there are 12 STEM model schools; subsequent search and mapping of the STEM companies in model areas revealed a greater number of STEM companies (27) that could be potential partners for conducting internship for students and that are active in 10 identified KBE sectors.

\*For the purpose of uploading documents to the DEC, all personal information and pictures were removed and replaced with "XXX"

### **k) Conducting the Impact Evaluation**

Save the Children supported an impact analysis aimed at examining the results of the ENABLE-BiH project and the effects of the STEM program in schools on students. The evaluation was led by the Centre for Development Evaluation and Social Science Research (CDESS). The ENABLE team supported CDESS to organize the impact study by providing contacts and support in obtaining permission to conduct a baseline. The impact evaluation will provide information and of students' interest in and perceptions of in STEM. The baseline study will be used to track change in perceptions of STEM overtime. Feedback and approval are still pending from MoEC of RS.

## **II. YEAR 4 ANNUAL WORK PLAN**

The annual work plan addresses activities to be implemented Year 4 of ENABLE-BiH, September 25, 2019 to September 25, 2020.

The activities and processes will lead to the achievement of **IR 1** STEM curriculum introduced and implemented in primary and general secondary education with linkages to corporate sector; and **IR 2** Joint STEM and PPDM standards introduced and implemented at universities/faculties for initial teacher education in STEM disciplines.

The plan identifies specific timeframes, sub-activities and results. The sub-activities will be implemented throughout the country, but with the focus on model areas for STEM implementation (the Sarajevo Canton, the Herzegovina-Neretva Canton, the Republic of Srpska, and the Brcko District) in close cooperation with educational authorities, business sector and other related actors and will engage field practitioners and wider audiences to contribute to the activity purpose.

### **Activity Outcome/Output I.1: Replication of the STEM Trainings in Selected Model Areas<sup>19</sup>**

Organize refresher-training sessions in all 12-model schools for 196 trained teachers.

#### **Activity Inputs:**

- Organize a series of highly technical/policy focused meetings with four Ministries of Education, Pedagogical Institutes, 12 Models Schools Representatives, ToT STEM Trainers/Mentors and Trainees/Mentees to prepare STEM Teaching Plan for the academic 2019/2020 year.
- Identify entry points and increase current percentage of STEM content integration to 25% in Y2, academic 2019/2020. This includes continuation of the Implementation Plan for STEM classes and STEM projects in each of Model Schools/Geographic Areas in BiH.

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<sup>19</sup> This activity has been implemented in Y II of the project implementation but it is being reported here since it overlaps and preconditions the activities in Y III, primarily STEM roll-out and mentorship program and since it has been modified in terms of the number of trained STEM-PPDM trainers/mentors (initially planned number of 25 was increased to 73).

- Conduct intensive communication with trainers/mentors and provide them with support and guidance to ensure quality preparation and implementation of STEM teaching.
- Conduct 1 cycle (RS) and 2 cycle of the mentoring program to support teachers in selected schools to develop and improve skills and knowledge to teach STEM in 12 Model Schools.

### **Anticipated Results:**

- Ensure implementation of STEM program in model schools from 2018/2019 school year in the form of one STEM week, trimester and later a whole school year
- STEM program fully implemented, for 2 academic years (2018/2019 and 2019/2020) in the 7 Model primary and secondary schools in Canton Sarajevo and Herzegovina-Neretva Canton, Federation BiH Entity and Brcko District by 100 trained PPDM-STEM teachers for 2000<sup>20</sup> primary and secondary students
- STEM program implemented for one semester (2<sup>nd</sup> school semester I academic 2019/2020 year) in the 5 Model primary and secondary schools in RS by 92 trained STEM teachers for 1840 primary and secondary students

**Anticipated Activity Timeframe:** September 2019 – June 2020

### **Activity Outcome/Output 1.2**

#### **Establishing cooperation and partnership with 3 universities in BiH and providing them with STEM and PPDM materials**

With continuing cooperation from three STEM faculties (Faculties of Natural Sciences and Mathematics in Sarajevo, Banja Luka and Mostar), implementation of STEM programs (undergraduate and graduate) will continue and will serve as an entry point and as Career Orientation Centers for secondary and university students to STEM industries and businesses. The three STEM related faculties will provide best practices for effectively integrating PPDM-teaching methods into pre-service instruction for future STEM teachers. Student teachers will be taught with a PPDM-centered teaching modality (versus the traditional and *ex-cathedra* teaching style still predominant at the pre-service level in BiH), which should better prepare them to bring these methods into classrooms.

The three STEM related faculties will, through their engagement with STEM model schools, actively promote and encourage enrolment of secondary school students in STEM universities.

#### **Activity Inputs:**

- Integration of PPDM Standards into regular teaching-model area. Canton Sarajevo already made the decision to make the shift and this was MoE published in Official Gazette in 2018, thanks to ENABLE Project.
- Facilitate cooperation between STEM universities and STEM model schools where faculties will implement structured and direct work with Model Schools. Facilitate cooperation

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between private sector/businesses and STEM model schools where faculties will implement structured and direct work with STEM companies.

### **Anticipated Results:**

- Three STEM faculties function as STEM university centers that promote STEM to academia, the business sector and lower level education (primarily secondary students) Establishment of joint STEM-PPDM undergraduate and graduate programs at the selected (and possibly other) STEM universities Boosted enrollment rate of 20% of secondary students (150 out of 750 secondary level students per Secondary /Gymnasium Model School) to STEM universities
- Traditional teaching style and methods increasingly replaced with student-centered and student-engaged teaching
- Greater development and connection between pre-service and in-service education
- 20% (696 students out of 3480 in total) of all students from 12 selected schools will change their perspective about STEM.

**Anticipated Activity Timeframe:** September 2019 –June 2020

### **Activity Outcome/Output 1.5**

#### **Continue cooperation with technological park/center**

INTERA and Save the Children will continue their strategic relationship in 2019/2020. INTERA TP will deploy and offer their technical and service capacities in STEM education to the educational professional community to increase teachers' capacities for providing STEM education for 280 students throughout the ENABLE Phase II Project (school year 2019/2020). Intera Technological Park Mostar will develop and increase the knowledge and skills of youth in STEM through the newly established INTERA Youth STEM Center (established in the Centre for Technical Culture in Mostar facilities) thus contributing to the expansion of STEM into a non-formal learning setting. The financial partnership with the established Technological Park (EXIT/Robokids Banja Luka) was suspended earlier this year because audit findings showed the partner to be overcommitting and under delivering in addition to other irregularities. However, because their commitment to children and youth in science remains strong, ENABLE will capitalize on its investment and past partnership to work with them while ENABLE directly procures inputs for planned activities. This will allow ENABLE to leverage its investment in EXIT/Robokids and strengthen their capacity to deliver activities in the future.

In addition, ENABLE BiH will utilize Centers of Excellence situated in Faculties for Natural Science and Mathematics in Banja Luka, Mostar and Sarajevo to provide additional support (practical application of STEM knowledge/competencies) to students and teachers from all 12 model schools. For example, in collaboration with the Center of Excellence Banja Luka, the ENABLE BiH team will support two Model Schools (Bijeljina and Ilidza) as hosts of the Mobile Planetarium project. In collaboration with the Center of Excellence in Mostar, the ENABLE Team will support the Day of Open Doors event, where the INTERA TP as well as all three local model schools are invited to participate.

### **Activity Inputs:**

- Implement 21 STEM courses at the technological parks
- Identify and include a minimum 280 children from vulnerable groups in STEM extra-curricular courses
- Promote STEM among the target audience – children, parents, teachers, educational institutions and private sector
- Establish cooperation between technological parks and private companies (at minimum 6 out of 27 planned) with the aim of organizing STEM fairs and competitions to demonstrate real-life STEM applications
- Establish connections and cooperation among technological parks, 12 STEM model schools and three STEM faculties for the purpose of exchanging good practices

### **Anticipated Results:**

- Greater outreach to and participation of children in STEM out-of-school programs and extracurricular activities
- Students' STEM skills and competences improved through STEM projects. Students gain relevant and applicable knowledge in STEM through hands-on experience and the opportunity to immediately test theoretical knowledge in practice and develop new skills through practical application.
- Increased interest of children and students in STEM subjects, contributing to increased enrollment in STEM faculties and pursuit of careers in STEM industries<sup>21</sup>
- STEM education and careers promoted through public activities that will bring together STEM related professionals, students from the secondary and university levels, parents and private companies
- Awareness of the importance of STEM for a knowledge-based economy raised among these key target audiences and increased interest in involvement and/or investment in STEM areas and industries

***Anticipated Activity/Timeframe:*** September 2019 – September 2020

### **Activity Outcome/Output 1.6**

#### **Establishing cooperation and partnership with leading STEM companies in BiH**

Establishing cooperation and partnerships with STEM companies (originally a Y3 outcome/output) will continue in Y4. ENABLE will explore how to supplement school and university education with real-life STEM opportunities. ENABLE will engage 27 leading STEM companies in or nearby the selected model areas and will provide students with opportunities to attend internship / traineeship programs. Students will also participate in practice-visits gaining practical experience in STEM industries.

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<sup>21</sup> For this project year it is expected that the interest will be increased initially, but more substantial interest increase is expected in academic 2019-2020. It is expected that the Impact Analysis will show increased interest and affinity to STEM as it is the main objective of the research and analysis.

The graduate students from the STEM faculties in Banja Luka, Sarajevo and Mostar will be tapped to facilitate the partnership between the STEM model schools and companies. The graduate students will work to implement STEM projects and develop internship programs for students. Selected graduate students will be supported by SC and the Technological Parks as they build these much needed learning opportunities and private sector relationships.

Specifically, in 2019/Y3, Save the Children started communication with STEM companies in B&H and initiated cooperation and education partnerships with several including Violeta d.o.o. Grude, BIT Alliance (representing 55 IT companies, BiH level) and AS Holding Group (representing 12 companies etc. BiH level). In Y4, Project will strengthen these activities and embark on new partnerships with more student education visits and internships. New private sector partnerships could include: Bimal Brcko, Oil Refinery Modrica, Bosnalijek, PE Elektroprivreda of B&H, Telemach, Al Jazeera etc.

### **Activity Inputs:**

- Continue to identify, rank and select STEM partnership companies
- Implement internship / apprenticeship programs at the companies in cooperation with schools, and STEM universities
- Provide 180 pupils and students with opportunities to complete internship/apprenticeship at the partner STEM companies to provide professional/work experience and insight into the industry. Concrete tasks and projects will be mutually beneficial for both the students and the company
- Organize STEM fairs and competitions in cooperation with partner companies, schools and STEM universities

### **Anticipated Results:**

- Promote cooperation among the business, non-profit and public /education sectors<sup>22</sup> including more and stronger private sector partnerships established in Y4.
- School and university students provided with real-life opportunities to apply and test their knowledge, skills, and competences through internships/apprenticeships
- School and university students informed about the STEM job market at an early stage of their education
- Contributed to the motivation of students to consider STEM as their future vocational and professional choice and improve their employability and marketable skills
- The selected companies take part in STEM fairs and competitions and further promote the STEM market and career opportunities

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<sup>22</sup> Save the Children will continue to establish cooperation and sign MoUs with STEM relevant companies where students from the model schools will complete their internship/traineeship/daily visits. The MoS will be multipartite between SC (as non-profit sector), model schools/universities (as public/education sector) and companies (as business sector). The universities will continue to facilitate communication between companies and schools/students and will provide support in designing internship programs that will be mutually beneficial for schools/students and companies.



**Anticipated Activity Timeframe:** October 2019 – July 2020

To ensure the above mentioned activities are completed, the ENABLE team is receiving support from the internal MEAL team throughout the entire year – see table below.

**A. Internal Evaluation Methodology**

<b>ACTIVITY</b>	<b>DUE DATE</b>	<b>RESPONSIBILITY</b>
Finalizing tools (completed)	25. October 2019	MEAL Coordinator
Revision of methodology and tools (completed)	22. January 2020	ENABLE project team
Preparation of official letters for the Ministries of Education and Science	06. March 2020	MEAL officer
Methodology submitted to relevant ministries	13. March 2020	MEAL officer
Administrative preparations	TBD	MEAL Officer / ENABLE team
Field Work	06-17. April 2020	MEAL Coordinator and Officer
Data analysis	01. May 2020	MEAL Coordinator
Report - First draft	15. May 2020	MEAL Coordinator
Final Report	22. May 2020	MEAL Coordinator

Additionally, the internal SC MEAL team conducted a meeting with the CDESS (also referred to as CREDI) researchers on the 29<sup>th</sup> of October with the attendance of the ENABLE BiH team. A follow up meeting is scheduled on the 23<sup>rd</sup> of March 2020.

**B. Activity Management**

**I. The ENABLE-BiH Project Team**

The ENABLE Phase II management approach will continue to feature a small secretariat team comprised of the full-time ENABLE-BiH Project Manager and the Project Coordinator, supported by a fulltime Project Assistant. The secretariat team will convene the multisector/multilevel Project Advisory Board (PAB) for ENABLE Phase II and serve as the primary liaison with USAID/BiH and key government partners and collaborating partners, universities, and related business sectors. The PAB included 16 members of the key educational institutions who have acted as champions of reform, allowing for STEM and PPDM to be scalable and applicable for the entire country.

The Project Manager will be responsible for overall project implementation, technical oversight, and supervision of Project Coordinator and Project Assistant, as well as coordination with stakeholders. She will coordinate the inputs and participation of the expert local and international consultants and be responsible for preparation of all reports, work plan preparation and implementation, and regular communication with project staff. She will provide

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appropriate information required for review of project implementation and coordinate M&E activities with responsible staff. Reporting to the Project Manager, Project Coordinator will coordinate day-to-day activity implementation, including logistics and timely preparation of activities, procurement of goods and services, communication with other staff, and facilitation. Project Manager and Project Coordinator will receive support in logistics and administrative tasks from a Project Assistant (engaged at 70% LoE). The secretariat team, housed within the SC BiH office in Sarajevo, will be supported by SC's Country Office senior leadership, technical expertise in education area, finance, advocacy, media/communications, MEAL, and procurement teams already in place, with years of experience with SC and institutional donors including US government. In this way, ENABLE-BiH Phase II will benefit from SC's operational and technical platform, while maintaining cost-effective day-to-day project management and coordination.

The ENABLE BiH Assistant provides logistics and administrative support to the ENABLE BiH Project Manager and ENABLE BiH Specialists throughout the life of the Project. ENABLE BiH Assistant will be responsible for handling procurement, contracts (travel costs coverage, experts, consultants), correspondence, preparation of payment orders and other administrative and logistic requirements that may arise during project/activity implementation.

The ENABLE BiH team will also be supported and provided with necessary guidance by SC's Country Office Senior Management Team and its technical and operational expertise in regards to education areas, finance, advocacy, media and communication, monitoring and evaluation, and procurement if needed. **Additional support in Y4 will be provided by SC/US BE Advisor and Awards Manager as needed.**

### **Activity Inputs:**

- Daily implementation and technical oversight of all activities and sub-activities
- Coordination and communication with relevant MoEs, Pedagogical Institutes, model STEM schools, universities, technological parks and companies
- Coordination and communication with a wider audience of relevant institutional and individual stakeholders and associates from various sectors primarily education and business sector Quarterly and annual narrative and financial reporting in compliance with the procedures and deadlines stated in the Cooperative Award Agreement
- Organization and coordination of media activities and appearances
- Preparing success stories and/or good-practice cases

### **Anticipated Results:**

- Activities and sub-activities implemented in accordance with the Annual Work Plan and M&E Plan
- Foreseen Activity outcomes/outputs achieved
- Foreseen Activity purpose and sub-purpose fulfilled
- Timely communication with the donor, when/if challenges arise

**Anticipated Activity Timeframe:** September 2019 - September 2020

## 2. Partnerships and Collaboration Strategy

### 2.1. Project/Activity partners and associates

The table below outlines the partners and associates that take part in ENABLE-BiH sub-activities, their roles and the advantages of their engagement in the Activity implementation.

#### I. Institutional Partners

Organization	Role	Advantage
Save the Children (for North West Balkans) – Lead Agency	<ul style="list-style-type: none"> <li>Overall Activity management and leadership; communication with and coordination among the Activity relevant stakeholders; conducting all necessary procurement procedures related to the Activity; organizing and overseeing all sub-activities and/or public events</li> <li>Ensuring compliance with all terms and conditions of the award.</li> <li>Ensure high standards of technical and managerial quality</li> </ul>	<ul style="list-style-type: none"> <li>9 years active and extensive engagement in pivotal education reform processes led by APOSO.</li> <li>Only I(NGO) fully involved in reform process focus on quality of education (<b>2010</b> – Creation of 5-year Strategic Plan with implementation plan of APOSO; <b>2012</b> – Analysis of the curricula for primary education in the RS; <b>2013-2015</b> – Implementation of LO for Literacy in Zenica-Doboj Canton; <b>2014-2015</b> – Supporting the APOSO in defining and adopting LO for mathematics)</li> <li>Active cooperation with other BiH (I) NGOs in education-focused projects (<b>2009</b>– supporting APOSO during creation and presentation of Secondary Analysis of TIMSS 2007 Study; <b>2010</b></li> <li>Defining Quality Standards for Preschool Education and Upbringing in BiH; <b>2010-2012</b></li> <li>Supporting the APOSO in defining LO for literacy)</li> </ul>
Save the Children Federation Inc/US	<ul style="list-style-type: none"> <li>Providing input and consultations as needed on the Activity and sub-activities, particularly in regards with narrative and financial reporting towards the USAID in</li> </ul>	<ul style="list-style-type: none"> <li>A global leader in humanitarian and development programming worldwide</li> <li>Working as a preeminent voice for children with governments, civil</li> </ul>

(main applicant)	accordance with the terms and conditions of the Award	<p>society and private sector partners for over 80 years</p> <ul style="list-style-type: none"> <li>• Has worked in BiH since 1996 implementing programs and assistance funded by a number of donors</li> <li>• SC's office in BiH has extensive experience in managing and implementing development programs in cooperation and partnership with government institutions</li> <li>• Strong technical expertise of staff and wide range of strategic partnerships with authorities and CSOs engaged in key reforms</li> <li>• Applies participatory approach and contextual understanding to implementation of all projects and activities</li> </ul>
Ministry of Civil Affairs of BiH	<ul style="list-style-type: none"> <li>• Providing recommendations for the adoption and application of the OTC for STEM proficiencies based on CCC and PPDM Operational Standards and Guidelines to relevant institutions and lower-level administrative units</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination body among BiH educational institutions</li> <li>• Signed MoU with SCNWB in 2016 on improvement of quality of education and equal access for all children in BiH and educational reforms in BiH</li> </ul>
MoE of the Sarajevo Canton, Herzegovina-Neretva, Canton, the RS, and Department for Education of the Brcko District	<ul style="list-style-type: none"> <li>• Signatories of Memorandums of Understanding for the implementation of STEM in model schools along with Pedagogical Institutes and schools</li> <li>• Ensuring implementation of STEM in model schools</li> </ul>	<ul style="list-style-type: none"> <li>• Key institutions for all educational policies and strategies for preschool, primary, secondary and university education</li> </ul>

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<p>Agency for Pre, Primary and Secondary Education (APOS0)</p>	<ul style="list-style-type: none"> <li>• Providing institutional guidance and recommendations on integration of STEM into regular education</li> <li>• Providing guidance on the revision of the curriculum so as to align them with learning outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Close cooperation with SCNWNB for the last 12 years</li> <li>• Partnership with SCNWB in defining SLO in mathematics</li> <li>• APOS0's priority focus on operationalization of teaching curricula for mathematics based on SLO of the Common Core Curriculum-Support to creating standards and guidelines for teacher education across BiH universities in the views of SLO</li> </ul>
<p>Agency for Development of Higher Education and Quality Assurance</p>	<ul style="list-style-type: none"> <li>• Providing institutional guidance and support on how to integrate PPDM documents into the university teaching curriculum</li> <li>• Promoting teaching methods within the subjects related to PPDM</li> <li>• Identifying the existing modules to which new methods can be integrated and recommending this integration</li> </ul>	<ul style="list-style-type: none"> <li>• The primary purpose and mission of the HEA is establishing and ensuring continuous development and enhancement of quality standards of higher education in BiH</li> <li>• Competent to set clear norms for minimum standards in the field of higher education</li> <li>• Competent to give recommendations to the MoE of RS, cantonal ministries and the Brcko District on criteria and standards for higher education as well as restructuring criteria</li> </ul>
<p>Faculty of Philosophy in Sarajevo, Zenica, Banja Luka and Tuzla</p>	<ul style="list-style-type: none"> <li>• Providing institutional guidance and support on how to integrate PPDM documents into the university teaching curriculum</li> <li>• Promoting teaching methods within the subjects related to PPDM</li> </ul>	<ul style="list-style-type: none"> <li>• Main institutions in BiH for educating pedagogues, psychologists and language teachers</li> <li>• Participated in a number of international and local projects aimed at improving teaching practices and methodologies</li> </ul>
<p>The School of Natural Sciences and Mathematics of the University of Sarajevo, Banja Luka and Mostar</p>	<ul style="list-style-type: none"> <li>• Serving as STEM centers of excellence</li> <li>• Promoting STEM to relevant and target audiences</li> <li>• Working on establishment of STEM Master or PhD programs</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct a range of study programs in different scientific areas</li> <li>• Educate pre, primary and secondary-teaching staff in science subjects</li> <li>• Main institutions in BiH that educate primary school teachers of mathematics, science and IT (from 6<sup>th</sup> to 9<sup>th</sup> grade)</li> </ul>

		<ul style="list-style-type: none"><li>• Educate general secondary school and vocational school teachers of these subjects</li></ul>
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Finally, regular and intensive engagement of the government institutions and their representatives is pivotal for building local ownership from the beginning, forming a foundation and paving a way for systemic change in the education field. Only this ongoing engagement will ensure sustainability and the continuation of the Activity outcomes. Finally, this partnership strategy is fully aligned with long-standing practices and philosophy of work of SC, i.e. establishing strategic partnerships with key state institutions and government agencies that have expert capacities and are mandated to lead reform processes.

### **III. ANNEXES**

## Annex I Tabular Overview of Year 4 Project Activities

Activity	Sub-activities	Year 4													Remark		
		1	1	1	2	3	4	5	6	7	8	9	10	11		12	13
		Jul	Aug	Sep	Oct	Nov	Dec	Jan 2019	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
<b>ENABLE BiH PHASE II</b>																	
Replication of the ToT in selected model areas	Preparation of the programs and materials for replication of ToT for 192 teachers in 12 selected areas/12 schools																After this period implementation of STEM will continue without mentors' support as the teachers will be capacitated to implement STEM on their own
	Conducting replication trainings in 12 schools for 192 teachers																
	Matching STEM Trainers/Mentors with selected schools to support implementation of STEM Curriculum																
	Conducting one-year mentoring program to support teachers in selected schools to develop and improve skills and knowledge to teach STEM																Trained and educated teachers will provide STEM education to 3840 children
	Roll-out of the STEM program at schools continued																
Equipping of STEM model schools	Procurement and distribution of STEM tools, equipment and materials to 12 selected model schools																The equipment is critical to support up-to-date and modern STEM classes
Establishing cooperation and partnership with 3 universities in BiH and providing them with STEM and PPDM equipment and materials	Procurement and distribution of STEM and PPDM equipment, tools and materials to selected university partners																The Universities are to include university of Sarajevo, Banja Luka and Mostar. The activity will contribute to improvement of the initial/preservice education in STEM/PPDM
Public event / conference to present developed draft STEM and PPDM documents	Finalizing design, corrections and printing of the STEM and PPDM documents and organizing public event /conference to present the STEM and PPDM documents to wider relevant audiences																All relevant stakeholders (educational authorities, academia, business sector) informed on STEM and PPDM policy framework
Establishing cooperation with two technological parks/centers	Procuring equipment, tools and materials to support work of the technological park and provision of STEM courses for children																STEM courses provided at technological park will supplement formal STEM education and enable practice-exchange between formal and informal sector and provide access to informal courses to socially disadvantaged children
	Development of new STEM courses by the technological park and/or revision and improvement of the existing courses																
	Implementation of STEM courses by the technological park																
Establishing cooperation and partnership with twelve STEM leading companies in BiH	Identification of the STEM companies and signing MoUs with them																Traineeships/internships will enable pupils and students acquire hands-on experience at work, help their career orientation and foster links and better harmonization between education sector and labor market
	Developing internship/apprenticeship programs at the companies in cooperation with schools and SCI																
	Providing pupils and students with the opportunities to complete internship/apprenticeship																
	Organizing STEM fair and competitions in cooperation with partner companies																



## Annex II Collaboration Strategy

Along with the above listed key partners and associates, the project has foreseen collaboration and/or synergy with (I)NGOs and other organizations implementing educational or thematically relevant projects.

Potential collaborators include, but are not limited to, the following:

Project/ organizations	Advantage	Collaboration strategy
OSCE Mission to BiH	<ul style="list-style-type: none"> <li>• Education is central to the work of OSCE BiH and its field operations</li> <li>• It focuses on education reform; establishing learning outcomes and standards; improving school management; reducing ethnic-based division and other forms of exclusion etc.</li> </ul>	To be kept informed on the ENABLE-BiH Activity progress, sub-activities and purposes in order to identify and utilize opportunities for synergy of the project activities
British Council BiH	<ul style="list-style-type: none"> <li>• Engaging high-school students, teachers, employees of government agencies and ministries in an array of educational projects and initiatives (“Global Going”; “Connecting Classrooms”, “Active Citizens”, “Schools for the 21<sup>st</sup> Century,” “Digital Cities”, “New Technologies in Education”)</li> </ul>	Same as above (SAA)
Council of Europe in BiH	<ul style="list-style-type: none"> <li>• Implementation of education projects (“Regional Support for Inclusive Education”; “Strategic Development of Higher Education and Qualification Standards in BiH 2013 – 2015.”)</li> </ul>	SAA
Open Society Fund BiH	<ul style="list-style-type: none"> <li>• Implements projects, and advocacy activities and conducts research focused on quality, equal, accessible and inclusive education (“Good Practices in Education”, “Školegijum” etc.)</li> </ul>	SAA
CIVITAS BiH	<ul style="list-style-type: none"> <li>• 20-year work experience in BiH</li> <li>• Runs educational programs in the area of pre, primary, secondary and university education</li> <li>• Implements projects focused on both formal and informal education</li> </ul>	SAA

<p>Center for Educational Initiatives “Step by Step”</p>	<ul style="list-style-type: none"> <li>• 22-year work experience in BiH</li> <li>• Runs educational projects related to professional development of teachers, improvement of education quality as well as promotion and of social justice principles and values</li> <li>• Publishes different educational publications, expert books, teachers’ manuals, analyses and reports</li> </ul>	<p>SAA</p>
<p>Association for Advancement of Science and Technology</p>	<ul style="list-style-type: none"> <li>• Work on improvement of education system quality</li> <li>• Work on improvement of conditions for quality scientific research</li> <li>• Work on and promote the usage of advanced technologies for industry strengthening</li> <li>• STEM camp organization</li> </ul>	<p>SAA</p>

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## Annex III Expert Working Groups for STEM and PPDM

The local and international<sup>23</sup>STEM and local PPDM expert teams include the following experts /university professors:

**“XXX” (Expert in Biology)**, Associate Professor in fields of Botany and Molecular Biology at the Department of Biology, Faculty of Science University of Sarajevo. She holds a PhD in Biology-research fields Plant Molecular-Cytogenetics and Plant Phylogeny / MSc in Biology-Plant Systematics / BSc in Biology Education, and has published in (co)authority 118 scientific publications: 11 books, 34 scientific papers and 73 conference proceedings. “XXX” has 17 years of experience in University teaching and researching for different fields of Biology (teaching and researching assistant (1999-2008), assistant (2008-2011), associate professor (2011-present)). As an Associate Professor in fields of Botany and Molecular Biology, she teaches the following courses: Plant morphology, Systematics of higher plants, Plant resources, The Methodology of Scientific Research, Palynology, Molecular cytogenetics of plants, Diversity of species, genes and ecosystems. She is the Head of Department of Biology for the last four years, member of IAPT (International Association for Plant Taxonomy), and of the Bioethics Society of BH, the Weed Society BH, and the Association for the Promotion of Balanced Development and Quality of Life – “FONDEKO”. She has also reviewed a few university handbooks and manuals and a significant number of scientific papers for different scientific journals.

**“XXX” (Expert in Biology)**, Associate Professor in Molecular Biology and Molecular Evolution at the Department of Biology, Faculty of Science, University of Sarajevo. This university professor has 21 years of teaching and experimental experience in Biology, mostly Molecular and Cell Biology as well as Biochemistry. This Associate Professor finished a Marie Curie Research Training Network, Postdoctoral Research/Study (Marie Curie Fellowship) and holds a PhD in Biology - Molecular and Cell Biology / Msc in Biology - Molecular and Cell Biology / BSc in General Biology & BSc in Biology Education. “XXX” is Vice dean for International Relations and Quality Control, and is the Autecology national expert for bat species (Chiroptera) and the European expert for subterranean habitats (IPBES). This researcher has published more than 100 scientific papers: books (33), chapters and textbooks (20), manuals (4) and conference proceedings (63) and has extensive experience in teaching a variety of biology courses in a few universities in Croatia, Germany and BiH.

**“XXX” (Expert in Physics)**, Professor Emeritus, Sarajevo School of Science and Technology (SSST) holds a PhD in Physics “Topographic Changes on Metallic Surfaces Induced by Ion Bombardment” / Master in Technical Physics “Sputtering Effects of Metallic Single Crystals Induced by Inert Gas Ions” / Bachelor in Physics “Physics Laws and Information Theory”. “XXX” spent most of her working years (from 1971 until the present) in the education sector, teaching or organizing new forms of curricula. From 1971 to 1991, she taught in different capacities - from Teaching Assistant to Full Professor - courses in General Physics and Solid State Physics at the Electrical Engineering Faculty of the University of Sarajevo. From 2001 to 2013, she taught various courses in physics at the Physics Department of the Faculty of Science at the University of Sarajevo (General Physics, Atomic and Nuclear Physics, Solid State Physics, Biophysics, Experimental Methods in Modern Physics, Medical and Radiological Physics). For the past three years (since 2014), as Professor Emeritus, she has been teaching Medical Physics and Biophysics and Application of Modern Physics in Medicine at the Medical Department of the Sarajevo School of Science and Technology.

**“XXX” (Expert in Mathematics)**, Associate Professor of Mathematics at the International University of Sarajevo. She holds a PhD in Pure Mathematics - “Univalence Criteria for Analytic Functions” / MSc in Mathematics / BSc in Mathematics. “XXX” has a wide range of experience in

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teaching and research in both Bosnia-Herzegovina and the United States. Over the past 20 years she has taught at three large universities in the US (Michigan, University of Texas and Penn State-Berks campus) as well as at the University of Sarajevo and three private BH universities. For the last five years she has been teaching at the International University of Sarajevo with a full range of courses over the years from Freshman Calculus, Mathematics for Teachers, to engineering courses in Linear Algebra, Probability and many others, to graduate courses in Complex and Functional Analysis. She participated in training elementary and high school teachers both in the US and here in Bosnia. She is a member of the Editorial Board of the Sarajevo Journal of Mathematics.

“XXX” (**Expert in Mathematics**), Full Professor of Mathematics at the School of Economics and Business Sarajevo. She holds a PhD in Mathematics / Msc in Mathematics / BSc in Mathematics. “XXX” is an expert for establishing the standards on learning achievements, evaluating the achieved results and developing the common core curricula in preprimary, primary and secondary education at the Agency for Pre-Primary, Primary and Secondary Education (since 2003). She is a member of the American Mathematical Society and the B&H Mathematical Society. She is a teacher of Mathematics at the high school level and is co-founder and co-head of the “International Math School 2+2”. She is also Head of the PhD programme at the School of Economics and Business. “XXX” participated in various research projects involving international cooperation and published a number of research papers.

“XXX” (**Expert in Mathematics**), Full Professor at the Department of Mathematics, Faculty of Science, University of Sarajevo. He holds a PhD in Mathematics / Msc in Mathematics / Postgraduate studies in Philosophy / Postgraduate studies in Mathematics / BSc in Mathematics. “XXX” has been a Full Professor at the University of Sarajevo, Department of Mathematics since September 1993: Rector of the University of Sarajevo (2012-2016), Dean of the Faculty of Sciences in Sarajevo (1992-2000), Professor at the University of Maryland College in Europe (1999-2002), Head of postgraduate studies in Mathematics, University of Sarajevo (1991-2013), Associate Professor, University Dzemal Bijedic Mostar, Faculty of Civil Engineering (Sep 1987- Aug 1990), Associate Professor, University of Sarajevo, Department of Mathematics (Sep 1990- Aug 1993). He teaches several courses: Analysis I, Analysis II, Mathematics for Engineers, Mathematics for Economists, Statistics, Introduction to Set Theory and Topology, Elementary Number Theory, Mathematical Foundations of Computer Systems, Computer Science, History of Modern Mathematics, Philosophy of Mathematics and Natural Sciences.

“XXX” (**Expert in IT and Engineering**) is Head of the Study Program Mathematics and Informatics at the Faculty of Science, University of Banja Luka. He has 16 years teaching experience at the Department of Computing and Informatics, and holds a doctor of mathematical science with PhD topic: "Solving some problems in teaching using combinatorial optimization methods" Additionally, he is a software development expert and an e-learning expert with many years of experience in the implementation of local and international projects in the field of education and information technologies. Currently in the election phase for the member of the Council for the Development of Higher Education and Quality Assurance within the MoE and Culture of RS, “XXX” possesses high level of knowledge in various mathematical fields, including theoretical and applied mathematics and knowledge of STEM approaches. He has multi-year experience in software development, in program and managerial positions. Combined with the concept of electronic education, he participated in several local and international projects in the field of improving the quality of education and improvement of the IT sector and has been actively involved in a number of working bodies for the modernization of curricula from mammography and informatics for elementary and high school in RS.

**The Local PPDM expert team includes three experts:**

“XXX” (**Expert in Psychology and Pedagogy**), Associate Professor for Measurement in Psychology, Organizational Psychology and Applied Psychology for Teachers at the Department of Psychology, Faculty of Philosophy, University of Sarajevo. She also works as an Associate Professor at

the Faculty for Mathematics and Natural Sciences, University of Sarajevo; an Associate Professor at Academy of Art, University of Sarajevo; an Associate Professor in the Centre for Interdisciplinary Studies, University of Sarajevo; and an Associate Professor in Additional Training for Pre-University Teachers (Learning outcomes, Assessment and Evaluation). **“XXX”** is the President of the Psychological Association in Federation of BiH and the President of Psychological Association in BiH. She is a member of the curriculum development working group for the Department of Psychology- undergraduate, graduate and doctoral studies. She conducted analysis and preparation of the Strategy for Education 2017- 2022 for primary education as a member of the working group formed by the MoE, Science and Youth in KS, 2016. She was involved in the development of Guidelines for Career Guidance in primary and high schools, as an Expert for the MoE and Science FBiH, 2016. **“XXX”** was involved in the evaluation of programs for basic education and the development of standards for teachers’ profession, guidelines for teacher training, development of Common Core Curriculum for Humanity and Social Sciences for primary and high schools, Common Core Curriculum for Cross-curricular and Intersubject areas for primary and high schools, and guidelines for implementation of Core Curriculum for Cross-curricular and Intersubject areas. She also prepared and conducted the research “About learning 2016” to identify and explain the value pupils place on education and learning, and conducted a need analysis of preschool teachers for continuous professional development and mapped the key competencies in education system in BiH.

**“XXX” (Expert in Psychology and Pedagogy)**, Professor at the Department of Psychology and Teacher Education, Faculty of Philosophy, University of Banja Luka. She teaches several scientific groups of subjects: Educational psychology, School psychology, Evaluation of knowledge and learning outcomes, Psychology of learning and teaching, Children with special needs and education. “XXX” is a member of the team who designed the curriculum for the Department of Psychology, Faculty of Philosophy and she is a Psychotherapist for children, youth and adults. She is a member of the Association of Psychologists in the RS and a member of the Association of Cognitive Behavioral Therapists. She conducted analysis of teaching study curriculums as part of the “Development of Qualifications Framework for General Education” project by the- British Council and the Analysis of the frequency of subjects in teaching study curriculums that develop competence of teachers for inclusive education by the the Center for Interactive Pedagogy, CIP Beograd, Evaluation of programs for basic education. She was a leader of the expert team for monitoring the revision of the curriculum for primary schools in RS.

**“XXX” (Expert in Teaching Methods and Didactics)**, Assistant Professor at the English Language Department (Teacher Education Program) at the Faculty of Philosophy, University of Sarajevo. She holds a PhD in Education Sciences (Thesis: Intercultural Communicative Competences of English Language Teachers and Students in Sarajevo Canton) / Msc in International Development and Education / BSc in English Language and Literature Teaching.” XXX” is an Assistant Professor of Language Didactics and Teaching Pedagogies in Foreign Language Education, of Early Primary Methods for Teaching Languages, of Secondary Teaching Methods for Languages, of Intercultural and Peace Education, of Practice Teaching, and of Action Research in Education at the Faculty of Philosophy of the University of Sarajevo (Department of English Language Teaching) and at Sophia University in Tokyo, Japan (Department of Education). She is a member of professional bodies - CREATIVUS: Youth Center for Communication and Creative Learning, Sarajevo, BiH, Chair of Board of Directors / SIETAR Japan: Society for Intercultural Education, Teaching, and Research. Tokyo, Japan, Society member / President of the Committee for Standardized Testing for English Language in the 9th Grade, MoE of Sarajevo Canton, University member, 2015 / Committee Member and Main Examiner for Teaching Pedagogies and Teaching Methods for English Language Teaching Licensing Examination in Primary and Secondary Schools MoE, Sarajevo Canton, 2009- present. She is also a Kingian Nonviolence, University of Rhode Island, International Network of Nonviolence Trainers, Certified International Trainer.



## **Annex IV STEM Roll-Out Overview**

*This Annex provides an overview of the proposed activities and process for implementing the STEM roll-out in 12 model schools. The goal of this Annex is to provide additional details explaining the specifics of the STEM roll-out and to supplement the content of the 2018-2019 Work Plan as an example that will be updated and adapted for academic year 2019/2020.*

During 2019, the project team conducted a series of technical and consultative meetings with Ministries/Departments of Education, management of STEM model schools, STEM-PPDM trainers-mentors and teachers in STEM model schools to finalize the modality and frequency of the STEM roll-out. These meetings were used to finalize STEM Implementation Plans on how STEM will be taught in schools as well as the frequency and density of the lessons. These meetings also clarified and ensured agreement on the coordination and communication modality (i.e. introduce coordination teams that will include representatives of the Ministry/Department of Education, model schools' management, ENABLE-BiH team members and two trainers/mentors). The STEM-PPDM trainers/mentors continued to hold mentoring and advisory meetings with teachers in model schools and worked on filling in the Implementation Plan.

The tables below are snapshots of the hours in formal education as set by the Ministry and the percentage that STEM will be integrated throughout project duration. The last section SUM I-III detail the calculations for both implementation years and previous academic 2018/2019 to this academic year 2019/2020, increasing from 10% to 20%.

### First Triad (Years I - III)

Subject	Year I			Year II			Year III			Sum I - III			
	GFS	Min. 10%	Optimum 20%	GFS	Min. 10%	Optimum 20%	GFS	Min. 10%	Optimum 20%	GFS	Initial 10%	Interim 15%	Optimum 20%
Mathematics	68	7	14	140	14	28	140	14	28	348	34	52	70
My environment	68	7	14	70	7	14	70	7	14	208	21	31	42
Informatics	34	3	6	35	3	6	35	3	6	104	9	13	18
<b>Total</b>	<b>170</b>	<b>17</b>	<b>34</b>	<b>245</b>	<b>24</b>	<b>48</b>	<b>245</b>	<b>24</b>	<b>48</b>		<b>64</b>	<b>96</b>	<b>132</b>
<b>Weekly average</b>		<b>1,7</b>	<b>3,4</b>		<b>2,4</b>	<b>4,8</b>		<b>2,4</b>	<b>4,8</b>		<b>6,6</b>		<b>13,2</b>

### Second triad (years IV - VI)

Subject	Year IV			Year V			Year VI*			Sum IV - VI			
	GF S	Min. 10%	Optimum 20%	GFS	Min. 10%	Optimum 20%	GFS	Min. 10%	Optimum 20%	GFS	Init. 10%	Interim 15%	Optimum 20%
Mathematics	140	14	28	140	14	28	140	14	28	420	42	63	84
My environment	70	7	14	--	--	--	--	--	--	70	7	10	14
Nature	70	--	--	--	--	--	--	--	--	--	--	--	--
Society	70	--	--	--	--	--	--	--	--	--	--	--	--
Geography	--	--	--	--	--	--	70	7	14	70	7	10	14
Biology	--	--	--	--	--	--	35	4	8	35	4	6	8
Informatics	--	--	--	--	--	--	35	4	8	35	4	6	8
Technical culture /	--	--	--	35	4	8	--	--	--	35	4	6	8



basics of engineering													
<b>Total</b>		<b>21</b>	<b>32</b>		<b>18</b>	<b>36</b>		<b>29</b>	<b>58</b>		<b>68</b>	<b>92</b>	<b>136</b>
<b>Weekly average</b>		<b>2,1</b>	<b>3,2</b>		<b>1,8</b>	<b>3,6</b>		<b>2,9</b>	<b>5,8</b>		<b>6,8</b>		<b>13,6</b>

### Third triad (years VII - IX)

Subject	Year VII **			Year VIII **			Year IX*			Sum VII - IX			
	GFS	Min. 10%	Optimum 20%	GFS	Min. 10%	Optimum 20%	GFS	Min. 5%	Optimum 10%	GFS	Min.	Interim 15%	Optimum
Mathematics	140	14	28	140	14	28	136	7	14	416	35	52	70
Geography	70	7	14	35	4	8	68	4	8	173	15	22	30
Biology	70	--	--	70	7	14	68	4	8	138	11	16	22
Chemistry	--	--	--	70	7	14	68	4	8	138	11	16	22
Physics	35	4	8	70	7	14	68	4	8	173	15	22	30
Technical culture / basics of engineering	--	--	--	70	7	14	--	--	--	70	7	10	14
Informatics	35	4	8	35	4	8	35	2	4	105	10	15	20
*Cooperation with companies	20	2	4	20	2	4	20	2	4	60	6	9	12
<b>Total</b>	<b>370</b>	<b>31</b>	<b>62</b>	<b>510</b>	<b>52</b>	<b>104</b>	<b>463</b>	<b>27</b>	<b>54</b>	<b>1288</b>	<b>110</b>	<b>16,5</b>	<b>220</b>
<b>Weekly average</b>		<b>3,1</b>	<b>6,2</b>		<b>5,2</b>	<b>10,4</b>		<b>2,7</b>	<b>5,4</b>		<b>11</b>	<b>1,65</b>	<b>22</b>

\*The reduced share / number of hours in Year IX is due to the cooperation with companies.

\*\* Additional focus on Years VII and VIII participating in the Impact Study