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Final Evaluation Report – Western Balkans

21st Century Schools Programme

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List of Most Frequent Abbreviations

BC	British Council
CSS	Control Sample Schools
CTPS	Critical Thinking and Problem Solving
ICT	Information and Computer Technologies
IT	Information Technologies
MSS	Main Sample Schools

Executive summary

In a context of new ways of work, digital innovation, and within an increasingly competitive knowledge economy, the countries of the Western Balkans are currently making efforts to improve their human capital resources. Promoting and fostering a competitive digital economy is now a top priority for Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia, and the role of education in providing the skills needed to achieve these aims is an essential precondition. As recognised by many international organisations and skills' forecasts, critical thinking and problem solving, and IT skills are the skills that will be most in demand in the labour market in the future. It is in this context that the British Council launched an ambitious Programme in 2018 to provide training to primary school pupils in the Western Balkans countries, in order to enhance their digital literacy and core transversal skills and help them take advantage of the new opportunities opening up in the digital economy. The British Council 21st Century Programme included a package of funding provision and capacity building activities across the countries of the Western Balkans. It had a budget of £10m and conducted over more than three and a half years and six training cycles from 2019 to 2022. The key aim of the Programme was to provide training activities to school leaders and teachers in critical thinking and problem solving (CTPS) and the application of IT skills, namely coding and programming using Micro:bit hardware provided by the UK government. The Programme also provided teachers with guidebooks, manuals and teaching materials.

This synthesis evaluation report presents the results of the comparative analysis; namely it focuses on the changes that happened during the implementation of the Programme by comparing the results of a baseline and an endline survey. Its aim is to measure the outcomes and outputs of the Programme, as set out in the Evaluation Plan based on the assumptions that underpinned the Programme Theory of Change. The purpose is to evaluate the effects of the Programme activities - related to the role of policymakers, school leaders, teachers, and pupils - on the Programme Outcomes and Outputs. These achievements are evaluated based on a set of Relevance, Effectiveness, Efficiency, and Sustainability criteria.

The **relevance** of the Programme is evident as the Programme aims were well aligned with the needs and priorities of the Western Balkan countries and their ongoing national education strategies and policy frameworks. The Programme was supported by policymakers and national ministries that established productive relationships with the British Council. An indicator of the relevance of the Programme has been the widespread inclusion of CTPS and coding in new curricula reforms and in educational policies and strategies throughout the region. The Programme has been especially relevant in relation to the increasing demand for CTPS and coding skills in all economies in the region as described above.

The **effectiveness** of the Programme has also been high. CTPS and coding have been introduced in the school curricula, though to a different extent. Here, an important enabling factor has been represented by the support given by school leaders to the Programme, enabling the implementation of effective coding clubs. Teachers have improved their knowledge and teaching practice of CTPS and coding, although the Covid-19 outbreak challenged the full effectiveness of the Programme implementation. Most importantly, the Programme has been effective for pupils. Given the traditional teaching systems of the Western Balkans, the Programme has contributed to challenging established ways of learning and teaching, exposing pupils to a critical teaching environment and fostering their interest in providing their opinions. Pupils' interest in coding has also increased, though to a varied extent (more so in Albania, Montenegro, North Macedonia and Serbia, but less so in Bosnia and Herzegovina and Kosovo). The Programme has been effective in supporting an increase in the application of CTPS teaching methods in classrooms throughout the region, and it has also been effective in promoting the teaching of coding, in a context of persistent structural challenges such as a lack of IT equipment in school, the limited availability of computers, and factors related to the teaching profession.

The Programme has also been **efficient** under a value for money dimension. Overall, 3,906 schools have been involved in the Programme, to which 100,526 Micro:bit devices were distributed.[1] Training was provided by 283 trainers to 3,690 school leaders (47% female) and 17,534 teachers (70% female) to improve their CTPS skills.[2] In addition, 19,752 teachers completed an online Micro:bit course to learn its use improve their coding skills. The project succeeded in establishing 2,294 coding clubs, involving 55,420 pupils (47% girls).[3] Given also the social, economic and geographical complexities of the Western Balkan context and the lack of IT specialists teachers, these results are remarkable.

The Programme also has the potential to be **sustainable** in the future. It has improved stakeholders' capability by developing the capacity of policymakers, school leaders, and teachers to support the uptake of CTPS and coding in their schools. Our survey shows that school leaders and teachers are rather confident that the teaching of CTPS and coding will continue in the future. In addition, the Programme has also created specific outputs, such as the teacher manuals or the Moodle platform that will be used well into the future. This is available in local languages and will be handed over to the ministries participating in the Programme and hosted on Government servers. Additional training materials and resources were developed to support teachers, such as a Coding Club Guide, a Best Practices Guide, and online textbooks for ICT teachers. All these resources should ensure that schools continue using Micro:bit after the end of the Programme end. Of course, more efforts are required at national level to improve the school environment in terms of funding provision and teachers 'professional conditions.

Outcomes of the Programme have been mostly achieved.

Outcome 3, that relevant decision makers create and implement curriculum and introduce other related policy measures to advance CTPS and coding skills learning in primary schools, has been successfully achieved. The evaluation target was that at least 70% of primary schools should have implemented compulsory or elective coding classes. Taking all the evidence from school leader and pupil surveys, it would appear that the target has been fully met in North Macedonia, Montenegro and Serbia; the target may also have been met in Bosnia and Herzegovina, and Kosovo, but this is not corroborated by evidence from the school leader surveys. The target does not yet appear to have been met in Albania.

In addition, the target of at least one new accredited teacher training course linked to the BC training initiatives has been met in each country of the region, with the exception of Bosnia and Herzegovina. As many as 10 such courses have been accredited in Serbia, with between 2 and 4 in other countries except Bosnia and Herzegovina, although this is likely to be introduced in the near future.

Outcome 2, that school leaders actively support the implementation of CTPS and coding skills at school level across the curricula was fully achieved in relation to CTPS and coding, but the support for coding has struggled against a difficult implementation environment. All school leaders ensured a transfer of CTPS knowledge to at least 3 untrained teachers in their school. School leaders also supported the creation and survival of coding clubs in their schools. Of the coding clubs that were established during the first and the second project year between 72% and 85% still existed by the end of the project, against a target of 70%. The final quarterly report of the British Council Programme stated that many schools in Albania and Kosovo lack proper computer labs or internet connection for the successful organisation of coding clubs. In Kosovo, schools in rural areas suffer from dilapidated school infrastructure, lack of heating, lack of IT equipment and internet access, and a lack of electricity and power supply generators.

[1] British Council, 21st Century Schools Programme Quarterly Report, Q4 2021.
[2] Ibid.
[3] Ibid.

Outcome 1, that teachers embed and practice CTPS and coding skills in classrooms, was fully achieved in relation to both CTPS but was not achieved in relation to the use of Micro:bit for coding. Against a target of 80%, we found that throughout the Western Balkans 79% of all trained teachers in all schools, (and 82% of trained teachers in the main sample of schools most exposed to the Programme) have incorporated CTPS teaching methods in their classroom lessons. However, against a target of 70%, we found from the teacher survey that only 48% of teachers have used Micro:bit in at least some of their lessons, showing that the target for this indicator has not been met in the region as a whole. It has been fully achieved only in North Macedonia (84%), partly achieved in Albania (59%), Montenegro (58%) and Serbia (52%), and not achieved at all in Bosnia and Herzegovina (18%) and Kosovo (16%).

The **Intermediary Outcome** of the BC Programme was that pupils from 10 to 15 years old across the Western Balkans demonstrate enhanced CTPS and coding skills**.** We found that **the Intermediary Outcome for CTPS has not been achieved, achieved**. No country in the region reached the 20% target for CTPS, and most countries recorded a deterioration of such skills. This is likely explained by the negative impact of the school closures introduced in response to the COVID-19 pandemic, which interrupted the application of CTPS teaching methods in classrooms as teaching was switched to online modes of delivery, and teachers were additionally unable to observe their pupils' performance so directly as in the classroom. **However, the Intermediary Outcome for coding has been achieved.** Pupils' skills in coding improved in line with the programme expectations, with every country in the region (except Bosnia and Herzegovina), improving pupils' skills at rates well above the target of 20%. Statistical modelling based on a difference-in-difference analysis revealed a significant impact of the Programme on improving pupils' coding skills based on pupils' self-assessed scores for their coding abilities, which was however, not reflected in teachers' assessments.

The expected Outputs of the Programme that we analysed in this Evaluation have mostly been achieved. Expected **Output 2**, that teachers would gain knowledge, skills and confidence to teach CTPS and coding skills, has been broadly achieved. Against a target of a 20% improvement, the BC teacher training courses succeeded in increasing the CTPS knowledge of the participants by 21% in the region as a whole, with some slight country variations. Against a target of a 20% improvement, the BC teacher training courses succeeded in increasing participants' knowledge and understanding of Micro:bit and its usage in teaching by 61% in the region as a whole, with some individual country variations. **Output 5** was that Micro:bit devices would have been actively used by teachers in their classroom practice. We found that Micro:bit devices have not been as actively used by teachers in their classroom practice as had been expected (only 48% of trained teachers against a target of 70% - see above under Outcome 1), but that those who have used the device found it to be highly useful. Against a target of an 85% usefulness rate, we found that the target was achieved by teachers, who rated the usefulness of the device at 85%. However, it was found less useful by pupils, who reported its usefulness rate at 55%, thus not meeting the target for pupils' perception of its usefulness. However the pupils in the main school sample scored the usefulness of Micro:bit substantially higher than pupils in the control school sample. This suggests a positive impact of the Programme on pupils' ability to use Micro:bit for coding. There was little difference in the evaluation of the usefulness of Micro:bit between boys and girls. There was, furthermore, substantial country variation, with the greatest positive experience reported in Montenegro, North Macedonia and Serbia, and the lowest in Albania, Bosnia and Herzegovina and Kosovo. This probably reflects a stronger set of skills of the teaching staff in the former, and their observably better digital infrastructure. **Output 6**, that girls and boys have experienced CTPS and coding teaching in classrooms and in coding clubs was achieved. Pupils experienced a measurable increase in the use of different elements of CTPS in their classes. Furthermore, pupils' interest in coding was positively impacted by the BC Programme,

with the measured improvement being statistically significant[4], while there was also a 5-percentage point increase in pupils' participation in coding clubs.[5]

In sum, the 21st Century Schools Programme has been highly relevant and well aligned with the needs and priorities of the Western Balkan school systems and societal needs. The Programme has been highly effective in engaging the support of school leaders for the introduction of CTPS teaching methods and coding across the curricula, with some exceptions. It was also effective in disseminating CTPS knowledge to non-trained teachers. School leaders have been enthusiastic in supporting the creation of coding clubs which have continued to be active in most countries. The Programme has also been very effective in engaging the enthusiasm and support of teachers both in the training programme and in the delivery of CTPS teaching, and to some extent in coding. Although the deployment of Micro:bit was below expectations, the training element of the Programme had a strong impact in supporting teachers to use Micro:bit in the classroom. The Programme was also effective in improving the knowledge skills and confidence of teachers to teach CTPS and coding. Many pupils have been exposed to CTPS teaching methods, providing them with an opportunity to express their opinions and participate in group discussions to a greater degree than before the BC Programme. Pupils' basic coding skills have also improved, and their interest in coding has been increased by the intervention of the BC Programme.

The Programme achieved good value for money, delivering enhanced teaching and learning benefits to 4,000 schools, while over 18,000 teachers have benefitted from improved CTPS skills, transforming teaching practice throughout the region in the direction of a more open minded and interactive approach to learning. Also, about 50,000 pupils have benefitted from an introduction to and participation in coding clubs due to the Programme activities. The Programme activities are likely to be sustained in the future, having developed the capacity of policymakers, school leaders, and teachers to support the uptake of CTPS and coding in schools. However, structural challenges related to school infrastructure and a lack of suitable IT equipment persist. An important legacy of the Programme has been the development of Teacher Manuals with detailed information on activities, lesson plans, project work, equipment used, and learning outcomes. Additionally, a Micro:bit online course, developed by the British Council, is available to all teachers on the Moodle platform and has been handed over to ministries for use after the end of the Programme, thus ensuring sustainability in the use of Micro:bit devices in the future. The Programme achieved almost all its expected Outcomes and Outputs, with the exception that the expected increase in pupils' CTPS skills was not achieved due to the circumstances of school closures in response to the COVID-19 pandemic. The use of Micro:bit for coding teaching was also limited in some rural areas due to the inadequacy of internet connections and out-of-date computer equipment. The Programme was also held back by lack of suitably qualified specialist IT teachers in some schools.

[4] When we say an improvement is "statistically significant" we mean that the improvement is not just due to chance - it is greater than one would expect if only the vagaries of chance were at work, i.e., there is likely some causal impact from the Programme intervention.
[5] A percentage point change refers to the difference between two percentages. Thus, the percentage point change between 10% and 11% is one percentage point.

1. Introduction

1.1. Context

The countries of the Western Balkans (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) have been in a process of transition to a market economy over the past thirty years that is in some respects still not yet complete. The economic restructuring that this transition has involved has created a demand for new skills following the introduction of new technologies and new forms of business organisation. As with other countries around the world, those of the Western Balkans are experiencing profound structural change due to the digitalisation of their economies, and consequently the demand for workers with digital skills is expanding. Yet the Western Balkan countries lag others in the development of their digital infrastructure. Compared to an internet penetration rate of 89% of households in the EU in 2018, the rates in the Western Balkans are far lower, ranging from 69% in Bosnia and Herzegovina to 79% in North Macedonia.[6] Moreover, the level of internet skills in the Western Balkans is generally below that found in the EU. According to a 2019 survey conducted by Eurostat, only 20% of individuals in Serbia have above basic digital skills, with the equivalent proportions elsewhere in the region recorded as only 15% in North Macedonia, 14% in Kosovo[7] and 8% in Bosnia and Herzegovina. In comparison, the proportion of people with above basic digital skills is 38% in the EU-28. In this context, the development of the digital skills of the population, especially of school age children, is of special importance.

It is not surprising, therefore, that the provision of digital skills has rapidly moved up the region's policy agenda. The European Union Strategy for the Western Balkans[8] sets out a Digital Agenda for the region as one of its flagship policy initiatives.[9] This aims to promote the development of the digital economy by supporting broadband connectivity and enhancing digital skills to enable economic growth. In addition, the European Investment Plan for the Western Balkans proposes to provide broadband internet connection to 2,155 schools in Albania, along with similar connections to 500 schools in Kosovo, and 1,500 schools in Serbia.[10] This plan has emerged in parallel with a major policy initiative for regional economic development known as the Berlin Process, managed under the auspices of the Regional Cooperation Council in Sarajevo. The digital dimension of this plan covers broadband deployment and aims to promote digital skills throughout the region. The British Council 21st Century Schools Programme was announced at the London Summit of the Berlin Process held in July 2018, which proposed a package of measures including a commitment of £10 million to help build digital skills and employment prospects for young people in the Western Balkans. It announced that The British Council will provide training to children in over 4,000 schools, to bolster digital literacy and core skills across the region to foster the next generation of innovators and entrepreneurs.[11]

Poor quality of education and its irrelevance to labour market needs are often seen as one of the key causes for high youth unemployment rates in the region. Teaching methods in schools often omit critical thinking and problem-solving approaches that have become vitally important in the digital age and are in wide demand by employers. The average youth unemployment rate is amongst the highest in Europe leading to emigration from the region due to a lack of appropriate jobs, especially for medium-skilled and highly skilled workers. The

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[6] Eurostat online data
[7] This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence – hereinafter 'Kosovo'.
[8] European Commission, 'A credible enlargement perspective for and enhanced EU engagement with the Western Balkans', COM(2018) 65 final, Strasbourg, 6.2.2018.
[9] European Commission, 'Measures in support of a Digital Agenda for the Western Balkans', SWD(218) 360 final, Brussels, 22.6.2018.
[10] See: https://www.wbif.eu/storage/app/media/Library/FactSheets/Sector%20Factsheets%202021/WBIF%20DII%20Factsheet%20Nov%202021.pdf
[11] See: https://www.gov.uk/government/news/pm-reveals-package-of-measures-to-promote-a-more-peaceful-prosperous-and-democratic-western-balkans

low standard of education for many young people was demonstrated by the 2018 OECD PISA test results.[12] In reading, the region's average score (402) was 83% of the OECD average and 88% of the Southeast European average. For mathematics and science, the distance was smaller but still substantial. The average score places the region above only 13 out of 79 countries in the reading and science test and above only 15 countries in the mathematics test.[13] In addition, the test results showed that large proportions of pupils were unable to read a minimum standard of literacy (defined as below level 2 in the PISA scoring system), including over one half of all pupils in Albania, Bosnia and Herzegovina, and North Macedonia and over three quarters of pupils in Kosovo. The PISA study showed that major causes of the lagging performance were a lack of educational materials and the poor quality of school building infrastructure. A common characteristic of the school systems is a lack, or inadequacy, of IT equipment in schools, weak internet connections and poor access of teachers and pupils to adequate computer equipment.[14] This has had a negative effect on the quality of the education that the school systems are able to provide to their pupils. In addition, the PISA study showed that poor qualifications of staff bear a negative relation to test scores in Reading and Mathematics. There was a high correlation between the reported pupils' test scores in all three subjects and the percentage of teachers who had attended a programme of professional development during the three months prior to the PISA survey, demonstrating the importance of adequate teacher training.

1.2. About the Programme

The British Council 21st Century Schools Programme was a three-year programme starting in October 2018 to provide training to school leaders and teachers in the skills needed to improve the teaching practice using critical thinking and problem solving (CTPS) teaching methods and the application of IT skills, primarily coding and programming within the classroom using Micro:bit hardware donated by the UK government. Following an initial short course of training of school leaders and selected teachers rolled out in 6 training cycles from 2019-2021, the Programme provided follow-up mentoring within schools. The Programme aimed to address the multiple constraints that prevent primary school pupils from developing their CTPS and coding skills. Relevant guide books and teaching materials have been developed to accompany standard training materials and facilitate teachers' learning processes and the application of their newly acquired skills in practice.

The Inception Phase of the Programme began in October 2018 and lasted up until March 2019. The Implementation Phase began in March 2019 and will come to an end 30 May 2022. The staff available to support the Programme are the BC team including the Senior Responsible officer, the Senior Programme Manager, the Project Manager, the Finance Manager, the MEL Manager and the Communication Manager, and the staff of the Ministries of Education in each beneficiary country. The project was supported by 25 trainers who trained 324 primary school leaders and 17,534 primary school teachers in CTPS skills during a series of three-day training sessions. Primary school IT teachers were trained in the use of Micro:bit through an on-line MOOC. This online course was completed by 19,752 teachers.[15] Furthermore, the Programme was supported by the delivery of up to 100,526 Micro:bits to schools involved in the Programme.[16]

During each training cycle, school leaders and teachers received 2-3 days CTPS training, school leadership training and micro: bit training.[17] Training for school leaders was intended to provide them with the tools and approaches they would need to ensure effective CTPS skills provision in their schools, including strategies for

[12] This threshold defines pupils who are unable to identify the main idea or reflect on the overall purpose in a text of moderate length. For data on PISA test scores in the Western Balkans see: https://www.oecd.org/pisa/data/2018database/
[13] See the LSE Baseline Report from this evaluation project
[14] See the country endline reports and associated endline synthesis report for more details.
[15] British Council (2022) "WB6 overview of ICT and coding in primary schools' curricula 2018 vs 2022", internal Programme document.
[16] Ibid.
[17] Training for school leaders lasted two days in all countries apart from Serbia where it was one day. When transformed to Moodle it was one or two weeks, one week corresponding to one face to face day. All CTPS trainings across WB6 were organised as 3 days face to face or 3 weeks online training, one week online corresponding to one day face to face. For more details see Appendix 6.

planning, monitoring and improving teaching and learning, and for mapping CTPS skills across the curriculum. In addition, they were provided with guidance on establishing and running coding clubs in their schools. The training programme for, on average, 5-6 teachers per school covered practice orientation, practical application and ongoing support through mentoring, online resources and peer networks, designed to enable them to effectively teach CTPS and coding skills in the classroom.[18] All teachers were trained in applied computing using Micro:bit through an 8-hour online MOOC covering the basics of coding and applied computing with practical exercises. The online training introduced teachers to the basics of Micro:bit with examples of how it can be used in the classroom.

The training was followed by 12 weeks of practical implementation in the classroom, during which teachers and their pupils were assigned specific projects and provided with hands-on support by their trainers acting as mentors during two site visits. The assigned projects involved the development of two lesson plans using CTPS pedagogy, and the development and implementation of a cross-curricular project focused on using Micro:bits in a practical setting. The trained teachers were expected to disseminate their newly acquired CTPS skills to their colleagues by demonstrating the use of Micro:bit in practical lessons and how to integrate CTPS skills into the teaching process. School leaders were required to advocate for CTPS teaching methods among teachers in their schools, to assess how CTPS was being taught, to map the areas of the curriculum where CTPS could be included, and to develop strategies to improve CTPS provision.

Each school participating in the Programme was encouraged to establish a coding club, with a target of establishing coding clubs in 70 % of participating schools. The coding clubs have acted as meeting points for pupils and teachers to exchange ideas and improve teaching practices using creative coding techniques. Coding clubs were expected to have up to 30 pupil members who would meet at least once a week in a designated school area (e.g., an IT classroom) to develop joint projects using Micro:bit devices. The Programme provided guidance to school leaders and ICT teachers on establishing coding clubs and supported their work with online resources produced in cooperation with the Raspberry Pi Foundation. Projects were able to take part at one set of national coding competitions organised by local British Council offices in 2019. Due to the COVID-19 pandemic, the planned additional annual competitions did not take place.

1.3. About the evaluation study

This evaluation of the British Council 21st Century Schools Programme in the Western Balkans has been carried out by a team of evaluators from LSE Enterprise, UK, together with a team of local experts from each of the six countries of the region where the Programme is being implemented. The evaluation project consists of a baseline study, and endline study, and this final evaluation study. The British Council MEL Programme Officer established a monitoring system to support these studies. The evidence used in the report has been gathered through mixed research methods using surveys and in-depth interviews (IDIs). This Baseline Report analyses the data obtained from fieldwork with interviewees and surveys in sampled primary schools from the 2nd and 3rd cycles of Programme implementation, plus control schools from the 5th and 6th cycles. The information gained from this analysis will be used to answer the evaluation questions following the completion of the Endline Study in 2021.

The methodology of the study is set out in the Evaluation Plan and the details of the implementation of the methodology are set out in detail in the Baseline and Endline Reports. Following to the Evaluation Plan, the main school sample (MSS) was drawn from schools that participated in the 2nd and 3rd cycles of the BC

[18] Teachers spent two days exploring four key features of CTPS (solving non-routine problems and questions; considering different perspectives on issues; evaluating evidence for and against different positions; understanding the deep structure of issues), and three foundational teaching strategies that support the development of these skills (asking questions to develop deeper thinking and check for understanding; modelling how to think critically and solve problems; providing systematic feedback and corrections). On the third day of the training programme, teachers were introduced to the concept of cross-curricular teaching and received guidance on how to design and implement cross-curricular projects in their schools.

Programme. Sampling of schools was done separately for each country in a two-stage sampling procedure. In the first stage, a sample of schools was chosen by the core team at LSE known as the Main School Sample (MSS). The sampling procedure used was PPS (Probability Proportional to Size), where the probability to choose a school was directly proportional to the number of pupils within that school. The PPS approach was chosen because the main aim is to measure results on 10-15-year-old pupils, while choosing schools using PPS allows our sample to provide the best representation of an average pupil.[19] Following this, additional schools were chosen by the local experts known as the Control School Sample (CSS), which were chosen for comparability with the schools in the MSS based on the experts' local knowledge. The CSS includes schools that did not participate in the first three cycles of the BC Programme. In the second stage, the target population (school leaders, teachers, pupils) was sampled from the schools that were sampled in the first stage.

In the first phase of the fieldwork in September/October 2019 we sampled the 2nd cycle schools from the MSS in all countries. The same number of schools were to be drawn in each country in January 2020 from the 3rd cycle schools to establish the baseline for the second half of the MSS. However, the COVID pandemic measures adopted by governments involved school closures in most countries and led to a temporary suspension of the fieldwork with 3rd cycle schools in March 2020. This was resumed on a restricted basis in September-October 2020. The Endline survey was carried out on the same set of schools in September-November 2021. In total, over 5,000 pupils and almost 500 teachers were surveyed in 64 sampled schools in the Western Balkans at both baseline and endline surveys.

In addition to the above, qualitative research was carried out based on 82 in-depth interviews (IDIs) with key informants who were, as far as possible and circumstances permitting, re-interviewed from the baseline survey. In Montenegro it was not possible to re-interview the same school leaders as in the baseline, since following the change of government in August 2020 nearly all school leaders in primary schools were replaced with a new set of school leaders. Instead, an entirely new set of school leaders were interviewed in the endline study.

1.4. Limitations of the evaluation

There are three important methodological limitations to the study results. First of all, the evaluation relies in some part on the answers to the self-evaluation questions posed to teachers, school leaders and pupils. Since we were not permitted to evaluate their knowledge ourselves, in our evaluation design we were forced to use both explicit and implicit school leader, teacher and pupil self-evaluation in our survey design. We understand that the results from the self-evaluation questions may be biased, with the direction and magnitude of such bias being varied across different countries, urbanity factors, and different population segments due to cultural, demographic and socio-economic differences. We are aware that the answers to the self-evaluation questions cannot be used on their own merit to measure the overall level of the phenomenon that those questions were designed to measure. Nevertheless, there is a strong argument that these biases will be equally at play at both the baseline and the endline, and that therefore comparing the two would still be a good measure of the progress achieved during the evaluation period. This is in particular the case since following our evaluation design we have used the same sample at the baseline and the endline (we basically have panel data) so measuring the difference between the two is both methodologically and logically sound. For this purpose the use of the difference-in-difference method is ideally designed to tease out the specific effects attributable to the programme itself, rather than other unaobservable factors that differntiate school, countries, and the common external events that affected all schools between the baseline and the endline surveys (e.g. the COVID-19 pandemic). Furthermore, in order to be able to make better inference from the baseline measurements, we have allowed for data triangulation wherever possible, as well as data filtering for the

[19] In PPS procedure, each school is assigned weight proportional to the number of pupils in that school, and then the random sample is taken from such "weighted" population, it provides the best representation of an average pupil. This allows that in the second stage, when sampling pupils, each pupil still has an equal chance to be chosen as it had in the original pupil population. This would not have been the case if in the first stage we just sampled schools randomly within each segment, so that each school has an equal chance to be chosen, because this would lead to overrepresentation of pupils from smaller schools in the second stage sampling of pupils.

question on computer programming/coding in Bosnia and Herzegovina and in Serbia, which provides an indication of the extent of the biases involved.

Secondly, during the school closures implemented in response to the Covid-19 outbreak, primary school teaching moved either fully online or by providing the teaching partially online and partially in person to a varying extent across countries, as well as by splitting classes and creating shift patterns to minimise contacts between pupils. At the same time many classes were shortened, while the number of teachers was not increased. This increased burden was not conducive to teachers' accepting new CTPS teaching approaches and teaching new contents regarding coding as promoted by the 21st Century Schools Programme. At the same time, pupils have had less teaching time due to shortened classes. This most likely affected the quality of teaching with respect to the CTPS content. It may also have affected pupils' ability to absorb the new teaching content with respect to coding.

Thirdly, again due to Covid-19 outbreak we had to adapt our data collection methods to the situation on the field. Many schools closed down in March 2020, when most of the teacher and school leader training courses were finished. Hence, there were no follow-up and monitoring visits. In effect, the Programme implementation was halted. Nevertheless, country experts managed to interview most of the teachers and school leaders during the CTPS/coding courses, and where this was not possible, they were contacted subsequently by a video call or a telephone call. This did not require changing the questionnaire and, while it is a recognised fact that changing the data collection method would have an impact on the results, we expect that this impact was minimal in this case.

2. Evaluation

In this section, the report evaluates the performance of the 21st Century Schools Programme by answering the key evaluation questions under the headings of Relevance, Effectiveness, Efficiency and Sustainability.

1. Relevance: Did the Programme do the right things?
2. Effectiveness: Did the Programme achieve its objectives?
3. Efficiency: How well were available resources used?
4. Sustainability: Will the benefits of the Programme persist in the future?

The evidence base on which the evaluation has been conducted is set out in the Baseline and Endline reports and in the comparative Appendices 1-6 at the end of this report. In this section we present a narrative summary of our main findings in relation to the evaluation criteria.

2.1. Relevance: Did the intervention do the right things?

The Programme was highly relevant and well aligned with the needs and priorities of the Western Balkan countries. It contributed to raising awareness among policymakers on how to strengthen the responsiveness of their education systems to better meet the skills needed in the 21st century. In every country, the promotion of CTPS and coding was well aligned with the existing strategies and reform processes.

In **Albania,** CTPS and digitalisation was already included in the curricula for 8th and 9th grades, and the Programme provided further impetus for including CTPS and coding skills in 6th and 7th grades. A Technical Working Group was established by the Ministry of Education and Sports (MoES) and the Agency for Quality Assurance of Pre-University Education (APAQUE) to analyse coding and programming with participation of the British Council. The Group agreed that coding with physical devices should be introduced in the curriculum for 6th and 7th grades starting from September 2021. Another important development which indicates the relevance of the Programme in meeting the needs and priorities of the education system has been the inclusion of coding clubs and coding skills as an indicator in the National Strategy of Education 2021-2026. The Programme also supported the AQAPUE to carry out regular training with teachers, with the MoES being committed to offer all teachers knowledge on coding and the use of Micro:bit in all subjects. Furthermore, several documents have been prepared to guide teachers on CTPS, on how to set up coding clubs in schools, and on how to guide pupils in using Micro:bit in their projects. The Programme was also relevant in raising confidence among teachers in teaching coding and programming given that many teachers lacked an IT background. Finally, the Programme was also suited to the needs and priorities of girls and boys, together with the needs of pupils from vulnerable backgrounds. According to the Albanian evaluation report, coding clubs were established in about half of the schools and they attracted the interest of pupils in Micro:bits. Indeed, the interest of pupils in doing computer programming outside school increased from 9% at the baseline to 16% at the endline with equal results among boys and girls, whereas some differences were noted for pupils with special educational needs and Roma children.

In **Bosnia and Herzegovina**, the Programme was well-aligned with the needs and priorities of the education system and policies of the country and paved the way for the introduction of policies and strategies to address CTPS and coding. For example, the Ministry of Education of the Republika Srpska (RS) has incorporated CTPS and coding into the Strategy for Education of RS 2022-2030, whereas the Ministry of Education in the Federation of Bosnia and Herzegovina is currently discussing the incorporation of CTPS and coding in future strategies. In Canton Sarajevo, coding has been introduced in 3rd to 9th grade and in Zenica Doboj country in 6th to 9th grades. According to interviews with school leaders and policymakers, the Programme was well aligned with the needs of teachers. In comparison with the baseline survey, which showed that one third of teachers did not have the skills or capacity to engage with the Programme, the endline survey showed that teachers have gained the enthusiasm and motivation to learn new skills. Furthermore, the Programme was

also aligned with the needs of girls and boys. They demonstrated almost the same interest in the activities, even though boys were more interested in coding and computer programming – as stated by a school leader, coding is more considered a "boy's" activity - in comparison to girls. However, as explained by one trainer, the Programme challenged this perception, thus proving to be important in promoting gender equality. Finally, the Programme was also aligned with the needs of pupils from vulnerable backgrounds and promoted inclusion in schools.

In **Kosovo,** the Programme was well aligned with the needs of the national education system and ongoing national strategies, such as the Kosovo Education Strategic Plan 2022-2026 in which digitalisation plays an important role. At the baseline, coding was not part of the school curriculum. However, since the 2019/2020 school year, coding has been introduced for grades 8 and 9, with eight classes dedicated to coding with Micro:bit, although it was still not taught in practice at the time of the endline survey. Since the 2021/2022 school year, textbooks have been introduced in coding lessons in grades 8 and 9 and this may stimulate the actual implementation of the curriculum requirements. Furthermore, the training was highly appreciated by teachers who considered it well-designed and practical and who also manifested a great interest in further developing their professional skills in CTPS. However, pupils have managed to learn coding in coding clubs and in private lessons outside school, thanks to the widespread internet connection (around 90% of households in Kosovo have internet access), which suggests that the integration of coding and programming in regular classes could be effective, given that it also aligned with pupils' interests and the availability of IT equipment at home. Overall, and related to the challenges of the pandemic, it seems that Micro:bit has mainly been used within coding clubs, with only one out of nine teachers reporting to have taught coding in regular classes.

In **Montenegro**, the Programme was well aligned with needs and priorities of the national education system according to the interviews with policymakers and school leaders, the Programme aptly focused on a set of skills aligned with the country's strategic development plan. The Ministry has been cooperating with the British Council to improve the curricula for the compulsory subject "Informatics with Technics" to enhance the informatics (including coding) component in place of the technics component. At the baseline, coding was a compulsory subject only in 8th grade, but by the endline this had been extended to all grades from 5th to 8th grade. The Bureau for Education Services has prepared a Teacher Handbook on Micro:bit Coding for Primary Schools was developed with the support of the Programme containing lessons plans, activities, and test for students. It is designed to support the new ICT curricula implementation and learning outcomes developed for grades 5-8. A Guide for Micro:bit Equipment comprising detailed explanation of around 50 different components used with the Micro:bit, their functions and ways of application was also provided to primary schools along with the relevant components. "Guide for Teachers" in cooperation with the British Council which provides teachers with instructions and examples for introducing digital competences. Further evidence of the relevance of the Programme is given by the results achieved by pupils in national and international competitions. The Programme has provided teachers with the opportunity to update their CTPS knowledge and skills through training and to learn coding teaching methods. It has been equally relevant to girls and boys; for instance, the Micro:bit clubs consisted of 50% boys and 50% girls. Similarly, it was relevant to vulnerable groups, including children from poor families, children with special educational needs, and children from refugees' families.

In **North Macedonia**, the Programme was well aligned with the needs and priorities of the national education system. A good level of cooperation was established between the Ministry and the British Council, with the Ministry providing logistical support and advisors from the BDE (the competent body for supporting teachers and school leaders) which also helped to create a Compendium containing good practices. The Programme enhanced the capacity of teachers to use IT tools and Micro:bit devices, though many schools still lack adequate IT infrastructure and IT teachers. Here, one of the biggest challenges has been that schools in rural areas lack trained professionals to teach coding. In addition, some schools share IT teachers and pupils share computers in coding classes. Coding is an elective subject in primary education, and while taught in 6th and 9th grade at the baseline, by the endline it was also taught in 7th grade. Coding is embedded in obligatory IT classes, with 30 hours in the third grade, 36 hours in the sixth grade, and 24 hours in the seventh grade. IT is

elective in ninth grade only with 72 hours dedicated to coding Teachers who attended training were enthusiastic and motivated to learn new skills. The Programme provided teachers with relevant skills, knowledge and self-confidence to teach CTPS. It was well aligned with the needs of all pupils (girls and boys) as well as with the needs of pupils from vulnerable backgrounds (though it benefited less pupils with learning difficulties and pupils from Roma families who also found CTPS and coding programming more difficult in comparison to other pupils). Finally, the Micro:bit device enhanced the learning experience for all pupils, though the Covid-19 pandemic prevented many pupils from using it. However, since the schools have reopened, teachers have begun to incorporate the use of Micro:bit devices in their teaching, and have seen pupils' interest and enthusiasm grow

In **Serbia**, The BC Programme intervention came at just the right time regarding both the needs of the education system and the education policy priorities in Serbia. It was well aligned with the education reform efforts and was introduced in Serbia from the highest level (Prime Minister's Office). The Ministry of Education, Science and Technology Development had already started implementing curriculum reforms to include the CTPS teaching approach and compulsory computer programming classes to all pupils aged 11-15. While, at the baseline, coding was taught to pupils in 5th and 6th grades, by the endline this had been extended to pupils in 7th and 8th grades. The BC Programme was fully in line with Serbia's education policy, and with their future policy directions, including the Strategy for Development of Education in the Republic of Serbia until 2030, thee Strategy for the Development of Digital Skills in the Republic of Serbia from 2020 to 2024, the Digital Agenda for the Western Balkans and the Digital Competence Framework: A Teacher for the Digital Age. The lack of knowledgeable IT teachers was identified in both the Serbian Baseline and Endline reports as the main bottleneck to teaching coding in primary schools. In these circumstances the introduction of coding on Micro:bit was an excellent and particularly suitable solution, since coding in Micro:bit is less demanding both for the teachers to teach and for the pupils to comprehend.

2.2. Effectiveness: Did the Programme achieve its objectives?

The BC Programme overall has been effective in delivering against its CTPS and coding objectives. The ministries of education have throughout been highly supportive of the BC Programme, not only in terms of facilitating the programme activities but also through adapting the curricula and educational policies to support the introduction of CTPS teaching methods and coding in the primary school systems. The Programme achieved many of its objectives in supporting the integration of coding into the curricula, providing written resources to support the implementation of coding with Micro:bit, in providing training to IT teachers and in providing additional resources at a regional level to strengthen the teaching of coding in primary schools.

Technical working groups were established in Albania with the support of the British Council to implement aspects of the Programme to review the curricula and introduce coding in grades 6 and 7 from 2021. Elsewhere, the Programme assisted the development of various policy documents designed to integrate coding and the use of Micro:bit into primary education, including the Kosovo National Curricula Framework of Kosovo (2019), the Kosovo National Strategy for Digitalisation of Education (2020-2021), the Kosovo Education Strategic Plan 2022-2026 while the Programme was fully aligned with the already developed Strategy for Development of Education in the Republic of Serbia until 2030, and the Strategy for the Development of Digital Skills in the Republic of Serbia for the period from 2020 to 2024.

Training in the use of Micro:bit was provided to 505 IT teachers in Albania, 44 teachers in Bosnia and Herzegovina, 50 IT teachers in Montengro, and 608 IT teachers in Serbia. In Kosovo, training was envisaged within the activities of the Kosovo Education Strategic Plan 2022-2026.

At a regional level Micro:bit online training course developed by the British Council has been translated to all local languages to support teachers to use the Micro:bit in their classrooms, hosted on a Moodle platform. Almost 20,000 teachers completed the Micro:bit online course. A Manual for Micro:bit Coding for Primary School has been developed by the Petlja Foundation and translated into local languages. A Coding Club Guide was developed in cooperation with Raspberry PI and Micro:bit Foundation, adjusted to the local context to

support teachers in establishing and running coding clubs providing 12-week ready-made lesson plans with projects to be developed using Micro:bit. A Guide for using Micro:bit accessories with detailed explanation of around 50 different components that can be used with Micro:bit was developed by the British Council. Over 100,000 Micro:bits were distributed to schools during the programme implementation throughout the Western Balkans. Six national coding challenges were organised in each of the WB6, awards handed over, winners of the first national competition participated at the regional coding challenge.

However, the capacities of the school systems to absorb the Programme were limited and this somewhat reduced its effectiveness below that which might have been attained. The Programme came at an inauspicious time due to the onset of the COVID-19 pandemic coinciding with the initial roll-out of the Programme. This led to school closures in 2020 and 2021, which disrupted the training schedule and the implementation of CTPS and coding as lessons were shifted to an online mode. School closures lasted longest in Kosovo with 186 days of mandatory school closures between the start of the pandemic and March 2022 and in Bosnia and Herzegovina with 173 days of mandatory school closures, compared to just 72 days in Albania and 83 days in Serbia.[20] These school closures had a negative impact on the effectiveness of the BC Programme.

Even without this, the implementation of coding using Micro:bit in the curriculum would have been limited in some countries and in rural areas due to the inadequacy of internet connections and digital infrastructure including out-of-date equipment and slow internet connections in some schools. This problem of a lack of digital infrastructure was particularly acute in Albania and can only be remedied by a large-scale investment in infrastructure development. Fortunately, this is envisaged in the recently launched EU Economic and Investment Plan for the Western Balkans. In Montenegro also, rural schools have problems with outdated computers and slow internet connectivity.

Our research revealed that the extent to which the curriculum supported the teaching of coding has varied widely across countries. It was expected that by the end of the Programme 70% of primary schools would provide compulsory or elective coding classes within the IT subject, which has been fully introduced in the curricula. In practice, the target for teaching coding has been fully achieved in Montenegro, North Macedonia and Serbia, and as far as we can tell also in Bosnia and Herzegovina and Kosovo. In Kosovo, despite being on the curriculum, at the time of the endline survey coding was not being taught in the surveyed schools, and pupils were instead learning coding either in coding clubs or in private lessons outside school. In Albania, coding was introduced in the academic year 2021-2022, and coding with Micro:bit was embedded in the IT curriculum of the sixth grade (6 hours dedicated to coding from a total of 35 hours of IT subject) and seventh grade (6 hours dedicated to coding from a total of 35 hours of IT subject). However, in practice, due to a series of limiting factors, the teacher survey revealed that the target for teaching coding in schools has not yet been achieved in Albania. The implementation of teaching coding has often been held back by a lack of qualified IT teachers, as documented in the country reports. In Albania a further obstacle has been a lack of uninterrupted electricity supply in some rural schools. A further limiting factor, according to interviewed teachers, has been the lack of time to teach coding due to over-ambitious curriculum content in some instances.

Effectiveness for school leaders

The Programme has also been highly effective in engaging the support of school leaders, who have mostly supported the implementation of CTPS teaching methods and the teaching of coding across the curricula, although only partly so in relation to coding in Bosnia and Herzegovina, Kosovo and Montenegro where school leaders were less enthusiastic or burdened by other responsibilities. It was expected that by the end of the Programme 50% of school leaders would have ensured that CTPS teaching was regularly practised by at least two non-trained teachers. The evaluation survey revealed that a similar proportion of trained and non-trained teachers deliver CTPS teaching in the MSS schools, suggesting an effective transfer of knowledge has taken place. This contrasts with the situation in the CSS schools where more trained than non-trained teachers have

[20] See: https://ourworldindata.org/covid-school-workplace-closures

implemented CTPS in their lessons. Taken together these two observations are highly suggestive of a strong effectiveness of the Programme in disseminating CTPS knowledge throughout the teaching body. More direct survey evidence reveals that the target has been reached throughout the Western Balkans (see Appendix 2).

Overall, the Programme has been highly effective in ensuring that coding clubs were established and continued to be active in most countries. Altogether, some 2,662 on-site coding clubs were established according to data from the British Council (about two thirds of schools in the Programme). Besides these, at least 325 additional schools registered their online clubs at the "Code Club International" online platform. However, the school leader and teacher surveys revealed that this enthusiasm has been variable across countries, with more than two thirds of schools establishing coding clubs in Albania, Kosovo, Montenegro, North Macedonia (according to teachers), with this high level only achieved in Kosovo and North Montenegro (according to school leaders). The teacher survey showed that a lower proportion of schools established coding clubs in Bosnia and Herzegovina and Serbia, than elsewhere although this was compensated by the creation of online coding clubs. In Serbia, additional online coding clubs were established, raising the proportion of schools establishing coding clubs in Serbia to 70%.

School leaders were also expected to ensure that at least 70% of the coding clubs that were established throughout the Programme were still active at the endline. In the region as a whole this target was more than met with 80% of schools establishing coding clubs by the end of the Programme, which strongly contributes to its sustainability.[21] More than 53,000 pupils taking part in these coding clubs (against a target of 55,000). However, experience differs between countries, with some evidence of less effectiveness in Montenegro (according to the reports of school leaders) and in Montenegro and Serbia (according to the reports of teachers). The main obstacle to the continued activity of coding clubs has been the impact of the COVID-19 pandemic and associated health restrictions on indoor gatherings which led to the temporary suspension of some coding clubs. However, these are expected to be reactivated once the pandemic subsides.

	% of schools setting up coding clubs	Target no. pupils in coding clubs	Actual no. pupils in coding clubs	% excess/shortfall
Albania	79%	14,000	16,728	19.5%
Bosnia & Herzegovina	66%	9,000	8,362	-7.1%
Kosovo	74%	7,500	6,844	-8.7%
Montenegro	94%	5,000	3,863	-22.7%
North Macedonia	95%	8,000	6,726	-15.9%
Serbia	69%	15,000	10,536	-29.8%

Source: British Council monitoring data

Effectiveness for teachers

The Programme has also been very effective in engaging the enthusiasm and support of teachers both in the training programme and in the development and delivery of new teaching methods and to some extent coding. Overall, almost 20,000 teachers have taken the online Micro:bit training course The Programme's target, that by the end of the Programme 80% of trained teachers would have integrated CTPS into their teaching and learning activities, has practically been achieved with 79% of trained teachers throughout the Western Balkans using CTPS teaching methods in their lessons (teacher survey), while 75% of all teachers do so (school leader survey) (see Annex 2). However, the target was missed in Bosnia and Herzegovina (according to both the school leader and teacher surveys) and in Montenegro and North Macedonia (according to the teacher survey). Moreover, our qualitative research reveals that teachers' knowledge about and practice of CTPS was relatively

[21] As shown in the evaluation endline report, of the coding clubs that were established during the first and the second project year between 72% (teacher survey) and 85% (school leader survey) still exist by the end of the project.

low in Bosnia and Herzegovina compared to other countries (see Endline synthesis report Table 11). The relative lack of effectiveness in Bosnia and Herzegovina may have been due to the severe effects of the COVID-19 pandemic because of difficulties experienced in using CTPS methods during online teaching. Bosnia and Herzegovina has been one of the worst affected countries in the world by the pandemic, with among the highest number of excess deaths.[22]

Over 100,000 Micro:bits have been donated to all primary schools in the region. However, the usage of Micro:bit has been less effective than was hoped for. It was expected that 70% of trained teachers would regularly use Micro:bit in the classroom. However, in the Western Balkans as a whole, only 48% of trained teachers use Micro:bit in some of their lessons. The proportion varies from a high of 84% in North Macedonia to a low of 18% in Bosnia and Herzegovina and 16% in Kosovo. More teachers in MSS schools use Micro:bit in their classrooms than do teachers from CSS schools, suggesting it may take time to build up the skills and confidence to use the device, since MSS teachers had a longer time to implement it than did CSS teachers (due to the later training cycles in which they were involved). Furthermore, a far higher proportion of trained than untrained teachers use Micro:bit in their lessons. According to the Endline report 48% of trained teachers use Micro:bit in their lessons compared to only 19% of untrained teachers. This suggests a **strong impact of the training element of the Programme in supporting teachers to use Micro:bit.**

The Programme was also effective in improving the knowledge skills and confidence of teachers for teaching CTPS and coding. On a scale of 1-5 where 1 = strongly agree to 5 = strongly disagree, teachers scored their confidence in developing their pupils' CTPS skills at 2.06 and their coding skills at 2.62. The British Council pre-post-test from teacher training showed a 23% gain in CTPS knowledge set against a target of 20%. This all indicates the effectiveness of the programme in delivering CTPS and at the same time its lesser effectiveness in delivering coding. Teachers' confidence in delivering CTPS was determined in part by teachers' age, experience and pupil behaviour. Older teachers who are more mature may be more confident in teaching CTPS while offsetting this, those with more experience may be more stuck in their ways and find it more difficult to adapt to deliver new teaching methods. Equivalently, a significant factor determining teachers' confidence in teaching coding is sharing of CTPS knowledge with other teachers which, perhaps surprisingly, significantly improved the readiness of IT teachers to teach coding, presumably due to peer-learning indicating an atmosphere of knowledge sharing within the schools and mutual confidence-building effects.

Effectiveness for Pupils

For pupils, all this led to an observable improvement in their CTPS which has provided many pupils with an opportunity to express their opinions and participate in group discussions in class to a greater degree than before the Programme was implemented, in place of rote learning approaches which have been the norm in the past. The Programme seems to have been somewhat more effective in this respect in Albania, Montenegro and Serbia than in other countries (see Annex Table A1.4). Similarly, there has been an overall improvement in pupils' basic coding skills in the region as a whole, although to different degrees in different countries, with the greatest gains in Albania, North Macedonia and Serbia. However, the Programme has been less effective in improving pupils' basic coding skills in Bosnia and Herzegovina and in Kosovo, which have remained at a rather low level.

Coding clubs have been established in 2,662 schools - about two thirds of all schools. Including coding clubs established online, the total number of coding clubs comes to 2,987 - in three quarters of all schools. About 14% of pupils in our survey schools participated in these coding clubs, an increase from 9% at the start of the BC Programme. If projected to the entire school system, this would suggest that around 140,000 pupils now

[22] See: https://ourworldindata.org/covid-deaths

attend these coding clubs, or about 47 pupils per club. The Programme can plausibly be attributed with having increased the participation in coding clubs by 50,000.

Pupils with special educational needs are sometimes less well supported due to the lack of specialised assistant teachers for special needs children. Overall, a special study by the British Council revealed that special needs pupils have benefitted from the Programme. However, our teacher survey also reveals the greater difficulty faced by these children in using Micro:bit, *relative to others*. The teachers' survey asked "How did children from vulnerable groups accept the Micro:bit compared to the other pupils?". On a scale 1=more difficult 2 = the same, 3=less difficult, pupils with special educational needs scored this at 1.55, and pupils from Roma families 1.65, indicating greater difficulty in using Micro:bit for these pupils than for others.

2.3. Efficiency: How well were resources used?

An important element of efficiency is an ability to respond in real time to changing events. In this respect, the British Council took steps to improve the Programme early on in response to monitoring reports to secure the effectiveness and efficiency of the Programme. Another example of the responsiveness of the Programme to changing events, and the efficient redeployment of resources, was the shift to online learning using the Moodle platform in response to school closures during the COVID-19 pandemic provides a good example.

Throughout the Western Balkans the BC Programme led to revised curricula with more coding content, the BC developed various new resources in response to this achievement. In Montenegro, a Teachers' Manual with detailed information on activities, lesson plans, exercises, project work, equipment used, aims and learning outcomes. A guidebook for Micro:bit equipment was also developed with a detailed explanation of around 50 different components used with the Micro:bit, and the components were donated to all primary schools. In Serbia, a digital textbook was developed in partnership with the NGO Loop Foundation for 7th and 8th grade IT teachers to support teacher's lesson plans related to projects using MicroPython to control Micro:bit devices. This was translated into the local languages in Albania and North Macedonia, in collaboration with NGO Petlja from Serbia. In Kosovo, four lesson units for the IT subject in grades 8 and 9 have been developed as an additional resource for teachers and pupils to teach and learn coding through Micro:bit. The lesson units will support the IT component of the revised curriculum in the 2022/23 school year. A handbook on how to integrate Coding as a cross-curricula skill in all subjects of grades 6-9 is being developed. For all countries, a Coding Club Guide has been developed in cooperation with Raspberry PI and Micro:bit Foundation in local languages, designed to support teachers in establishing and running coding clubs providing 12-week ready-made lesson plans with projects to be developed using Micro:bit.

A further example of responsiveness was observed in Montenegro, where it was noticed early on that an insufficient number of IT teachers from large schools were included in the Programme (since each school sent a maximum of 12 teachers for training irrespective of size, of which perhaps 2 would be IT teachers). This left many pupils with no contact with the Programme. In Montenegro, the British Council persuaded the government to invest 210,000 euros, extending the Programme to all teachers in primary schools. This funding enabled the Programme to reach out to teachers at all levels and include all pupils in coding activities.

Efficiency also relates costs to benefits. At £10 million, the Programme was a costly exercise. With 3,956 schools and 17,533 teachers included in the programme, this comes to a cost of around £2,500 per school in round figures. The benefits, however, have been substantial. According to the teacher survey about 75% of teachers disseminated their knowledge to at least one other teacher, so in total it is likely that over 300,000 teachers have benefitted from improved CTPS skills, which is transforming teaching practice throughout the region in the direction of a more open minded and interactive approach to learning. Teachers have improved their knowledge, skills and confidence to teach both CTPS and coding to their pupils. Although with some still substantial gaps in the latter which will require further efforts on the part of national education systems to follow up in the aftermath of the BC Programme.

Furthermore, the Programme had an impact on pupils' preferences, with 22% of surveyed pupils saying that they preferred to do coding/programming over other subjects at school in the baseline survey at the start of the BC Programme, a proportion which doubled to 55% at the endline survey at the end of the BC Programme. Furthermore, there is plausible evidence that pupils' coding skills and pupils' interest in coding were considerably augmented by the intervention of the BC Programme as related in Annex 3 below.

In conclusion, the programme delivered positive impacts for the primary education systems in the Western Balkans, especially given the context of poor digital infrastructures and equipment in many schools, especially in rural areas, and the deficit of qualified IT educators to deliver coding lessons in many of the primary schools in the region. It should also be recognised that the teaching of coding is new to many schools, as coding has been introduced as a new subject in the IT subject area only in 2020/2021 or 2021/2022 school years in most of the countries.

2.4. Sustainability: Will the benefits of the Programme endure in the future?

The country evaluation reports suggest that there is a varied probability of the sustainability of the Programme. On the one hand, the Programme has developed the capacity of policymakers, school leaders, and teachers to continue to support the uptake of CTPS and coding skills. As mentioned above, the Programme has successfully engaged the enthusiasm and support of teachers in the development and delivery of new teaching methods and coding. On the other hand, many structural challenges related to school infrastructures and the lack of IT equipment persist. Importantly, and as a further indication of future sustainability, coding and programming are the overarching objectives in all the Western Balkan countries, and the intervention of the British Council has been fine-tuned with other ongoing strategies in the region such as the Common Regional Market Initiative 2021-2024, which has among its objectives the integration of the Western Balkans into the pan-European digital market.

In **Albania,** there seems to be a good reason to think that the Programme will be sustainable. As mentioned above (see the section on Relevance) the new Strategy of Education 2021-2026 is on the right path towards ensuring sustainability, given the importance that the Ministry is giving to the development of CTPS and coding/programming. School leaders were not only very supportive of the Programme and interested in participating, but their age (35-54 on average for school leaders and teachers) is an encouraging support for future sustainability. Furthermore, the school leader survey shows that all school leaders are confident that the teaching of CTPS will continue in the future. At the same time, pupils' interest in CTPS and coding/programming have also increased, with many of them (regardless of gender, school results, and family background) having shown interest in coding and in developing a career in IT, which also paves the way to a close collaboration with local businesses.

In **Bosnia and Herzegovina**, the survey showed that, in addition to the positive attitude of policymakers in implementing the Programme, school leaders had enthusiasm and motivation to implement the Programme, which are important enabling factors to ensure sustainability in teaching CTPS and coding skills in the classroom. The support of policymakers and school leaders, combined with the fact that some aspects of the Programme have been incorporated into national strategies (see also the section on Relevance) is promising in terms of ensuring sustainability. Teachers' motivation is also important for guaranteeing the continuation of Programme activities in the future, but relatively low salaries provide little incentive for them to devote additional time to incorporate the training received into classroom practice. Other challenges emerged in terms of sustainability, as some teachers considered the support from policymakers being mainly rhetorical and noted that a key factor to increase sustainability would be to revise school curricula in order to fully incorporate CTPS and coding.

In **Kosovo,** the results of the Programme suggest that coding has been recognised as useful in all subjects, whereas before the launch of the Programme the general perception was that coding was exclusively a subject for IT teachers. However, many difficulties persist. For example, in some schools, school leaders and teachers

had to contribute financially to purchase the necessary equipment and materials for coding activities in the Coding Clubs. This suggests that the lack of resources needs to be properly addressed to guarantee sustainability of the Programme. In 2020, the Ministry approved a new regulation for teachers' continuous professional development, which offers a significant opportunity to disseminate the knowledge and skills learned from the British Council training to untrained teachers.

In **Montenegro**, school leaders have also supported CTPS teaching. They reported a high level of motivation among teachers and pupils in acquiring CTPS skills; most importantly, they are confident that CTPS teaching will continue in the future in their schools. Policymakers are also confident that the benefits of the Programme will continue in the future; in this regard, the Ministry is preparing a Strategy for Digitalisation of the Education System 2022-2027, with an Action Plans for 2022 and 2023 which are likely to ensure the sustainability of the Programme, as it will create a long-term framework to support CTPS and coding in primary schools. At school level, the positive feedback from pupils is also an enabling factor for sustainability, motivating teachers to continue to use CTPS teaching methods. However, in comparison to CTPS, challenges to the sustainability of coding are greater. On the one hand, the Covid-19 pandemic and the online teaching disrupted teachers' ability to teach coding; on the other, outdated school infrastructure, poor internet access and obsolete equipment might hinder the sustainability of teaching coding. Here, an important legacy of the Programme has been the development of Teacher Manuals with detailed information on activities, lesson plans, project work, equipment used, and learning outcomes. As also mentioned in the section on Relevance, it is expected that the reform of the compulsory subject "Informatics with Technics" with more room devoted to coding will also ensure greater sustainability to the teaching of this subject.

In **North Macedonia**, the sustainability of the Programme is strongly linked to the new "Concept for Primary Education", which places great importance on developing the CTPS skills of pupils. CTPS and IT skills are also part and parcel of a new strategy for the period 2018-2025. The inclusion of digital literacy and CTPS in the new Concept for Primary Education is a strong indicator of the sustainability of the Programme. Furthermore, school leaders have actively supported CTPS and coding in their schools and stated that they would continue this support in the future. Likewise, teachers strongly agreed that their school leaders have actively supported their teaching using CTPS teaching methods, and they are likely to continue to incorporate CTPS and coding in classrooms in the future. Thus, in North Macedonia there are sufficient enabling conditions to ensure the Programme's continuation following its completion**.**

In **Serbia**, current educational policies strongly define the priority for the development of computer programming and coding skills by the teachers, and it is likely that these trends will continue. In response to our survey questions, school leaders and teachers show strong support for the future implementation of CPTS and coding skills in their schools. All schools in Serbia have embedded CTPS and coding skills in their core curriculum, so both CTPS and coding are embedded in teaching in primary schools and new elective subjects using Micro:bit for coding geared to robotics. As of the 2020/2021 school year the Serbian Ministry of Education introduced a new subject, Digital World, in the first-grade of primary school. Through this subject, the pupils will be acquainted with digital devices and their application, online communication and will be introduced to the algorithmic way of thinking. Micro:bit was specifically mentioned as coding device in the textbook for this subject. To facilitate new curricula among teachers of lower primary grades, the Make Code editor, a web-based environment for learning to code with physical computing devices such as the Micro:bit was introduced. Two digital manuals aimed at supporting teachers using Micro:bit in subjects other than the IT were developed in partnership with the Petlja Foundation. The part related to programming is not too complex so that coding using Micro:bit can be applied in teaching a variety of subjects (mathematics, physics, biology, etc.). These manuals are likely to greatly support the sustainability of the Programme in Serbia.

Throughout the region, the Micro:bit online course developed by the British Council is available to teachers on the Moodle platform and has been handed over to ministries for use after the end of the Programme, thus ensuring the sustainability of the use of the distributed Micro:bit devices in the future. Related to this, the teachers and school leader surveys revealed a high level of confidence that the teaching of coding would continue in the future. On a scale of 1-5 where 1=strongly agree to 5=strongly disagree, the school leaders

and teachers gave a score of 1.9 to their confidence that coding teaching would continue in the future in their schools. This suggests a guarded agreement that the British Council Programme will be sustainable. The slight hesitation in the case of coding may be related to a lack of suitable IT equipment and appropriately qualified IT teachers in some schools in the Western Balkans.

3. Conclusions

While the details of the Programme's achievements of its expected outcomes and outputs are set out in Annexes 2-5, in this concluding section we summarise the main findings of our evaluation study. The 21st Century Schools Programme was relevant and aligned with the needs and priorities of the Western Balkan countries. It raised awareness among policymakers on how to strengthen their education systems to better meet future skills needs. In each country, the promotion of CTPS and coding was well aligned with the existing strategies and reform processes. The BC Programme has been effective in delivering its CTPS and coding objectives. In achieving this, ministries of education have throughout supported the BC Programme by facilitating its activities and by adapting the curricula and educational policies to support the introduction of CTPS teaching methods and coding in primary schools.

However, the limited capacity of the school systems to absorb the Programme reduced its effectiveness. It came at an inauspicious time, with the onset of the COVID-19 pandemic forcing school closures in 2020. This hindered the implementation of CTPS and coding teaching using Micro:bit. Even without this, the use of Micro:bit for coding teaching was limited in some rural areas due to the inadequacy of internet connections and out-of-date computer equipment. The Programme was also held back by lack of suitably qualified specialist IT teachers.

The Programme has also been highly effective in engaging the support of school leaders for the introduction of CTPS teaching methods and coding across the curricula, with some exceptions. The Programme was also effective in disseminating CTPS knowledge to non-trained teachers. School leaders have been enthusiastic in supporting the creation of coding clubs which have continued to be active in most countries, especially in Kosovo and North Macedonia.

The Programme has also been very effective in engaging the enthusiasm and support of teachers both in the training programme and in the development and delivery of CTPS teaching methods, as well as, to some extent, in coding. However, our qualitative research reveals that teachers' knowledge about and practice of CTPS was relatively low in Bosnia and Herzegovina compared to other countries. The relative lack of effectiveness in Bosnia and Herzegovina may have been due to the severe effects of the COVID-19 pandemic which badly affected the country at this time.

Although the deployment of Micro:bit was below expectations, more teachers in MSS schools use Micro:bit in their classrooms than do teachers from CSS schools who were trained later, suggesting it may take time to build up the skills and confidence to use the device. The teaching of classes online at later stages of the programme due to school closures may also have an effect on this outcome, although since both groups of teachers were affected in the same way suggests that the difference in behaviour could plausibly be attributed to the effects of the Programme. However, a higher proportion of trained than untrained teachers use Micro:bit in their lessons, suggesting a **strong impact of the training element of the Programme in supporting teachers to use Micro:bit**. The Programme was also effective in improving the knowledge skills and confidence of teachers to teach CTPS and coding. Teachers' confidence in delivering CTPS was determined in part by their age, experience and pupil behaviour. The emphasis within the Programme that trained teachers should be encouraged to share their newly gained knowledge of CTPS with other teachers promoted peer-learning effects and confidence-building in the use of CTPS teaching methods.

Many pupils have experienced CTPS for the first time, providing them with an opportunity to express their opinions and participate in group discussions to a greater degree than before the BC Programme. The Programme was more effective in this respect in Albania, Montenegro and Serbia than elsewhere. Pupils' basic coding skills have also improved, with the greatest improvements in Albania, North Macedonia and Serbia. However, it has been less effective in improving pupils' basic coding skills in Bosnia and Herzegovina and in Kosovo, which have remained at a rather low level. Additionally, pupils' interest in coding has been increased by the intervention of the BC Programme.

The British Council was able to respond speedily to difficulties in the initial Programme implementation by responding to the Programme monitoring reports. With 4,000 schools included in the programme, the Programme cost of £2,000 per school has produced substantial benefits suggesting a high value for money. Over 18,000 teachers have benefitted from improved CTPS skills, which is transforming teaching practice throughout the region in the direction of a more open minded and interactive approach to learning. This has provided a major boost to the ability of school systems to deliver teaching using CTPS teaching methods (e.g., an additional 100,000 pupils experiencing critical thinking in the classroom and an additional 80,000 experiencing problem solving in their lessons). The Programme can also plausibly be attributed with having increased pupils' participation in coding clubs by 50,000. The programme can therefore be considered to have been efficient in delivering positive impacts for the primary education systems in the Western Balkans, especially given the headwinds that it faced in delivering these benefits. These have included a context of poor digital infrastructures and equipment in many schools, especially in rural areas, and a deficit of qualified specialist IT teachers in many of the primary schools in the region. Given these headwinds, it is all the more remarkable that the Programme achieved most of its targets and has had a transformative impact on school systems throughout the Western Balkan region.

The country evaluation reports suggest that Programme activities are likely to be sustained in the future. This is because it has developed the capacity of policymakers, school leaders, and teachers to support the uptake of CTPS and coding teaching, because digital transformation is an overarching policy objective in all the Western Balkan countries. However, many structural challenges related to school infrastructure and the lack of IT equipment persist, especially to the sustainability of coding including outdated school infrastructure, poor internet access and equipment that might hinder the sustainability of coding teaching. Here, an important legacy of the Programme has been the development of Teacher Manuals with detailed information on activities, lesson plans, project work, equipment used, and learning outcomes. It can be expected that the reforms of the compulsory subject "Informatics with Technics" to devote more room to coding will also ensure the sustainability of this subject in schools throughout the region. Additionally, the Micro:bit online course developed by the British Council is available to teachers on the Moodle platform and has been handed over to ministries for use after the end of the Programme, thus ensuring sustainability in the use of Micro:bit devices in the future. Related to this, the teacher and school leader surveys revealed a high level of confidence that the teaching of coding will continue in the future.

Several lessons have been learned for policymakers and school leaders for the future development of the CTPS and coding in primary schools.

- Improved motivation of school leaders and teachers is the main factor leading to positive outcomes for pupils and the education system in general. Therefore, continuing training for school leaders in the CTPS teaching approach should be sustained to motivate their support for teachers in using CTPS teaching methods in their schools.

- In future, ensure that only motivated teachers are selected for training. School directors should more carefully select teachers for training to identify motivated and committed teachers who have the capacities and willingness to learn and to pass knowledge and skills to their peers.

- Continue to provide training to teachers in coding using Micro:bit. Schools lack qualified specialist IT teachers. The BC has developed a new course on Micro:bit that is suited to the level of knowledge of teachers, has increased teacher confidence, and should be used in the future for training teachers in coding.

- Involving pupils in leading the organisation of coding clubs has improved pupils' interest in coding and their involvement in coding activities outside the classroom. Pupils should be given greater responsibility for organising coding clubs, and also for organising other extra-curricular activities that could promote CTPS skills such as debating clubs.

- Pupils with special educational needs and Roma pupils experience greater difficulties in using Micro:bit and in developing their coding skills compared to other pupils. Consideration could therefore be given to training specialised assistant teachers to support these pupils.

- Coding competitions should become a regular activity across all schools. This could incentivise teachers and pupils to explore the new opportunities that Micro:bit allows. The winning projects should be stored and shared with all schools.

Several lessons have been learned for the British Council on future development and rollout of similar Programmes in other countries:

1. Develop stronger dissemination plans with school principals to share knowledge with non-trained teachers. Encourage school leaders to organise more meetings for trained teachers to present their knowledge to their colleagues.

2. Strengthen the mentoring and coaching component of the Programme.

3. In future, the trainings in coding should be longer, with specific examples provided by subject for potential projects and the use of Micro:bit.

4. Support schools to develop an activity plan aiming to increase the number of pupils participating in coding clubs.

Appendix 1: Assumptions relating to theory of change – were they met?

In this section, we discuss whether the assumptions related to the Theory of Change were met, and in particular: (i) assumptions related to policymakers and the education system as a whole (Table A1.1) ; (ii) assumptions related to school leaders (Table A.1.2); (iii) assumptions related to teachers - CTPS (Table A.1.3a); (iv) assumptions related to teachers - coding (Table A1.3b); (v) assumptions related to pupils (Table A1.4). The validity of the assumptions that underpin the Programme impact according to the Programme Theory of Change have been assessed by the country experts based on their findings from field research. These have been given a summary score depending upon the extent to which the assumptions have been fully met (A), mostly met (B), partly met (C), or not met at all (D). The scoring methodology involves a review of the evidence derived from fieldwork in each country by the local experts. These scores are applied to the findings from the qualitative research. A score of "fully met" would require that in all respects the assumption is met, a score of "mostly met" would require that the assumption is met in large part but not fully, a score of "partly met" requires that the assumption is met only in some respects, while a score of "not met at all" is self-explanatory. Averages are presented for the Western Balkans as a whole in the last row in each Table. For the qualitative indicators, where there is an equal distribution of scores, for example three "B" and three "C" we round up to a "B" overall. It should be noted that comparisons across countries should be treated with caution, due to the subjective nature of the expert evaluation. To the extent possible, the scores have been validated and corrected for comparability by the core research team at LSE.

Table A1.1: Assumptions related to policymakers and the education system as a whole

	The Ministries of education supported the Programme		The school system had the capacity to absorb the Programme	
	Baseline	**Endline**	**Baseline**	**Endline**
AL	B	A	C	C
BA	B	B	C	C
XK	B	A	B	B
ME	A	A	B	B
MK	A	A	B	B
RS	A	A	C	B
WB	A	A	C	B

Source: Baseline and endline reports. Note: A = fully; B = mostly; C= partly; D= not at all

Ministries of education overwhelmingly supported the Programme, with some hesitation noted only in Bosnia and Herzegovina. As can be seen in table A1.1 there were mixed results for the assumptions related to policymakers that the "*Ministries of education supported the Programme*". The evaluation shows that this assumption was either fully met (Montenegro; North Macedonia; Serbia) and mostly met (Albania; Bosnia and Herzegovina; Kosovo) at the baseline. As confirmed by the interviews with policymakers, there was since the beginning a strong endorsement of the Programme and its aims, which were also fine-tuned with the current developments of education systems in the Western Balkans (see also section on Relevance above). At the endline, this assumption was fully met in all of the countries (with the exception of Bosnia and Herzegovina due to the decentralisation of the education system). Overall, policymakers demonstrated their willingness to

support the training of school leaders and teachers, and to improve the curriculum on CTPS and coding/programming, which is also confirmed by the fact that CTPS and coding/programming have now been included in several national policy frameworks and strategies aimed towards the digitalisation and modernisation of education systems (see also section on Relevance). In addition, there seems to be a great commitment at governmental level to continue to work with the British Council in the provision of guidance and learning materials (see also section on Sustainability).

A less consistent picture emerges with reference to the second assumption on whether *"the school system had the capacity to absorb the Programme"*. At the baseline, this assumption was mostly met in Kosovo, Montenegro and North Macedonia, and by the endline in Serbia too. In Albania and Bosnia and Herzegovina the capacity of the systems to absorb the Programme was only ever partly met. Some of the explanatory factors include the lack of school infrastructure (AL, BA), limited IT equipment (XK), the novelty of including coding in the curriculum in comparison to CTPS teaching already present in the teaching methods (thus with teachers being familiar with it) (ME), and the availability of IT teachers (RS). In other words, the assumption on the capacity of the school system to absorb the Programme was affected by the schools' structural challenges which are common in most of the countries and, as shown later (see assumptions on teachers/coding and pupils/coding) hindered the Programme from achieving its full outcomes in all countries.

Table A1.2: Assumptions related to school leaders

	School leaders were willing (baseline) / did participate in capacity building activities (endline)		**School leaders supported CTPS (baseline) / engaged with the Programme (CTPS) (endline)**		**School leaders supported coding (baseline) / engaged with the Programme (Coding) (endline)**	
	Baseline	**Endline**	**Baseline**	**Endline**	**Baseline**	**Endline**
AL	B	A	B	A	C	B
BA	A	A	B	B	B	B
XK	A	A	A	A	A	B
ME	B	B	A	B	A	B
MK	B	A	B	A	B	B
RS	B	B	B	B	B	B
WB	B	A	B	A	B	B

Source: Baseline and endline reports. Note: A = fully; B = mostly; C= partly; D= not at all

In this section we evaluate the set of assumptions related to school leaders. As can be seen from table A1.2 the first assumption on whether "School leaders were willing (baseline)/did participate in capacity building activities (endline)" was fully met in all countries, with an improvement from the baseline (in which it was mostly met) to the endline (fully met). Only in Montenegro, and Serbia, was some hesitation observed by the endline (where the assumption remained "mostly met"). Overall, it can be said that school leaders were fully available to participate in the capacity building activities of the Programme and willing to foster motivation among the teachers to be trained. However, there were some exceptions; for example, in Montenegro the replacement of new school leaders following the election of a new government in 2020 had a negative impact on their capacity building activities, with only 17% of the new school leaders from the MSS having taking part in the training activities, and in North Macedonia one school leader from the MSS did not take part in the activities which were handled by the deputy.

A similar picture emerges for the second assumption, namely whether "*School leaders supported CTPS (baseline)/engaged with the Programme (CTPS) (Endline)*". As it can be seen in the second column of table A.1.2 the assumption was overall partly met at the baseline and fully met at the endline. The assumption was fully met at the baseline in Kosovo and Montenegro, and mostly met in Albania, North Macedonia, Bosnia and Herzegovina, and Serbia. The assumption was fully met at the endline in Albania, Kosovo and North Macedonia, having slipped back in Montenegro due to the changes in school leaders mentioned above, and was also only "mostly met" in Bosnia and Herzegovina and Serbia. As reported by the IDIs, school leaders were very active in engaging with the teaching of CTPS by organising open classes and discussions (AL) and, despite already having background knowledge on CTPS, they considered the British Council training an important opportunity to refresh their knowledge about the CTPS techniques, with the "six hats" being the most appreciated one (XK). In some cases, the Covid-19 pandemic, with the increasing challenges in terms of leadership and responsibilities for school leaders, was considered the main factor which prevented them from fully participating in the Programme activities (BA, ME).

Finally, the third assumption, namely "*School leaders supported coding (baseline)/ engaged with the Programme (coding) (endline)*" was mostly (but not fully) met in all countries at both baseline and endline. Some improvement can be noted in Albania, in which the assumption went from partly met to fully met and where school leaders actively supported the establishment and implementation of coding club activities in about 60% of the schools. By contrast, in Kosovo and in Montenegro the reverse can be noticed, with the assumption being mostly met at the endline whereas at the baseline was fully met.

Table A1.3a: Assumptions related to teachers - CTPS

	Teachers were interested and available for CTPS training		**Teachers had or acquired appropriate CTPS skills**		**Time and resources were available to implement CTPS**	
	Baseline	**Endline**	**Baseline**	**Endline**	**Baseline**	**Endline**
AL	A	A	B	A	C	C
BA	A	A	C	B	B	B
XK	B	A	B	A	B	B
ME	B	B	B	A	B	B
MK	B	A	C	B	C	B
RS	B	B	B	A	B	B
WB	A	A	B	A	B	B

Source: Baseline and endline reports. Note: A = fully; B = mostly; C= partly; D= not at all

In this section we evaluate three sets of Assumptions related to teachers with reference to CTPS. At a first glance, it can be said that the results of the evaluation showed that teachers were interested and available for CTPS training and that they acquired appropriate CTPS skills from the training they received, although a more challenging aspect was related to the issue of time and resources available to implement CTPS.

As also shown in table A.1.3a, the results of the endline confirm that all *"teachers were interested and available to participate in CTPS training"*, with this assumption being fully met at the endline in all of the countries, with the exception of Montenegro and Serbia in which it was mostly met. For example, in Kosovo, 65% of the MSS teachers and 43% of the CSS teachers took part in the training, given also that the training activities were

accredited by the MEST and, hence, they can be used for teachers' promotion. In Montenegro, the British Council programme was considered to be well aligned with teachers' needs in CTPS, with all of them demonstrating interest in continuing to further enhance their skills in CTPS teaching methods. However, some teachers also believed that it would be important to receive further guidance on how to incorporate CTPS in their lesson plan; for instance, in North Macedonia teachers of foreign languages expressed some confusion on how CTPS could be incorporated into teaching. With reference to the assumption *"teachers had or acquired appropriate CTPS skills"*, the assumption was overall fully met at the endline in most of the countries, except for Bosnia and Herzegovina and North Macedonia. In Albania, more than 80% of teachers have incorporated CTPS in their classes, whereas in Kosovo and Montenegro the results of the evaluation suggest that the British Council Programme helped teachers to improve their teaching approach to CTPS by learning new techniques.

More challenges emerge with reference to the assumption on "*time and resources were available to implement CTPS*", with this assumption mostly met at the endline for all the countries with the exception of Albania where the Covid-19 pandemic had, as elsewhere, a negative influence on the amount of time for implementing interactive teaching methods.

Table A1.3b: Assumptions related to teachers - coding

	Teachers had access to adequate IT infrastructure in schools		Teachers had or acquired appropriate coding skills from training		Time and resources were available to implement coding teaching	
	Baseline	**Endline**	**Baseline**	**Endline**	**Baseline**	**Endline**
AL	D	D	D	C	D	C
BA	C	C	D	C	B	C
XK	C	C	D	C	C	C
ME	C	C	C	C	C	C
MK	C	B	B	B	D	C
RS	B	A	B	B	B	B
WB	C	C	C	C	C	C

Source: Baseline and endline reports. Note: A = fully; B = mostly; C= partly; D= not at all

As can be seen from table A1.3b on coding, in comparison with the previous table A1.3a on CTPS, the assumptions for all the three items were only partly met at the endline, with little differences in comparison to the baseline.

Regarding the first assumption (with the exception of Serbia emerging as the only country in which the assumption was fully met - but even there only at the endline), teachers had overall limited access to adequate IT infrastructure in schools. As reported in the individual evaluation country reports, outdated computers, lack of laboratories, and lack of adequate school infrastructure were widely considered among the biggest challenges reported by school leaders and teachers (AL, XK, BA, ME). For example, in Kosovo the lack of computers and Internet access (with only one out of eight schools having WIFI accessible in the entire school) were reported by teachers as serious challenges which prevented them from implementing the teaching of coding. Indeed, on a scale from 1 to 5 (from fully agree to does not agree at all) teachers in Kosovo reported that their schools lack adequate IT infrastructure for teaching programming/coding. Similar issues were

reported in Montenegro, though there was a greater availability of resources in urban schools than in rural schools.

The second assumption on whether "*teachers had/acquired appropriate coding skills from training*" (Table A1.3b) was only partly met. In Albania, Bosnia and Herzegovina, and Kosovo the assumption was "not met at all" at the baseline, with an improvement at the endline when it was partly met. In Montenegro, it was partly met at the baseline, and this was confirmed at the endline. In North Macedonia and Serbia, it was mostly met at the baseline, and this was confirmed at the endline. The country evaluation reports shed some light on the potential factors accounting for this outcome. In Kosovo, during the survey with teachers, some of the non-IT teachers noted that the duration of training for Micro:bit was too short and not sufficient in terms of time. In Montenegro, some of the teachers did not possess enough experience or knowledge about coding/programming, with some older teachers struggling to fully adapt to new technologies and teaching methods.

The assumption on "*time and resources were available to implement coding teaching*" (Table A1.3b) was also only partly met by all countries, with the exception of Serbia where it was mostly met at the endline. For example, in Kosovo issues such as lack of computers, Internet access, materials and equipment were mentioned as barriers to teaching coding for some teachers, even though according to the trainers the main barrier was teachers' reluctance to integrate coding into their teaching. Other factors that were mentioned as important in preventing the programme from achieving its full aims in the implementation of coding teaching were the high number of pupils in the classes (ME), the Covid-19 pandemic that also shortened the duration of classes (MK), and poor school infrastructure (AL, BA).

Table A1.4: Assumptions related to pupils

	Pupils have/gained the basic CTPS skills to engage with the Programme		**Pupils have/gained the basic coding skills to engage with the Programme**	
	Baseline	**Endline**	**Baseline**	**Endline**
AL	B	A	D	C
BA	C	B	C	C
XK	C	B	C	C
ME	A	A	B	B
MK	C	B	C	B
RS	B	A	C	B
WB	B	A	C	B

Source: Baseline and endline reports. Note: A = fully; B = mostly; C= partly; D= not at all

In this final section we evaluate the last set of assumptions related to pupils. As can be seen in Table A1.4 there was an improvement in pupils' skills for both CTPS and coding. With reference to CTPS the the assumption that pupils had the basic skills to engage with the Programme at the baseline was fully met only in Montenegro, it was mostly met in Albania and Serbia, and only partly met in Bosnia and Herzegovina, Kosovo and North Macedonia. Improvements were noted at the endline in all countries. In Kosovo, teachers

also reported that CTPS teaching methods were accepted with more difficulty by Roma, Ashkali and Egyptian pupils and those with special needs.

With reference to the assumption that pupils had the ability to engage with coding, the picture is less favourable. At the baseline, the assumption was not met at all in Albania, and only partly met in Bosnia and Herzegovina, Kosovo, North Macedonia and Serbia (see Table A1.4 above). By the endline, an improvement was noted in Albania North Macedonia and Serbia, but even then, the assumption was not fully met in any of the countries. The relatively weak initial conditions concerning pupils' skills to engage with coding/programming is related to the low level of skills revealed by the PISA 2018 tests, which showed that many pupils in the region lacked basic knowledge concerning mathematics and science, and indeed reading abilities, that would enable them to engage successfully with teaching in coding/programming (see the Introduction to this report above). Overall, and in comparison with the assumptions referred to the implementation of CTPS skills, the assumptions relating to pupils' ability to engage with coding were less promising, and this was exacerbated by the lack of enabling conditions such as IT equipment, infrastructure, and to more exogenous challenges such as the Covid-19 pandemic with the conversion of online classroom teaching and the reduction in the number of hours taught to pupils.

Conclusions

The findings from the qualitative research suggest that there is mixed evidence on how and to what extent the assumptions underlying the Theory of Change were met.

The Assumptions related to **policymakers** and the education system as a whole were fully met at the endline by all the Western Balkans countries, with the exception of the decentralised system of Bosnia in which the assumption was mostly met. Fully aligned with ongoing reform processes of modernisation and digitalisation of education systems, the Programme was highly supported by the Ministries of Education. This support, in turn, created a positive enabling environment for school leaders and teachers. Furthermore, Ministries have also worked in cooperation with the British Council, not only in creating awareness of the Programme but under more practical aspects, such as the organisation of the training and workshops and the work done in producing materials and documentation. Nevertheless, the assumption related to the capacity of the school system to absorb the Programme was only "mostly met", given that it is also dependent upon structural factors such as schools' infrastructures, availability of IT equipment, and geographical location (urban vs rural schools).

School leaders have played a great role in supporting and fostering the implementation of the programme, and the assumption on their participation in capacity building activities was fully met at the endline. In the Western Balkans as a whole, the assumption on whether school leaders engaged with CTPS was also fully met at the endline, whereas it was mostly met with reference to coding (and indeed at least 70% of coding clubs established during the first and the second project year still exist). The role played by school leaders in implementing the Programme has also been an important factor in influencing the assumptions related to teachers. In particular, the assumption on whether **teachers** participated in CTPS training and acquired appropriate skills was fully met at the endline, although it was only partly met with reference to the time and resources available to implement CTPS, given also the outbreak of Covid-19 and the disruptions in terms of teaching modalities and length of teaching classes. By contrast, the results of the evaluation show that the assumptions related to teachers, in terms of implementing coding, were only party met at the endline in the Western Balkan countries as a whole; specifically, teachers only partly had access to adequate IT infrastructure in schools, and only partly acquired appropriate coding skills from training. The assumptions related to whether time and resources were available to implement coding teaching were also only partly met. The lack of school infrastructure, IT equipment, the insufficient number of trained specialist IT teachers and the Covid-19 pandemic can be accounted as the primary reasons for explaining this outcome. Finally, and consistently with the assumptions regarding teachers, the assumptions related to **pupils** provide a similar result. At the baseline pupils the assumption that pupils had the basic CTPS skills to engage with the Programme was mostly met in the Western Balkans as a whole, while the assumption that pupils had the basic

coding skills to engage with the Programme was only partly met. Yet, despite this inauspicious starting point, pupils' CTPS and coding skills improved overall by the end of the Programme.
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Appendix 2: Short-term Outcomes

This section sets out the key findings in relation to the achievement of the Programme Outcomes. Outcome 3 relates to policymakers, Outcome 2 to school leaders and Outcome 1 to teachers.

Outcome 3*: "Relevant decision makers create and implement curriculum and introduce other related policy measures to advance CTPS and coding skills learning in primary schools".*

By the end of the BC Programme, teachers throughout the region had gained substantial knowledge about CTPS teaching methods and had begun to widely practice them in the classroom. In cases where teachers had prior knowledge of CTPS, the BC training refreshed their knowledge and introduced them to new techniques.

The BC Programme led to a flurry of policy activity, introducing reforms to primary school curricula. This introduced a new impetus to coding teaching into schools throughout the Western Balkans. In **Albania**, coding with Micro:bit has been embedded in the curriculum of the sixth grade (6 hours) and seventh grade (6 hours) since the academic year 2021-2022. In **Bosnia and Herzegovina**, there has not been anything much new in the curricula with the exception of Canton Sarajevo where coding has been introduced to the curriculum for the 3rd to 9th grades and in Zenica Doboj Canton for the 6th to 9th grades, with 10 hours per academic year. In **Kosovo**, coding/programming has become part of the IT curricula for the 8th and 9th grades since the academic year 2019/2020. As a result of the National Curricula revision, four new lesson units have been developed for grades 8 and 9 (4 hours per grade for coding with Micro:bit and programming logo robots) in the textbooks since the academic year 2021-2022. This might also reflect the small number of hours devoted to the subject in the school year. In **Montenegro**, coding has been expanded in the curriculum from just 2 hours in the 8th grade to 7 hours per year in all grades. In **North Macedonia**, coding was already taught extensively before the BC Programme with between 36 hours in the 6th grade and 72 in the 9th grade. This has now been supplemented with 24 hours in the 7th grade, although the hours have been reduced to 30 in the 6th grade, making a total increase of 30 hours. Coding is also taught in lower primary levels. In **Serbia**, coding has been expanded in the 7th grade (14 hours) and 8th grade (12 hours), having already been taught in 5th and 6th grades before the BC Programme.

Overall, the teaching of coding has been expanded substantially in the region, especially in Albania, Montenegro, North Macedonia and Serbia, although the number of hours devoted to this activity remains low in all countries with the exception of North Macedonia and to a lesser but still substantial extent in Serbia.

Indicator: Schools have embedded coding in the core curriculum. Target: At least 70% of primary schools have implemented compulsory or elective coding classes

By the end of the Programme, all six countries had introduced coding into their curricula (i.e. by the school year 2021/2022). At the time of the endline survey (October/November 2021), the pupil survey revealed that 77% of pupils had been exposed to classes in coding/programming in each country of the Western Balkans, with the exception of Albania.[23]

[23] The endline pupil survey found that 23% of pupils reported that they had "never" received classes in coding (see Endline Report Table P16), implying that 77% of pupils had been exposed to coding. In Albania only 59% had received any coding classes at the time of the endline survey.

In Serbia all schools have compulsory coding classes integrated into the curriculum,[24] and the pupil survey showed that coding has been experienced by 92% of pupils.

In North Macedonia coding is taught in grades 6 and 7 as a compulsory subject and grades 8 and 9 as an elective subject; the school leader survey showed that 92% of all surveyed schools have implemented some coding classes, while coding has been experienced by 90% of pupils.

In Montenegro coding has been introduced in the curricula of all grades 5 to 8; the school leader survey showed that 72% of all surveyed schools have implemented some coding classes, while coding has been experienced by 75% of pupils.

In Bosnia and Herzegovina coding has been introduced in the curricula of some cantons (notably Canton Sarajevo and Zenica Doboj Canton); the school leader survey showed that 46% of all surveyed schools have implemented some coding classes, while coding has been experienced by 84% of pupils.

In Kosovo, coding has been introduced as a compulsory subject in grades 8 and 9 with textbooks that have started to be used since the 2021-2022 school year; the school leader survey showed however that none of surveyed schools had formally implemented coding classes (perhaps because the survey was implemented at the start of the school year in which coding was introduced into the curriculum and was actually taught later in the school year), although the pupils survey showed that coding has been experienced by 72% of pupils.

In Albania coding was introduced in the curricula of grades 6 and 7 using Micro:bit in the 2021/2022 school year; the school leader survey showed that 28% of all surveyed schools have implemented some coding classes, while coding has been experienced by 59% of pupils.

The reason why not all pupils reported exposure to coding lessons at schools was due in part to the fact that coding was introduced into the curricula at a late stage of the Programme in some countries, but also due to the lack of computer equipment in some schools in the region. It is relevant that the school leaders survey revealed that only 52% of schools in the region have adequate IT infrastructure to teach coding/programming. The extent to which this infrastructure is available varies widely from 83% of schools in Serbia and 79% in Montenegro to just 7% of schools in Albania (and between 50% and 62% in Bosnia and Herzegovina, Kosovo and Montenegro).

Taking this evidence together suggests that the target has been fully met in North Macedonia, Montenegro and Serbia. Judging by the responses of pupils, the target may have been met in Bosnia and Herzegovina, and Kosovo, but this is not corroborated by evidence from the school leader surveys. The target does not yet appear to have been met in Albania.

Indicator: The number of new teacher training programmes (including BC training programme) that have been accredited by relevant state authorities by the end of the Programme. Target: at least one in each country.

Altogether, the BC Programme has led to the accreditation of 21 training courses in the Western Balkans. These have included **seven** courses for school leaders (3 in Serbia, 2 in Kosovo, 1 in each of Albania and Montenegro, and none in North Macedonia and Bosnia and Herzegovina). These courses have included topics such as introduction to CTPS, leadership skills, team management, change management and an introduction to Micro:bit. In addition, **seven** courses have been accredited for training teachers in CTPS and coding using MIcro:bit (3 in Serbia, 2 in Kosovo, and 1 each in Albania, Montenegro and North Macedonia). In addition **five** other courses have been accredited including 4 in Serbia training for IT teachers to implement new IT curricula and in Micro:bit, and 1 in Montenegro on the new curriculum requirements for coding, and 1 in North Macedonia

[24] The evaluators were not permitted by the national authorities to enquire as to the actual implementation of this curriculum requirement in the schools.

for learning Micro:bit. However, no training courses have been accredited in Bosnia and Herzegovina, although the ministry recognises both achool leader courses and CTPS courses as continuous learning and documentation on course completion is kept in their files. Thus, **the target has been exceeded overall beyond the expectation of a total of 6 accredited training courses, although the absence of an accredited training course in Bosnia and Herzegovina should be noted entirety.**

Outcome 2*: "School leaders actively support the implementation CTPS and coding skills at school level across the curricula"*

The expected outcome of the BC Programme, that school leaders' have provided active support for implementation of CTPS teaching methods, has been fulfilled in almost all schools. Findings from the school leader survey show that, throughout the Western Balkans, school leaders' active support for their teachers' use of CTPS techniques improved from a score of 1.57 (on a scale of 1=strongly agree to 5=strongly disagree) before the implementation of the BC Programme to a score of 1.31 after the implementation of the BC Programme (see Endline synthesis report). Teachers agreed; their scores for school leaders' support for their use of CTPS teaching methods improved from 1.70 before the implementation of the BC Programme to 1.45 afterwards. However, according to the country reports, in some countries the COVID-19 pandemic reduced the time available for those techniques during the period of remote teaching, so the improvement is all the more remarkable.

In contrast, the extent of support offered by school leaders for the teaching of coding/programming has been less effective. This is partly due to inadequate infrastructure for IT lessons. In Albania, some rural schools lack electricity, and many schools lack IT equipment. In addition, few teachers have the skills to teach coding/programming. In Bosnia and Herzegovina, while school leaders actively supported the teaching of coding skills, many schools lack IT resources and have weak internet connections. In Kosovo, many schools only have internet access in the school leaders' office, and so teachers must use the school leaders' office to teach coding/programming. School leaders in Montenegro had mostly been replaced following the recent change of government. They also cited the inadequacy of their schools IT infrastructure, and the need to replace outdated computers. In Serbia, while all school leaders have supported the teaching of coding/programming across the curriculum, they are faced with significant obstacles due to a lack of knowledgeable IT teachers. **In conclusion, while Outcome 2 has been mostly achieved in relation to CTPS and coding, the support for coding has struggled against a difficult implementation environment.**

Indicator: % of school leaders who ensure that CTPS teaching is regularly practised by at least 2 non-trained teachers at the end of the Programme. Target: at least 50%.

The teacher survey revealed that trained teachers have been relatively successful in transmitting their CTPS knowledge to untrained teachers who implement CTPS teaching in similar proportions of classes as trained teachers (Table 7 Endline report). The teacher survey also revealed that three quarters of trained teachers (73%) had shared their knowledge about CTPS with at least one other teacher who had not participated in training. Since there were 280 trained teachers in the sample, this implies that 210 teachers shared their knowledge with at least one other untrained teacher. Moreover, since there are 64 schools (and school leaders) in the sample, this implies that on average trained 3.3. teachers per school (280/64) shared their knowledge with at least one untrained teacher; in other words, on average, each school leader ensured that CTPS knowledge of the trained teachers was shared with at least 3 non-trained teachers. Therefore, **the target for indicator (i) of Outcome 2 criterion has been achieved. Indeed, the target was exceeded by some distance, since on average 100% of school leaders ensured a transfer of knowledge to at least 3 untrained teachers in their school.**

Indicator: % of coding clubs established during the first and the second project year that still exist by the end of the project. Target: at least 70%.

Throughout the Western Balkans, coding clubs were established by 76% of schools in the period up to 5 months after the initial training of teachers and school leaders. These included 2,662 coding clubs established in school premises, and a further 325 established online. According to our survey, coding clubs were established in more than half of the surveyed schools (in 54% of surveyed schools according to school leaders, and 61% according to teachers). They were established in a greater proportion of MSS schools (66%) than CSS schools (31%). The difference suggests a strong impact of the BC Programme in enabling and supporting school leaders to establish coding clubs in their schools. **Of the coding clubs that were established during the first and the second project year, between 72% (teacher survey) and 85% (school leader survey) still existed by the end of the project. The target for indicator (ii) of Outcome 2 has therefore been achieved.**

Outcome 1 *"Teachers embed and practice CTPS and coding skills in classrooms"*

By the end of the BC Programme, teachers throughout the region had gained substantial knowledge about CTPS teaching methods and had begun to widely practice it in the classroom. Where teachers had prior knowledge of CTPS, the BC training refreshed their knowledge and introduced them to new techniques. According to the country endline reports, qualitative research suggested that teachers in MSS schools achieved this Outcome "fully" with the sole exception of Bosnia and Herzegovina. Teachers in CSS schools in Kosovo, Montenegro and North Macedonia were judged to have fully achieved the outcome, in Albania and Serbia were judged to have "mostly" achieved this outcome while in Bosnia and Herzegovina only partial achievement was noted. The difference in achievement between the MSS and CSS schools provides some evidence of Programme impact in this respect.

In contrast, the Outcome has at best only partly achieved its intended outcome in relation to coding/programming (and not been achieved at all in Albania and Kosovo). This judgement applied equally to teachers in MSS schools and CSS schools. In Albania, it was reported that few IT teachers were qualified to teach IT classes, and that they have little interest in acquiring such knowledge. However, the relatively few trained IT teachers have made their best efforts given limited school capacities, infrastructure, and resources to develop coding/programming.[25] In Kosovo, although coding/programming has been integrated into the curriculum since the academic year 2019/2020, interviewed teachers reported that in practice the curriculum was not implemented, and coding/programming was not currently taught in primary schools at the time of the survey. The reason was that with a few exceptions, IT teachers do not possess knowledge and skills to teach the subject.[26] The situation has been improving in Serbia, in response to a shortage of trained IT teachers, the BC Programme engaged a local NGO "Petlja", which specialises in computer programming education, to develop teaching materials and online courses to help teachers implement this part of the Programme. These online sources have been translated and are being shared with other countries, so it is expected that the situation will improve throughout the Western Balkans in the near future.

Indicator: % of trained teachers who integrate CTPS skills into teaching and learning activities by the end of the Programme. Target: at least 80%.

[25] It should be noted that the British Council has developed a Manual for Micro:bit Coding for Primary School containing materials for students and teachers of the sixth and seventh grades with interactive exercises and projects to be developed by them. Furthermore, training was provided to 505 ICT teachers teaching in grades 6th, 7th, 8th and 9th by three external consultants engaged by British Council Albania where instructions on the materials developed by British Council for coding and micro: bit were shared along with examples on how to use these resource materials during their teaching practise.

[26] It should be noted that as a result of the National Curricula revision, four new lesson units were developed and integrated into the ICT subject curricula of grades 8 and 9, where eight learning hours/classes are dedicated to coding with micro:bit and programming logo robots, four hours per each grade. The lesson units are integrated in the textbooks of grades 8 and 9 and have started to be used since the academic year 2021-2022. The implementation of this curriculum was not yet established at the time of the survey in autumn 2021, but hopefully it will be gradually implemented as IT teachers receive further professional training.

The school leader survey showed that 75% of trained teachers in MSS schools have integrated CTPS skills into their teaching and learning activities (see Endline Synthesis Report Table 12). This is close to the target of 80%, but with a substantial degree of non-achievement in Montenegro and North Macedonia and over-achievement in Bosnia and Herzegovina and Kosovo. It is notable that the achievement level of trained teachers is substantially higher in MSS schools compared to CSS schools (75% vs. 64%) suggesting relatively strong signs of impact of the BC Programme and provides evidence of the contribution of the BC Programme to positive change. The same indication is given by the comparison of the greater integration of CTPS in lessons in MSS schools by trained teachers (75%) compared to untrained teachers (50%) in those schools.

The teacher survey backs up the findings from the school leader survey reported above, to an even greater extent, with 82% of trained teachers reporting that they use CTPS teaching methods in their lessons. Considering the teacher perceptions, we find that **the target for indicator (i) of Outcome 1 has been achieved**, **in that 82% of trained teachers in MSS schools throughout the Western Balkans, and 79% of all trained teachers in all schools, have incorporated CTPS teaching methods their lessons** (see Endline Synthesis Report Table 13). From the teachers' perspective, Bosnia and Herzegovina seems to be somewhat of a laggard in this respect.

Indicator: % of trained teachers regularly use Micro:bit in the classroom by the end of the Programme. Target: at least 70%.

Table A4.3 Proportion of teachers using Micro:bit & its use in the classroom (%)

	All teachers	Trained teachers	Non-trained teachers
AL	53.7	59.4	28.6
BA	16.1	17.7	0.0
XK	17.5	15.8	50.0
ME	52.5	58.3	0.0
MK	84.2	83.8	0.0
RS	48.1	51.7	38.1
WB	**43.9**	**47.8**	**19.4**

Source: Endline synthesis report and teacher survey. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans

In the Western Balkans, only 44% of trained teachers have used Micro:bit in at least some of their lessons, showing that **the target for this indicator has not been met in the region as a whole.** A notable exception is North Macedonia where the target has been more than met, since more than 80% of trained teachers use Micro:bit in their classrooms. This latter finding may be due to the fact that North Macedonia was the only country in the region that had introduced coding into the curriculum before the start of the Programme.[27] The final two columns of Table A4.3 shows that a far higher proportion of trained than untrained teachers use Micro:bit in their lessons, providing some evidence of Programme impact in supporting teachers to use Micro:bit in their lessons. There is a wide variation in the use of Micro:bit across countries, with between 50%-60% of trained teachers using Micro:bit in Albania, Montenegro and Serbia, compared to just 16% to 18% in Bosnia and Herzegovina and Kosovo. Also, a greater proportion of teachers in MSS schools use Micro:bit than in CSS schools (45.4% in MSS schools compared to 39.2% in CSS schools). The larger proportion of trained teachers who used Micro:bit in MSS schools compared to CSS schools suggests that it takes time to build up

[27] Information received from the British Council.

teachers' confidence and interest in using Micro:bit. Other survey data shows that school leaders were neutral in their assessment of whether their trained teachers use Micro:bit in the classroom regularly, scoring this at only 2.7 in the region as a whole (on the scale 1=strongly agree and 5= strongly disagree).

Overall, these data reveal that **the target for the coding element of Outcome 1** (that 70% of trained teachers regularly use Micro:bit in their lessons) has been **fully achieved in North Macedonia, only partly achieved in Albania, Montenegro and Serbia, and not achieved at all in Bosnia and Herzegovina and Kosovo.**

Conclusions on Outcomes

The Short-Term Outcomes of the BC Programme have been mostly met with a few exceptions, mostly relating to the use of Micro:bit in the classroom. With respect to **Outcome 3**, it was expected that **policymakers** would create and implement curriculum and introduce other related policy measures to advance CTPS and coding skills learning in primary schools (Short term outcome 3). The Programme led to a wide introduction or upgrading of CTPS into primary school teaching practice. Reforms to primary school curricula inspired by the Programme have given a new impetus to coding teaching into schools throughout the Western Balkans. **In conclusion, Outcome 3 was successfully achieved**.

With respect to **Outcome 2**, it was expected that **school leaders** would actively support the implementation of CTPS and coding skills at school level across the curricula (Short Term Outcome 2). This Outcome has been broadly achieved with respect to CTPS teaching methods in all schools throughout the Western Balkans. In some countries the COVID-19 pandemic reduced the time available to implement CTPS during the period of remote teaching, so the improvement is even more remarkable. **In conclusion, Outcome 2 was fully achieved in relation to both CTPS and coding, although school leaders' support for each of these struggled against a difficult implementation environment.**

With respect to **Outcome 1**, it was expected that **teachers** would embed and practice CTPS and coding skills in classrooms (Short Term Outcome 1). By the end of the BC Programme, teachers throughout the region had gained substantial knowledge about CTPS teaching methods and had begun to widely practice them in the classroom. In cases where teachers had prior knowledge of CTPS, the BC training refreshed their knowledge and introduced them to new techniques. In contrast, Outcome 1 was at best only partly achieved its intended outcome in relation to coding/programming (and not at all in Albania and Kosovo). The main difficulties were (i) a lack of good internet connections and a lack of up-to-date computer equipment, especially in rural areas and (ii) a lack of adequately qualified IT teaching professionals in some schools. In response to this shortage of trained IT teachers, the BC Programme in Serbia engaged a local NGO "Petlja", to develop a set of online teaching materials to help teachers learn how to use Micro:bit and implement this part of the Programme. **In conclusion, Outcome 1 was fully achieved in relation to both CTPS but was not fully achieved in relation to the use of Micro:bit for coding.** The latter conclusion however is subject to the caveat that trained teachers were far ahead of non-trained teachers in their use of Micro:bit in their classrooms, indicating that a learning period is required for full benefit of the coding aspects of the BC Programme to be achieved. This suggests that a prolonged application of the Programme methods and activities should continue to deliver progress for the education systems in the Western Balkans in the future, and that its sustainability will be a crucial determinant of its long-term impact.

Appendix 3: Intermediary outcome – pupils

This section sets out our key findings in relation to the achievement of the Intermediary Outcome of the BC Programme.

Intermediary Outcome: "*Pupils from 10 to 15 years old across the Western Balkans demonstrate enhanced CTPS and coding skills"*.

Given that it was not possible to assess pupils directly on their CTPS and coding skills, we relied on self-reported assessments of such skills. For the case of CTPS, we asked school Leaders and Teachers of pupils to give us an aggregate assessment of their pupil population broken down by gender and school-grade. Assessment was on a 1-10 Likert scale. These results were then aggregated at the respondent level (i.e., across grades and genders), and then averages were taken at the level where reporting was necessary (e.g., country level or school-type level). For school Leaders, this results in an unweighted average across schools; for the metric by school Teachers, it results instead in a pseudo-population weighted average (based on the number of respondent teachers rather than on the number of pupils). For the case of coding skills, we were able to produce, in addition to the above, also a pupil-derived measure. Specifically, pupils were also asked to assess their coding skills (again, in a 1-10 scale), resulting in a self-reported measure of coding skills - which was again averaged to the appropriate level (e.g., country level) without prior aggregation to the school level (thus producing a fully population-weighted average of the metric). To ensure that the self-reported assessment of coding skills was not biased, we followed this by a question asking pupils to name at least one programming language or coding tool and adjusted the self-reported scores downwards (giving the base score of 1) to those pupils who were unable to name any valid languages or tools. On the whole, then, two measures were produced for CTPS (assessment by leaders and by teachers) and four for coding skills (assessment by leaders, by teachers, by pupils as reported and by pupils filtered). This Appendix reports the results from these measures, using different techniques to compare across relevant dimensions and in particular along the following comparisons: main sample schools versus control sample schools, treated schools versus non-treated schools[28] and within-group differences over time (baseline versus endline).

CTPS skills

Indicator: The percentage by which pupils improved their CTPS skills compared to the baseline assessment. Target: an improvement of at least 20%.

As can be seen in Tables A3.1, pupils' CTPS skills as assessed by their teachers did not change (taking all schools in the region as a whole). In MSS schools there was a 0.8% improvement whereas in CSS schools there was a fall of -7.9%. This could be taken as moderate success in so far as the schools more exposed to the programme fared better than those that were less exposed. It should be noted that the overall moderate improvements in the MSS schools were driven almost entirely by a substantial improvement in Serbia, while pupils' CTPS skills fell in all other countries. The poor results were likely caused by the disruptive effects of school closures during the COVID-19 pandemic since the consequent use of online teaching was less amenable to the adoption of CTPS teaching methods. For the control sample schools, teachers' assessments declined by -7.9%, and would have been worse except for an improvement in North Macedonia. However, as shown below, these differences fail the test of statistical significance and thus cannot be taken to suggest a particular movement in either direction. We elaborate on this point further in the last section of this Appendix.

[28] Treated schools are defined as those which had received training at least one month before the implementation of the endline survey. Alternative definitions (e.g., using a three-month threshold or considering as non-treated all schools which received training after the breakout of the COVID pandemic) produced qualitatively similar results which are thus not reported here.

In conclusion, this target has not been met in the Western Balkans as a whole or in any of the individual countries.

Table A3.1: Teachers' perception of pupils' CTPS skills for MSS & CSS schools

	MSS			CSS			All schools		
	Baseline	**Endline**	**% change**	**Baseline**	**Endline**	**% change**	**Baseline**	**Endline**	**% change**
AL	6.6	6.1	-7.5%	6.9	6.1	-11.7%	6.7	6.1	-9.0%
BA	5.9	5.0	-15.5%	.n/a	6.3	n/a	5.9	5.3	-9.9%
XK	7.1	7.0	-1.4%	7.5	7.3	-3.1%	7.3	7.0	-4.1%
ME	6.5	6.4	-2.0%	n/a.	4.4	n/a	6.5	6.1	-6.2%
MK	6.5	6.1	-6.3%	6.5	7.4	14.5%	6.5	6.2	-4.6%
RS	6.0	7.0	16.4%	7.1	6.6	-7.7%	6.2	6.9	11.3%
WB	**6.4**	**6.4**	**0.8%**	**7.1**	**6.5**	**-7.9%**	**6.5**	**6.5**	**0.0%**

Source: Endline synthesis report and teacher survey. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans

It is evident from this analysis that the assessment of pupils' CTPS and coding skills is rather mixed. **Overall, CTPS skills as assessed by teachers showed little improvement, with no country reaching the 20% target and most countries recording a deterioration of such skills.** We do not know the underlying reasons for this, but one explanation may be that teachers' assessment of CTPS skills may have become more conservative after the BC training took place, as they presumably became more aware of what CTPS and coding skills entail - and thus more critical in their assessment of the pupils' skills on these. In addition, the COVID-19 pandemic restrictions largely prevented the use of CTPS methods due to school closures in 2020 and the shift to online modes of teaching through online media including non-interactive TV programmes, which may have influenced teachers' perceptions of their pupils' CTPS skills. While the absolute change may therefore not be very informative, the *relative* change between MSS and CSS schools provides the most relevant and important insight with respect to the impact of the Programme in the given circumstances. Here the data shows that CSS schools have performed relatively better than CSS schools, with a non-negative change in the former and a negative change in the latter. This may suggest a positive impact of the Programme in improving pupils' use and skills in CTPS. We further examine the changes in pupils' CTPS and coding skills using some more formal statistical analysis below, using a difference-in-difference methodology designed to control for unobservable effects of school and country institutional differences and external effects common to all schools between baseline and endline such as the COVID-19 pandemic.

Coding skills

Indicator: The percentage by which pupils improved their coding skills compared to the baseline assessment. Target: an improvement of at least 20%.

The change in coding skills between the baseline and the endline surveys has been measured through the teacher survey and the pupil survey. Teachers were asked to assess the coding skills of their pupils on a scale of 1-10 where 1= no skills to 10= high skills. Pupils were asked to self-asses their own coding skills on the same scale. For the whole region, teachers' assessment of pupils' coding skills registered a 5% decrease at the endline compared to the baseline (see Table A3.2). This may reflect a greater awareness among teachers of the coding skills of their pupils at the endline following the implementation of coding in their classrooms using Micro:bit (as shown above, coding was not widely taught in primary schools before the initiation of the Programme). Teachers' assessment of pupils' coding skills showed an improvement only in Albania, from the lowest base prior to the Programme (an assessment of 3.0 against an average for the region of 5.8. No data is shown for Kosovo due to lack of response to the survey on this question as primary school teachers had not begun to teach coding within the curriculum at the time of the endline survey.

Table A3.2: Pupils' coding skills (teachers' assessment and pupils' self-assessment) all schools

	Teachers			Pupils			Pupils (filtered)		
	Baseline	**Endline**	**% change**	**Baseline**	**Endline**	**% change**	**Baseline**	**Endline**	**% change**
AL	3.0	4.8	61.6%	3.6	4.6	27.4%	1.3	2.1	61.5%
BA	5.3	4.8	-8.9%	4.9	4.8	-1.2%	2.5	2.0	-21.0%
XK	--	--	--	6.1	5.1	-15.7%	1.3	4.6	245.9%
ME	7.0	6.4	-8.1%	4.9	5.4	10.7%	2.3	5.0	118.3%
MK	7.1	5.1	-28.6%	4.8	5.3	9.5%	2.0	3.7	89.7%
RS	6.5	6.3	-2.9%	5.3	5.3	0.0%	2.2	3.6	66.7%
WB	**5.8**	**5.5**	**-5.0%**	**4.9**	**5.1**	**3.3%**	**1.9**	**3.5**	**81.7%**

Source: Baseline synthesis reports and teacher and pupil endline surveys. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans. For Kosovo there were too few teacher respondents to provide valid results

Pupils' self-perception of their own coding skills is lower than the assessment of their teachers (at 4.9 by pupils compared to 5.8 by teachers at the baseline, and 5.1 vs. 5.5 at the endline). The pupils' self-assessment increased slightly overall by 3.3%, with substantially increased self-assessment scores in Albania, Montenegro and North Macedonia, no change in Serbia, and reductions in self-assessed skills in Bosnia and Herzegovina and Kosovo. To check the pupils' understanding of "coding" a filter question was used to ask pupils to name a programming language. Where they could not do so (or where they reported some non-coding software such as "Microsoft Word" as a programming language), their score was reset to "1". This produced a "filtered" score for pupils' self-assessed coding skills, shown in the last three columns of Table A3.2. The results reveal a substantial improvement in **pupils self-assessed coding skills which increased by 82% between the baseline and the endline in the region as a whole, for all schools**. The 20% threshold was met in all the countries of the Western Balkans with the exception of Bosnia and Herzegovina.

Given the uneven way in which the BC programme was rolled out and our evaluation surveys were implemented due to the school closures associated with the COVID-19 pandemic (see section on survey fieldwork above), the distinction between main-sample and control-sample schools (MSS vs CSS) was not as clear-cut as intended. To overcome this, we have split the schools between those for which the endline survey took place after the provision of BC training (which we call 'treated' schools) and those which were still being trained (or expecting training) at the time of the endline survey (which we call 'untreated'). Tables A3.3 compares the pupils coding scores for MSS and Treated groups, for both filtered and unfiltered scores and the Baseline and Endline and shows the corresponding changes in the scores at the Endline.

For the unfiltered scores the results for 'treated' schools are very similar to those obtained for the main-sample schools, although pupils in MSS schools registered a small decrease in the average coding scores, the pupils in the Treated schools registered a slight increase. In both cases, pupils in all countries apart from Bosnia and Herzegovina and Kosovo registered an improvement in coding scores. Turning to the filtered scores, however, produces a different picture. Here, we find that treated schools have registered very substantial improvements in pupils' self-assessed coding skills - with the overall score for pupils in both MSS and Treated schools, rising by 61% for pupils in MSS schools and 72.3%, for pupils at Treated schools, in both case a significant improvement, well over the 20% target, slightly more so in the Treated schools, with a reduction in scores only in Bosnia and Herzegovina.

Table A3.3: Comparison of pupils' unfiltered and filtered self-assessed coding skills for MSS and Treated groups

	Unfiltered						Filtered					
	MSS			Treated			MSS			Treated		
	B	E	%	B	E	%	B	E	%	B	E	%
AL	3.8	4.5	46.9%	3.6	4.5	25.5%	1.5	2.2	50.7%	1.3	2.1	58.3%
BA	4.4	2.3	-47.7%	4.4	2.3	-47.7%	2.4	2.1	-13.3%	2.4	2.3	-5.8%
XK	6.3	5.0	-19.6%	6.2	5.1	-18.1%	1.4	4.4	207.7%	1.4	4.6	240.4%
ME	4.8	5.5	16.0%	4.9	5.6	15.0%	2.8	5.0	77.9%	2.5	5.2	113.0%
MK	4.8	5.1	5.6%	4.8	5.3	9.7%	2.0	3.6	81.8%	2.1	3.8	81.6%
RS	5.1	5.5	6.8%	5.3	5.5	2.8%	2.9	3.6	25.4%	2.3	2.7	19.3%
WB	**4.9**	**4.7**	**-4.1%**	**4.7**	**4.8**	**1.5%**	**2.2**	**3.5**	**61.2%**	**1.9**	**3.2**	**72.3%**

Source: Baseline and Endline synthesis reports and pupil surveys. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans. Scores for Western Balkans are unweighted averages. B = Baseline; E = Endline; % = percentage difference between endline and baseline scores.

On the basis of the self-assessment by pupils, filtered through the knowledge of coding languages, we can confidently conclude that **pupils' coding skills improved in line with Programme expectations, with every country in the region (except Bosnia), as well as the region as a whole, improving pupils' coding skills with increases well above the target of 20%.**

Difference In Difference analysis relating to pupil CTPS and coding skills

This subsection reports on the results of two types of tests:

1. Differences in means, at the Endline, between (i) treated & untreated and (ii) MSS & CSS schools.
2. Difference-in-Difference estimates (baseline/endline vs (i) treated & untreated and (ii) MSS & CSS)

We have used two definitions for "treatment". One is the originally defined MSS-CSS distinction. The other is based on the information we received about the timing of training. As explained above, we count as "treated" all schools which received training up to a month before the endline survey (and all others as non-treated). The results do not change when we use alternative definitions such as training received up to three months before the endline survey, or training received before the COVID outbreak up to February 2020.

The variables that we use are the self-reported coding skills (filtered and unfiltered); two variables measuring pupils' interest in coding (based on Q17: "How interested are you in doing computer programming?" where 1=very interested, 2=somewhat interested and 3 = not particularly interested). The binary form takes the value of 1 when pupils report "very interested" and 0 otherwise; the continuous form is simply the average score from the 3-point Likert scale; and two variables from the teachers' assessment of pupils' coding and CTPS skills.[29]

[29] Formal statistical analysis of the assessment reported by school leaders was not possible due to the small sample size (number of observations).

Table A3.4. School-wide t-tests: difference in performance indicators at the Endline

Variable	**Pupils' self-reported coding skills**				**Pupils' interest in coding**				**Teachers' assessment of pupils**			
Measure	Unfiltered		Filtered		Binary measure		Continuous measure		CTPS skills		Coding skills	
Comparison groups	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS
Treated/MSS	4.629	4.521	3.211	3.227	0.217	0.222	2.161	2.146	6.230	6.202	5.422	5.321
(sample size)	(58)	(45)	(58)	(45)	(58)	(45)	(58)	(45)	(58)	(47)	(39)	(31)
Control	3.155	4.491	2.638	3.014	0.210	0.202	2.033	2.163	6.735	6.472	6.153	5.905
(sample size)	(5)	(18)	(5)	(18)	(5)	(18)	(5)	(18)	(5)	(16)	(3)	(11)
Difference	**1.474**	**0.030**	**0.573**	**0.213**	**0.007**	**0.020**	**0.128**	**-0.017**	**-0.505**	**-0.270**	**-0.731**	**-0.584**
T-test	2.246	0.073	0.802	0.497	0.161	0.769	1.484	-0.327	-0.818	-0.704	-0.586	-0.803
P-value	0.014**	0.471	0.213	0.311	0.436	0.223	0.072*	0.372	0.208	0.242	0.281	0.213

*** p<0.01, ** p<0.05, * p<0.1

The t-tests of the difference between treated and untreated groups of pupils at the endline (Table A3.4) shows that the Programme has had a positive effect on pupils' self-reported coding skills, by all tests (unfiltered v filtered), with a statistically significant difference for one of these measures (column 1: treated-untreated; unfiltered). The teacher's assessment of coding skills shows no (significant) impact of the Programme and the same applies for the case of CTPS skills. This may be due to the impact of the Covid-19 pandemic on teaching of coding and CTPS, as well as the teachers' limited observation of pupils during Covid times. As mentioned earlier, it can also be due to teachers obtaining a more critical view on the assessment of such skills post-training. Despite this, the results show that pupils' interest in coding has been positively impacted by the Programme, with the improvement being statistically significant according to one test (column 7: continuous measure/treated-untreated).

Table A3.5a. Difference-in-Difference estimates: difference in the difference of performance indicators between Baseline and Endline

Variable	**Pupils' self-reported coding skills**				**Pupils' interest in coding**				**Teachers' assessment of pupils**			
Measure	Unfiltered		Filtered		Binary measure		Continuous measure		CTPS skills		Coding skills	
Comparison groups	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS	Treated-untreated	MSS-CSS
Endline	-1.965**	-0.125	0.107	1.116**	-0.129*	-0.174***	0.204*	0.418***	-0.733	-0.240	-1.315	-0.806
	(0.965)	(0.509)	(0.835)	(0.436)	(0.0665)	(0.0343)	(0.118)	(0.0618)	(0.991)	(0.443)	(1.434)	(0.638)
Treated/MSS	-0.555	0.0388	-0.651	0.0769	0.0724	0.0407	-0.0983	-0.0104	-1.052	-0.386	-1.052	-0.386
	(0.714)	(0.430)	(0.618)	(0.368)	(0.0492)	(0.0289)	(0.0873)	(0.0520)	(0.854)	(0.376)	(1.133)	(0.494)
DiD effect	**2.029****	**-0.009**	**1.225**	**0.136**	**-0.0654**	**-0.0209**	**0.227***	**-0.00688**	**0.547**	**0.115**	**0.321**	**-0.199**

	(1.007)	(0.609)	(0.872)	(0.521)	(0.0695)	(0.0410)	(0.123)	(0.0738)	(1.017)	(0.510)	(1.473)	(0.736)
Constant	5.121***	4.615***	2.531***	1.898***	0.339***	0.376***	1.829***	1.746***	7.468***	6.712***	7.468***	6.712***
	(0.682)	(0.355)	(0.590)	(0.304)	(0.0471)	(0.0239)	(0.0835)	(0.0431)	(0.837)	(0.329)	(1.111)	(0.432)
Observations	121	123	121	123	122	124	122	124	115	118	94	97
R-squared	0.041	0.002	0.194	0.181	0.46	0.462	0.563	0.555	0.027	0.018	0.105	0.101

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.5b. Difference-in-Difference estimates: difference in the difference of performance indicators between Baseline and Endline

Variable Measure	**Pupils' self-reported coding skills**				**Pupils' interest in coding**				**Teachers' assessment of pupils**			
	Unfiltered		Filtered		Binary measure		Continuous measure		CTPS skills		Coding skills	
Comparison groups	School wide	Matched cohorts	School wide	Matched cohorts	School wide	Matched cohorts	School wide	Matched cohorts	School wide	Matched cohorts	School wide	Matched cohorts
Endline	-1.965**	-1.641**	0.107	0.321	-0.129*	-0.212***	0.204*	-0.249**	-0.0607	-0.161	-0.0804	3.446**
	(0.965)	(0.796)	(0.835)	(0.662)	(0.0665)	(0.0768)	(0.118)	(0.118)	(0.0688)	(0.634)	(0.109)	(1.327)
Treated	-0.555	-0.402	-0.651	-1.036**	0.0724	0.0128	-0.0983	0.0845	-0.158***	-1.004*	0.0985	1.178
	(0.714)	(0.527)	(0.618)	(0.438)	(0.0492)	(0.0508)	(0.0873)	(0.0777)	(0.0509)	(0.512)	(0.0804)	(0.941)
DiD effect	**2.029****	**1.768****	**1.225**	**1.477****	**-0.0654**	**0.117**	**0.227***	**0.0923**	**0.0714**	**0.195**	**0.0333**	**-3.157****
	(1.007)	(0.830)	(0.872)	(0.690)	(0.0695)	(0.0800)	(0.123)	(0.122)	(0.0719)	(0.653)	(0.114)	(1.388)
Constant	5.121***	5.044***	2.531***	2.785***	0.339***	0.411***	1.829***	2.208***	0.284***	7.332***	0.508***	4.095***
	(0.682)	(0.504)	(0.590)	(0.419)	(0.0471)	(0.0486)	(0.0835)	(0.0743)	(0.0487)	(0.501)	(0.0770)	(0.901)
Observations	121	306	121	306	122	310	122	310	122	272	122	152
R-squared	0.041	0.017	0.194	0.222	0.460	0.082	0.563	0.086	0.097	0.029	0.054	0.048

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The analysis reported in Tables A3.5a and A3.5b show the Difference-in-Difference (DiD) effect of the Programme on pupils' coding skills and interest in coding. This is a strong result, which controls for the factors that affect all schools simultaneously (such as the COVID-19 pandemic restrictions and school closures), while identifying the separate effects of the BC Programme on the schools that had been treated in comparison to those that had not been so treated. **The analysis reveals that the BC Programme had a statistically significant positive effect on pupils' self-assessed coding skills and on their interest in coding.**

Table A3.5a presents the results of the school-wide comparisons (i.e., comparing the aggregate results of schools at the baseline versus the endline). The results are as follows: for pupil's self-assessed coding skill, in one of the tests, (column 1: unfiltered & treated-untreated) the DiD effect is positive and statistically significant; in two tests the effect is positive but insignificant; while in one test the effect is negative, but this has effectively no explanatory power at all (zero R-squared). On the same comparison basis, teacher assessment of pupils' coding skills does not seem to have been impacted by the Programme. Pupils' interest in coding has been positively affected by the programme, though only one test has a significant result (column 7: pupils' interest in coding/continuous measure/treated-untreated). Concerning pupils' interest in coding, the continuous variable performs better than the binary version.

In Table A3.5b we present further results for the treated/untreated comparison. We reproduce the results from the previous Table and also include a cohort analysis, which identifies the scores of pupils from particular cohorts at the baseline (grades 6 and 7) with those of the same cohort matched at the endline (grades 7, 8 and 9 - depending on the time-distance between the baseline and endline surveys in each school). The results remain in the same direction, but with some differences. Specifically, this time we find a significant positive effect from the treatment on pupils' self-assessed coding skills both under the unfiltered and under the filtered measure for the matched cohorts (columns 2 & 4); but also a statistically significant negative effect (deterioration of skills) for the case of teachers' assessment of pupils' coding skills (column 12). This is consistent with the findings discussed earlier: generally speaking, **pupils' assessment of their improvement of their skills is positive, while the assessment by their teachers (and school leaders) tends to be negative or at least non-positive.**

Conclusions on the Intermediary Outcome

The analysis presented here shows that there is limited evidence on the impact of the Programme on pupils' CTPS and coding skills. On one measure (filtered self-reported coding skills), we get convincing evidence of a positive effect (except for Bosnia) for schools that were treated by the Programme that goes well beyond the project target (Table A3.6b & Table A3.7). We also get strong positive effects estimated for pupils' enhanced interest in coding. On other measures, however, and especially in the case of teacher-led or school leader-led assessments of progress with regard to pupils' CTPS and coding skills, the evidence suggests that the 20% target has not been achieved. The difference-in -difference analysis also reveals a strong effect of the Programme on pupil self-assessed coding skills and interest in coding, combined with a negative teacher-reported effect (Table A3.8b). There are three types of factors that may explain this:

1. **Timing and intensity of treatment.** While the Programme had a relatively long duration, the changes that are targeted may have a long maturity period, requiring long and continuous 'treatment' in order to materialise. In some cases, BC training happened too close to the endline survey, with only months, or even weeks, between the two. In this context, it may be unreasonable to expect large effects on pupils' skills. This is somewhat supported by the results for the cohort analysis, which shows stronger results, at least on the pupils' self-assessment metric, within cohorts.

2. **Framing and updated perceptions.** The baseline survey results are drawn from teachers and school leaders who had not received formal training on teaching CTPS or coding. It is natural to expect that the teachers' and leaders' judgement on the depth of pupils' CTPS and coding skills may have not been as accurate at the baseline (before the training) as at the endline (after the training). This may

have inflated the reported scores at the baseline and updated downwards teachers'/leaders' assessment of skills at the endline. This is consistent with the pattern emerging from our data, whereby the teachers' and leaders' assessments are systematically less positive compared to the pupils' assessments (including, especially, those that are filtered). Moreover, during the COVID-19 pandemic teachers and leaders were less able to observe their pupils' CTPS coding skills development due to school closures which led to less day-to-day contact with pupils.

3. **Quality of treatment and pupils' learning.** The success of any programme will naturally depend on the 'on the ground' conditions that affect pupils' learning and skills-development. The variations observed across countries in the degree to which pupils' skills have improved, although not systematic enough, are consistent with this view that 'context matters'. As highlighted in the Enabling Environment Reports produced at the start of the evaluation project, the institutional and policy context differs across the countries of the Western Balkans and gives rise to different country effects of the Programme. Furthermore, as identified in the Baseline and Endline Synthesis Reports, the assumptions required by the Programme Theory of Change)e.g. the school system had the capacity to absorb the Programme) were not equally met in each country, also contributing to differences in country outcomes.

Our study was not designed to investigate in any depth the relative importance of these factors, or indeed whether any of these factors had a statistically significant bearing on the observed outcomes. The available data only allow us to make the above observations in the form of conjectures, rather than as robust conclusions. The overall message that emerges, however, is that the intermediary outcome appears to have been fully achieved across the region as a whole, but with wide country variations, and with a degree of uncertainty related to teachers' and leaders' less favourable assessment compared to the pupils themselves. Pupils' own confidence in their coding skills and interest in coding has clearly advanced significantly in treated schools, and perhaps to a level that is well beyond the expectations of the project.

Appendix 4: Specific outputs

In this section we set out our findings regarding the specific expected outputs of the British Council 21st Century School Programme, focusing on Outputs 2, 5 & 6 as indicated in the Evaluation Plan

Output 2: *Teachers gain knowledge, skills and confidence to teach CTPS and coding skills*

The country reports demonstrate that teachers have broadly gained knowledge, skills and confidence to teach CTPs in their classrooms. There has been a gradual shift from rote learning to the use of new interactive teaching methods where pupils get involved in discussions about topics and learn through group work as well as individual study. Where teachers had previous training in CTPS, the BC training refreshed their knowledge and introduced them to new techniques (as in Kosovo and Montenegro, for example). The teacher surveys showed that they agreed with the statement that "I feel confident about developing my pupils' CTPS skills", with an average score across the region of 2.06 (on a scale of 1=strongly agree to 5= strongly disagree), indicating that they are fairly confident to teach using CTPS methods (see Endline Synthesis Report Table 16).

The introduction of new teaching methods also encountered some resistance, however, and the qualitative research through interviews with school leaders and teachers came across cases where school leaders were faced with the challenge of unmotivated staff, who were not willing to accept new teaching methods. Statistical modelling of these effects revealed that teachers' readiness to use CTPS methods is lower among more experienced teachers who are less willing to innovate (while at the same time older teachers are more willing to innovate with new teaching methods, perhaps indicating that maturity beats experience in this respect). Additionally, under the COVID-19 pandemic measures, teachers and school leaders were not able to use CTPS teaching methods as much as they would have liked. In some cases, as in Bosnia and Herzegovina, teachers still need additional training and more support for using CTPS methods.

Concerning teachers' knowledge, skills, and confidence to teach coding/programming, the country reports judged that less progress has been made by the BC Programme. In many schools, IT teachers lack enough specialist knowledge to teach computer programming/coding. An unexpected positive effect of the COVID-19 pandemic was that it provided an opportunity for teachers to further develop their skills through remote teaching using computer technologies. The modelled teachers' readiness to develop their pupils' coding skills was significantly improved in schools where trained teachers shared their CTPS knowledge with other non-trained teachers, indicating that a school atmosphere of collegiality pays dividends.

Indicator: % by which teachers have improved their knowledge of teaching CTPS skills. Target: at least 20%

The British Council training programme imparted new knowledge about CTPS teaching methods to 17,534 primary school teachers. The BC staff carried out pre-training and post-training surveys to identify the impact of the training courses on teachers' knowledge of CTPS. The results of these surveys revealed that on average the training succeeded in increasing the knowledge of the participants by 21%, with some slight country variations as shown in Table A4.1. **This target for Output 1 of the BC Programme has therefore been met.**

Table A4.1: Increase in knowledge and understanding of teachers in CTPS (%)

Target	AL	BA	XK	ME	MK	RS	WB
20%	23%	21%	22%	18%	18%	22%	21%

Source: British Council pre- and post-training survey. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans.

Indicator: % by which teachers have improved their confidence and understanding of Micro:bit and its usage in teaching coding. Target: at least 30%

The BC staff also carried out pre-training surveys and post-training surveys to identify the impact of the training courses on teachers' knowledge and understanding of Micro:bit and its usage in teaching coding. The results of these surveys revealed that, on average, the training succeeded in increasing the knowledge of the participants by 61%, with some large country variations as shown in Table A4.2. **This target for Output 1 of the BC Programme has therefore been met.**

Table A4.2: Increase in knowledge and understanding of Micro:bit and its usage in teaching coding

Target	AL	BA	XK	ME	MK	RS	WB
30%	51%	74%	78%	56%	31%	74%	61%

Source: British Council pre- and post-training survey. Note: AL=Albania, BA=Bosnia and Herzegovina, XK=Kosovo, ME=Montenegro, MK = North Macedonia, RS=Serbia, WB = Western Balkans.

In conclusion the Programme Output 2, that teachers gained knowledge, skills and confidence to teach CTPS and coding skills, has been broadly achieved. This should be caveated by the observation that teachers' knowledge and skills and confidence to teach coding has been held back by the absence or weakness of internet connections and a lack of up-to-date computer equipment and other digital infrastructure in some schools, especially those in rural and remote areas.

Output 5: Micro:bit devices have been actively used by teachers in their classroom practice

The willingness of teachers and pupils and their interest in using new technologies has supported the implementation of the BC Programme in a context of limited school infrastructure for coding, including a lack of computers' laboratories and internet access. For most teachers in MSS and CSS school, the BC training was the first experience in coding and Micro:bits. While they consider coding a useful component of training, some teachers stated that the training time devoted to coding was too short and the COVID-19 restrictions limited their engagement to use and explore Micro:bit further.

Indicator: Usefulness rate of Micro:bit among teachers. Target: at least 85%

The average score for the usefulness of Micro:bits was reported by teachers at 5.0, on a scale from 1 = not at all useful to 10 = extremely useful, (essentially the same in both MSS schools and CSS schools). This indicates that the teachers found the Micro:bit device to be rather useful, although there is much scope to further explore opportunities that Micro:bit offers for all subjects.

Table A4.3: Teachers' perception of usefulness of Micro:bit (score, scale 1-10)

	Usefulness score			Usefulness rate		
	MSS schools	CSS schools	All schools	MSS schools	CSS schools	All schools
AL	6.3	3.1	5.0	94.1%	58.3%	79.3%
BA	2.9	8.5	3.4	50.0%	100.0%	53.6%
XK	6.0	7.0	6.1	100.0%	100.0%	100.0%
ME	5.0	5.0	5.0	78.6%	100.0%	82.4%
MK	4.2	6.1	4.6	89.7%	100.0%	91.7%

	Usefulness score			Usefulness rate		
	MSS schools	CSS schools	All schools	MSS schools	CSS schools	All schools
RS	5.5	4.6	5.2	97.4%	77.3%	90.0%
WB	**5.0**	**4.9**	**5.0**	**86.7%**	**80.0%**	**85.2%**

Source: Teacher survey Q31B. Note: There was a low number of responses for the Kosovo survey

Considering all teachers who scored 2 or above as deriving some usefulness from the Micro:bit device, the usefulness rate overall was assessed by teachers at 85.2%, meeting the target. The usefulness rate was higher in MSS schools than in CSS schools as could be expected. This suggests that teachers take time to learn how to use the Micro:bit in the classroom, since the MSS schools were exposed to its use for longer than the CSS schools. Nevertheless, there was substantial variation across countries, with the greatest positive effect in Kosovo and the least effect in Bosnia and Herzegovina. **The target for this indicator was achieved: teachers consider Microbit useful at a rate of 85%.**

Indicator: Usefulness rate of Micro:bit among pupils. Target: at least 85%

Pupils scored the usefulness of Micro:bit at 3.8 on a 1-10 scale where 1 = not useful at all to 10= extremely useful. The pupils in MSS schools gave a score of 3.9 compared to 3.6 in CSS schools. It seems that pupils take some time to build the confidence and ability to use Micro:bit, considering that the pupils in the MSS schools had longer time to make use of it than the pupils in the CSS schools. This suggests a positive impact of the Programme on pupils' ability to use Micro:bit for coding. There was little difference in the evaluation of the usefulness of Micro:bit between boys and girls. There was substantial country variation, with the greatest positive experience reported in Serbia (5.8) and Montenegro (5.1) and the lowest in Albania, Bosnia and Herzegovina and Kosovo, all at around 3.0. This probably reflects the stronger set of skills of the teaching staff in these two countries, and the observably better digital infrastructure there. Considering all pupils who scored 2 or above as deriving some usefulness from the Micro:bit device, the usefulness rate of Micro:bit for pupils was 54.7%, far below the target. **For the region as a whole the target for this indicator was not met.**

Table A4.4: Pupils' perception of usefulness of Micro:bit (score, scale 1-10)

	Usefulness score (1-10)			Usefulness rate		
	MSS schools	CSS schools	All schools	MSS schools	CSS schools	All schools
AL	3.1	3.0	3.1	43.5%	41.2%	41.9%
BA	3.1	2.9	3.1	45.7%	43.1%	44.9%
XK	3.3	2.1	2.9	43.0%	30.9%	39.0%
ME	5.4	2.1	5.1	80.0%	24.4%	73.7%
MK	4.1	5.4	4.5	66.0%	67.7%	66.5%
RS	6.4	5.2	5.8	93.5%	93.0%	93.3%
WB	3.9	3.6	3.8	56.8%	50.4%	54.7%

Source: Pupil survey Q26A

Pupils scored the usefulness of Micro:bit at 3.8 on a 1-10 scale where 1 = not useful at all to 10= extremely useful. The pupils in MSS schools gave a score of 3.9 compared to 3.6 in CSS schools. It seems that pupils

take some time to build the confidence and ability to use Micro:bit, considering that the pupils in the MSS schools had longer time to make use of it than the pupils in the CSS schools. This suggests a positive impact of the Programme on pupils' ability to use Micro:bit for coding. There was little difference in the evaluation of the usefulness of Micro:bit between boys and girls. There was substantial country variation, with the greatest positive experience reported in Serbia (5.8) and Montenegro (5.1) and the lowest in Albania, Bosnia and Herzegovina and Kosovo, all at around 3.0. This probably reflects the stronger set of skills of the teaching staff in these two countries, and the observably better digital infrastructure there. Considering all pupils who scored 2 or above as deriving some usefulness from the Micro:bit device, the usefulness rate of Micro:bit for pupils was 54.7%, far below the target. **For the region as a whole the target for this indicator was not met.**

However, this conclusion should be caveated by the finding that the usefulness rate among pupils was more than met in Serbia, where 93% of pupils found it to be useful. The usefulness rate was also high among pupils in Montenegro and North Macedonia. These three countries are the ones where the Theory of Change assumptions about the ability of the pupils to benefit from the Programme was met, being the highest in the region. Therefore, we may hypothesise that a major cause of the low level of perceived usefulness of Micro:bit among pupils is the lack of readiness, in terms of ability to engage, of pupils in Albania, Bosnia and Herzegovina and Kosovo, to which may be added all the factors documented in this report relating to the lack of teachers IT skills in these countries, the lack of internet connectivity and the lack of adequate computer equipment in the schools.

In conclusion, we find that Micro:bit devices have not been actively used by teachers in their classroom practice to the extent that was expected, but that those who have used the device found it to be highly useful.

Output 6: Girls and boys have experienced critical thinking, problem solving, and coding skills in classrooms and in coding clubs

In both MSS and CSS schools, we find that most pupils across the Western Balkans have experienced CTPS teaching in the classroom (see Endline Synthesis Report Table 18). The pupil survey reveals that 84% of pupils experienced group work in class. The use of CTPS teaching methods became more problematic during the COVID-19 pandemic and the related school closures. Teachers found it difficult to keep the attention of pupils online, and they found that some pupils lost interest and motivation, so implementing new teaching methods became more difficult during periods of school closures. Class discussions and problem solving are important elements of the CTPS approach. Throughout the Western Balkans, three fifths of pupils "often" think about and discuss issues in class and more than half propose solutions in class. There is a wide range of experience, with more than two thirds of pupils in North Macedonia experiencing "often" discussing issues in class compared to just under half in Bosnia and Herzegovina, and an only slightly smaller gap in relation to problem solving. More than half of pupils say that they like to find out more about the topic debated in school after class; girls were much more likely to do this than boys, for example 60.5% of girls in MSS schools did so compared to 52.3% of boys.

A lesser proportion of pupils received lessons in coding/programming than took part in lessons using CTPS. About 14% of pupils participate in coding clubs. Coding clubs are often supported by the extra efforts of teachers, pupils and parents, rather than by the education system. In Bosnia and Herzegovina, in-depth-interviews revealed that coding clubs survive mainly through the efforts of dedicated IT teachers. In Kosovo, in one rural school we found that both the school management and the teachers had themselves purchased the equipment and materials needed for their coding club.

Indicator: Change in experience of elements of CTPS. Target: an increase.

At the baseline, 8.3% of pupils never took part in group work in class. This almost doubled at the thendline to 16.3%. This is most likely the result of the school closures due to the experience of schools during COVID-19

pandemic which prevented group work being carried out in the affected schools. Besides this, group work seems to have been successfully used in Albania with only 7.2% of pupils reporting they never experienced it and in North Macedonia (5.3%). The laggard has been Bosnia and Herzegovina with one third (34.4%) of pupils reporting that they never experienced group work in class.

In the baseline pupil survey, 50% of pupils reported that their teachers "often" ask them to think about issues and to discuss them in class, compared to 60% at the endline - a 10 percentage point increase. There was little difference between the experience of boys and girls in this dimension of CTPS. At the baseline, 43% of pupils reported that their teachers often ask them to consider a certain problem and propose their own solutions, while at the endline 51% proposed solutions in class, an increase of 8 percentage points in this aspect of CTPS. **The target for this indicator was achieved: pupils experienced an increase in the use of different elements of CTPS in class.**

Indicator: At the end of the Programme, pupils show significantly higher interest in coding skills and coding clubs. Target: an increase.

In the baseline pupil survey, 88% of pupils reported that they were "very much" or "somewhat" interested in computer programming, while at the endline, only 82% of pupils reported the same level of interest, a reduction of 6 percentage points. At the baseline, 58% reported that they preferred to do coding to all other learning activities at school. At the endline this had fallen to 55% a reduction of 3 percentage points. The exceptions were pupils in North Macedonia and Serbia where the endline proportions were 69% and 61%, an increase of 11 and 3 percentage points respectively. However, the decrease in interest in coding was greater among the untreated schools compared to the treated schools. Once this factor is taken into account, it can be seen that the BC Programme had a positive impact on the interest in doing coding. The results of statistical modelling of this process reveals that **pupils' interest in coding has been positively impacted by the BC Programme, with the improvement being statistically significant** (see Tables A3.7, A3.8a, & A3.8b above).

The pupils survey shows that participation in coding clubs has increased during the implementation of the Programme. At the baseline only 9% of pupils participated in a coding club, compared to 14% at the endline. Thus, **there has been a 5 percentage point increase in pupils' participation in coding clubs.** If projected to the entire school system, this would suggest that around 140,000 pupils now attend these coding clubs, or about 47 pupils per club. Of this increase, the Programme can plausibly be attributed with having increased the participation in coding clubs by 50,000. Boys are slightly more likely to participate in coding clubs than girls, especially in Bosnia and Herzegovina, Montenegro and North Macedonia. In Bosnia and Herzegovina, twice as many boys than girls participated in coding clubs. The available evidence from our study therefore shows that there has been an increase in pupils' interest in coding skills and coding clubs.

Conclusions on Outputs

It was expected that, because of the BC Programme, teachers would gain knowledge, skills and confidence to teach CTPS and coding skills (Output 2). In relation to CTPS, it was expected that teachers would improve their knowledge of how to teach using CTPS teaching methods by at least 20%; this was achieved with an increase of 21% following the BC teacher training course. It was also expected that teachers would improve their confidence and understanding of Micro:bit and its usage in teaching coding by at least 30%. In the event this was massively overachieved with an increase in understanding of Micro:bit and its usage of 61%. In conclusion, the Programme Output 2, that teachers gained knowledge, skills and confidence to teach CTPS and coding skills, has been broadly achieved throughout the Western Balkans.

It was also expected that by the end of the Programme the Micro:bit devices would be actively used by teachers in their classroom practice. The target for the usefulness rate of Micro:bit among teachers was at least 85%; this was achieved with a measured usefulness rate among teachers of exactly 85%. The target for the usefulness rate of Micro:bit among teachers was at least 85%; this was not achieved as the measured

usefulness rate from the pupil survey was 55%. However, this should be caveated by the observation that the usefulness rate among pupils in Serbia was 93% and was also high among pupils in Montenegro and North Macedonia. These three countries were the ones where the ability of the pupils to benefit from the Programme was also highest. A major cause of the low level of perceived usefulness of Micro:bit among pupils in Albania, Bosnia and Herzegovina and Kosovo is likely to have been their lack of readiness in terms of their ability to engage with the BC Programme, along with a lack of teachers with adequate IT skills in these countries, a lack of internet connectivity and a lack of adequate computer equipment in the schools. We conclude that although Micro:bit devices have not been as actively used by teachers as expected, those who have used the device found it to be highly useful.

Finally, it was expected that girls and boys would have experienced critical thinking, problem solving, and coding skills in classrooms and in coding clubs (Output 6). The first indicator for achievement of the Outcome was that pupils would experience an increase in the elements of CTPS teaching approach, i.e. (i) critical thinking and (ii) problem solving. The target for part (i) of this indicator was achieved: pupils experienced an increase in the use of different elements of CTPS in class. The pupil surveys carried out at the baseline and the endline of the Programme revealed a 10-percentage point increase in the use of critical thinking approaches in the Western Balkans. The surveys also revealed an 8 percentage points increase in the problem-solving element of CTPS teaching. However, the use of group work in the classroom fell with twice as many pupils never taking part in group work at the end of the Programme compared to the beginning. This was most likely the result of the school closures due to the experience of schools during COVID-19 pandemic which prevented group work being carried out in the affected schools.

The second indicator for this outcome was that by the end of the Programme, pupils would show significantly higher interest in coding skills and coding clubs. The pupil surveys revealed a twofold reduction in the proportion of pupils reporting that they were “very much” or “some” interested in computer programming, equivalent to 6 percentage point decline in interest. There was also a 3-percentage point decline in the proportion of pupils who reported that they preferred to do coding to all other learning activities at school. The exceptions were pupils in North Macedonia and Serbia where the endline proportions were 69% and 61%, an increase of 11 and 3 percentage points respectively. However, the overall decrease in interest in coding was greater among the untreated schools compared to the treated schools (i.e. schools ``treated” by the Programme – see Annex 3 above). Once this factor is taken into account, it can be seen that **the BC Programme had a positive impact on pupils’ interest in doing coding**. The results of our statistical modelling of this process reveals that pupils’ interest in coding has been positively impacted by the BC Programme, with the improvement being statistically significant. **In addition, there has been a substantial increase in pupils’ participation in coding clubs.**

In sum, the expected Outputs of the BC Programme have mostly been achieved. Firstly, the expected Outcome that teachers gained knowledge, skills and confidence to teach CTPS and coding skills, has been broadly achieved throughout the Western Balkans. Secondly, although Micro:bit devices have not been as actively used by teachers as expected, those who have used the device found it to be highly useful. Thirdly, girls and boys have experienced an increased use of CTPS in the classroom although, probably due to the school closures related to the COVID-19 pandemic, they have experienced a reduction in group work. Finally, pupils have developed a significantly higher interest in coding skills and coding clubs than they otherwise would have done, due to the influence and activity of the BC Programme in their schools.

Appendix 5: Summary of Programme achievements

Outcome or Output	Indicator and target	Result
Outcome 3: "Relevant decision makers create and implement curriculum and introduce other related policy measures to advance CTPS and coding skills learning in primary schools".		**Outcome 3 was successfully achieved**.
	Schools have embedded coding in the core curriculum. **Target**: At least 70% of primary schools have compulsory or elective coding classes	All countries have met the target for the introduction ("create") of coding into the curriculum (see Section 2.1 "Relevance" above). However, the implementation part ("implement") of the target for this indicator has only been fully met with certainty in Montenegro, North Macedonia and Serbia. It may have been met in Bosnia and Herzegovina, and Kosovo and, and has not yet been met in Albania (see above Appendix 2, Outcome 3)
	The number of new teacher training programmes (including BC training programme) that have been accredited by relevant state authorities by the end of the Programme. **Target:** at least one in each country.	While the target has been exceeded overall beyond the expectation of a total of 6 accredited training courses, the absence of an accredited training course in Bosnia and Herzegovina should be noted. entirety.
Outcome 2: "School leaders actively support the implementation CTPS and coding skills at school level across the curricula"		**Outcome 2 was fully achieved in relation to CTPS and coding, but the support for coding has struggled against a difficult implementation environment.**
	% of school leaders who ensure that CTPS teaching is regularly practised by at least 2 non-trained teachers at the end of the Programme. **Target**: at least 50%.	The target has been achieved. Indeed, the target was exceeded by some distance, since on average 100% of school leaders ensured a transfer of knowledge to at least 3 untrained teachers in their school.
	The proportion of coding clubs established during the first and the second project year that still exist by the end of the project. **Target**: at least 70%.	Of the coding clubs that were established during the first and the second project year between 72% (teacher survey) and 85% (school leader survey) still exist by the end of the project. **The target for indicator (ii) of Outcome 2 has therefore been achieved.**
Outcome 1 "Teachers embed and practice CTPS and coding skills in classrooms"		**Outcome 1 was fully achieved in relation to both CTPS but was not achieved in relation to the use of Micro:bit for coding.**

	% of trained teachers integrate CTPS skills into teaching and learning activities by the end of the Programme. **Target**: at least 80%.	Considering the teacher perceptions, we find that **the target for indicator (i) of Outcome 1 has been achieved**, in that 82% of trained teachers in MSS schools throughout the Western Balkans, and 79% of all trained teachers in all schools, have incorporated CTPS teaching methods in all the classes that they teach
	Indicator: % of trained teachers regularly use Micro:bit in the classroom by the end of the Programme. Target: at least 70%.	Only 44% of trained teachers have used Micro:bit in at least some of their lessons, showing that the target for this indicator has not been met in the region as a whole. It has been fully achieved in North Macedonia, only partly achieved in Albania, Montenegro and Serbia, and not achieved at all in Bosnia and Herzegovina and Kosovo.
Intermediary Outcome: "Pupils from 10 to 15 years old across the Western Balkans demonstrate enhanced CTPS and coding skills".		**The Intermediary Outcome for CTPS has not been achieved, but the Outcome for coding has been achieved**
	The percentage by which pupils improved their coding skills compared to the baseline assessment. Target: an improvement of at least 20%.	No country in the region reached the 20% target, and most countries recorded a deterioration of such skills, since the school closures during the pandemic undermined the ability of teachers to use the technique in their (online or TV) lessons
	The percentage by which pupils improved their coding skills compared to the baseline assessment. Target: an improvement of at least 20%.	Pupils' skills on coding improved in line with the programme expectations, with every country in the region (except Bosnia), as well as the region improving pupils' skills at rates well above the target of 20%.
	DiD analysis:	Pupils' assessment of their improvement of their skills is positive, while the assessment by their teachers (and school leaders) tends to be negative or at least non-positive.
Output 2: Teachers gain knowledge, skills and confidence to teach CTPS and coding skills		**The Programme Output 2, that teachers gained knowledge, skills and confidence to teach CTPS and coding skills, has been broadly achieved.**
	The percentage by which teachers have improved their knowledge of teaching CTPS skills. **Target**: at least 20%	The training succeeded in increasing the knowledge of the participants by 21% in the region as a whole, with some slight country variations as

		shown in Table A4.1. This target for Output 1 of the BC Programme has therefore been met.
	The percentage by which IT teachers have improved their confidence and understanding of Micro:bit and its usage in teaching coding. Target: at least 30%	The training succeeded in increasing the knowledge of the participants by 61% in the region as a whole, with some large country variations as shown in Table A4.2. This target for Output 1 of the BC Programme has therefore been met.
Output 5: Micro:bit devices have been actively used by teachers in their classroom practice		**Micro:bit devices have not been actively used by teachers in their classroom practice to the extent that was expected, but those who have used the device found it to be highly useful.**
	Usefulness rate of Micro:bit among teachers. Target: at least 85%	The target for this indicator was achieved: teachers consider Microbit useful at a rate of 85%.
	Usefulness rate of Micro:bit among pupils. Target: at least 85%	The usefulness rate of Micro:bit for pupils was 54.7%, far below the target. For the region as a whole the target for this indicator was not met.
Output 6: Girls and boys have experienced critical thinking, problem solving, and coding skills in classrooms and in coding clubs		**The Output has been achieved**
	Change in experience of elements of CTPS. Target: an increase.	The target for this indicator was achieved: pupils experienced an increase in the use of different elements of CTPS in class. Proportion of pupils “often” experiencing critical thinking in class increased by 10 percentage points (i.e., 100,000 pupils). The proportion “often” experiencing problem solving in class increased by 8 percentage points (i.e., 80,000 pupils).
	At the end of the Programme, pupils show (i) significantly higher interest in coding skills and (ii) in coding clubs. Target: an increase.	(i) pupils’ interest in coding has been positively impacted by the BC Programme, with the improvement being statistically significant. (ii) there has been a 5-percentage point increase in pupils’ participation in coding clubs (i.e., by an estimated 50,000).

Appendix 6: IT and coding in primary school curricula at the end of the 21st Century Schools Programme

A large number of written resources have been developed within the Programme. These have been distributed to schools and have been major input into the implementation of the Programme and are likely to underpin the future sustainability of the use of CTPS teaching methods and the teaching of coding using Micro:bit in primary schools throughout the Western Balkans. Table A6.1 sets out the details.

Table A6.1. Written resources developed to support implementation of coding with Micro:bit in schools with support of the 21st CS programme.

Albania	British Council has developed a Manual for Micro:bit Coding for Primary School containing materials for students and teachers of the sixth and seventh grades with interactive exercises and projects to be developed by them. The manual is in online mode and will also be prepared as a printed handbook by British Council and shared with all schools. Those materials were originally developed by Petlja Foundation for Serbian IT teachers, and following translation to Albanian, taken over by Albanian Ministry of Education and shared with IT teachers of the 6th and 7th grade. This was a great example of cross-country cooperation.
Bosnia and Hercegovina	Coding Club guide. From November 2020, all schools around the country receive support from Coding Club consultants to establish and run Coding Clubs in their schools.
Kosovo	Four lesson units for the IT subject of grades 8 and 9 are being developed, as an additional resource for teachers and students to teach and learn Coding through micro:bit. The lesson units will support implementation of the IT revised Curricula, approved by the Ministry of Education. The lesson units will be developed in the form of scripts and video. The units will be ready in March 2022 and are expected to be used in the academic year 2022/2023. The handbook will be published online by the MoE and will be provided to teachers and students as an additional resource of learning. A handbook with activities how to integrate Coding as a cross-curricula skill in all subjects of the grades 6-9 is being developed. The handbook will support teachers of different subjects of cycle 6-9 to use Coding and micro:bit in the classroom and enhance the learning outcome of students. It will also help the Ministry of Education improve further the curricula, by introducing coding as a cross-curricula learning outcome. The handbook will be ready in March 2022 and is expected to be introduced for use in the academic year 2022/2023. The handbook will be published online by the MoE and will be provided to teachers and students as an additional resource of learning.
Montenegro	Teacher Handbook on Micro:bit Coding for Primary Schools containing extensive instructions for teachers including lessons plans, activities, and test for students is in the final phase of development. This Handbook is designed to support the new IT curricula implementation and learning outcomes developed for grades 5-8. It is to be reviewed and endorsed by the National Bureau for Textbook Publishing. Guide for Micro:bit Equipment comprising detailed explanation of around 50 different components used with the micro:bit, their functions and ways of application was also developed. These components were recently donated to all primary schools.
North Macedonia	1.Translation of online material 'MicroPython for Microbit', in collaboration with partner organization Petlja from Serbia - it is a content for pupils from upper grades to support lesson plans related to creation and implementation of projects using MicroPython to control Micro:bit devices; 2. Production of 20 short TV/ video series with micro:bit projects

	targeting lower grade teachers, pupils and their parents. This activity is financed by the British Council grant for the 21st Century Schools Pilot project for lower grade teachers.
Serbia	The digital textbook developed in partnership with the NGO Loop Foundation in Serbia for 7th and 8th grade IT teachers to support standard teacher's lesson plans related to development and implementation of projects using Micro Python to control micro:bit devices. It is a self-paced learning material suitable also for coding clubs, extracurricular activities linked to other subjects, and can inspire teachers to use projects in their classroom or motivate pupils upgrade these projects and create improved and new school projects. Similarly, digital textbooks and were developed for Serbian IT 5th grade teachers (Programming with micro:bit in Make Code) and 8th grade Technics and Technology teachers (Control of electromechanical models using micro:bit devices). As of 2020/2021 school year Serbian Ministry of Education introduced a new subject, Digital World in the first-grade primary school. Through this subject, the pupils will get acquainted with digital devices and their application, online communication and will be introduced to the algorithmic way of thinking. The textbook was developed by one of the British Council trainers (outside the project scope) and approved by the Ministry of Education. Micro:bit was specifically mentioned as coding device in the textbook for this subject, its usage being greatly promoted by the Ministry for use in Serbian schools. To facilitate new curricula among teachers of lower primary grades, upon the request by the Ministry of Education, the Make Code editor, web-based environment for learning to code with physical computing devices such as the micro:bit. which also enables web-based simulation of the physical device (micro:bit, for example), so students can edit and test their programs even if they don't have a device at hand was translated and localized into Serbian language. Two digital manuals aimed at supporting teachers using micro:bit in subjects other than the IT were developed in partnership with Petlja Foundation: Manual for the use of Micro:bit devices - basic level and Manual for the use of Micro:bit devices - advanced level. The team of authors tried to make the part related to programming not too complex so that these projects, given their interdisciplinary character, could be applied in teaching other subjects (mathematics, physics, biology, etc.). Each of the projects included in both manuals consists of a theoretical introduction that connects materials from several subjects, a detailed instruction for creating a project that contains a code display in the Make Code environment, the necessary material for making a model, as well as code display and video lessons that explain all of this in detail. At the end of each project there is a short quiz to test students' knowledge.

Substantial resources were devoted to providing additional training IT teachers in support of the newly introduced curriculum requirement in all countries (except as yet in Kosovo) to provide teaching of coding within IT subject lessons. The extent of the changes to the curriculum are documented above in section 2.1 of the mian text ("Relevance"). Table A6.2 sets out the detail of this training effort.

Table A6.2. Training provided to IT teachers to support implementation of coding with Micro:bit in IT subject (other than CTPS training)

Albania	Training was provided to 505 IT teachers teaching in grades 6th, 7th, 8th and 9thby three external consultants engaged by British Council Albania where instructions on the materials developed by British Council for coding and micro: bit were shared along with examples on how to use these resource materials during their teaching practise. The half day sessions were delivered online for groups of 10-15 IT teachers.
Bosnia and Hercegovina	Training for IT teachers from Zenica Doboj Canton completed in Jan 2022. Out of 81 teachers invited, 44 teachers attended 2-day F2F workshops consisting of presentation of new IT curricula plus workshop on Coding with Micro:bit with practical exercises.

Kosovo	There has been no additional training to IT teachers delivered, as the Ministry of Education will design further support to IT teachers related to Coding and digitalisation of the education as per plan of the KESP 2022-2026, and the online training of 21st Century Schools project has been considered as an asset.
Montenegro	Introductory one day workshop on the new curriculum was delivered to 50 IT teachers. A dedicated 2-week Moodle course was designed focusing on the new curriculum requirements for coding for grades 5, 6, 7 and 8. It is a highly practical course with lots of assignments for teachers. The course contains session on the use of additional equipment provided to schools (Micro:bit kits) as well as elements of electronics. It is officially accredited by the Bureau for Education. The course was designed by the same authors who designed the curriculum, plus IT teachers, CTPS trainers and professional programmers. This Moodle course was delivered in two rounds for about 200 IT teachers. Additionally, "booster" programme was developed, engaging IT professionals to work with IT teachers with less experience with coding and those seeking to extend coding skills to more complex projects. They have online and face-to-face sessions working once a week. Booster programme is a highly practical hands-on training on Micro:bit coding for coding clubs' teachers and students. IT consultants visit their schools once a week, helping them develop projects and providing additional training in coding. During these workshops, schools were able to develop multiple new projects in a short period of time. There are 7 IT consultants who work with 5-6 schools at a time. This additional support has proved very useful as more schools are approaching us to receive mentorship. This programme is running from November 21 till March 22.
North Macedonia	N/A
Serbia	Training of trainers conducted and online moderated training for 5th grade IT teachers to implement new IT curricula including coding with physical device (e.g. Micro:bit) was developed, accredited and delivered to 698 IT teachers. training of trainers (ToT) conducted and online moderated training was developed, accredited by the Ministry, ToT conducted, and training delivered to 608 IT teachers of 7th and 8th grade enabling them to implement new IT curricula which introduced coding with physical device (e.g. Micro:bit). ToT conducted and online moderated training was developed, accredited by the Ministry, training of trainers (ToT) conducted, and training delivered to 445 8th grade Technics and Technology teachers enabling them to implement new curricula which introduced lessons on control of electromechanical models using physical devices (e.g., Micro:bit)

Additional resources developed on regional level to strengthen coding in primary schools

Micro:bit online training course developed and translated to al local languages as an innovative approach for capacity building of teachers to regularly use Micro:bit in teaching classes. 19,752 teachers completed the Micro:bit online course. Courses developed earlier in all local languages (Serbian, Montenegrin, Albanian, Macedonian and three Bosnian languages (Bosnian, Croatian and Bosnian Serbian) by the UK company and hosted on external UK server are transferred on to Moodle platform. Micro:bit online course is now part of the Moodle self-paced CTPS courses for teachers which will be handed over to Ministries across WB, thus ensuring sustainability for use after the project end. A Coding Club Guide was developed in cooperation with Raspberry PI and Micro:bit Foundation, adjusted to a local context and designed to support teachers in establishing and running coding clubs providing 12-week ready-made lesson plans with projects to be developed using Micro:bit. A guide for use of Micro:bit accessories comprising detailed explanation of around 50 different components to be used with the Micro:bit, their functions and ways of application was developed

by Montenegro British Council, translated and available in Serbian, Macedonian and Albanian. Altogether 100,526 Micro:bits were distributed to schools during the programme implementation in all six Western Balkan countries. Six national coding challenges were organised in each country, awards were handed over, and the winners of the first national competition participated at a regional coding challenge event.