



INFORMATION AND COMMUNICATION TECHNOLOGIES

Development of Standards and Scope and Sequences

The Challenge

In November 2018, the Republic of Uzbekistan Ministry of Preschool and School Education (MoPSE) announced its Information Technology Nation initiative, which is aimed at producing graduates with the ability to work in cyber security, software development and testing, network administration, graphic design, animation, and game design. To achieve these outcomes, the public education system began addressing a series of critical constraints, including access to information and communication technology (ICT) hardware and broadband access at the school level, time allocated to ICT classes, and outdated standards and curriculum for ICT education, which should better reflect assessments of ICT skills and current labor market and university demands.



The Journey

The U.S. Agency for International Development's Uzbekistan Education for Excellence Program supported the Ministry to review the standards and curriculum, a supportive teacher professional approach, and piloting to enhance ICT instruction. The Program mobilized local experts from the Republican Education Center and international experts from Mississippi State University's International Institute and Center for Cyber Education to begin the process by developing standards for grades 1–11 for ICT education. ICT standards development is a major step toward Uzbekistan's vision of producing graduates with critical thinking, problem-solving, and practical skills that will enable them to succeed. This brief provides an overview of the development and review of ICT student learning standards and scopes and sequences.

What are Standards?

ICT student learning standards, referred to in this brief as standards, are the ICT learning goals for what students should know and be able to do in ICT at each grade level. Standards reflect content requirements, values, goals, and needs of the country, communities, and individual students.

Why are Standards Important?

Standards help inform teachers of what content to teach, what teaching strategies to apply, and what learning materials are appropriate for their students. Standards serve as guidelines for the curriculum and help in the selection or development of teaching and learning materials that will best help students meet standards-based learning goals. Standards also provide guidance for student expectations and teacher assessment of learning, ensuring they are fair, measurable, and useful to students, teachers, and parents. Standards do not mandate any teaching practice, curriculum, or assessment method; they guide them.

What is a scope and sequence?

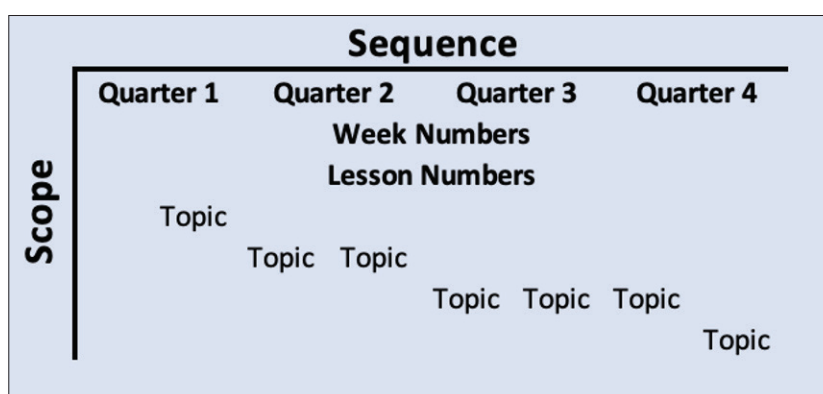
In general, a scope and sequence is developed on the basis of the students standards and then used as the foundation for developing a textbook that encompasses the curriculum. A scope and represents the organization of a curriculum, its contents, and their placement in time. The scope is the range of topics within domains, and the sequence is the order and time of year in which the topics are taught (see Figure 1). A scope and sequence is an important element of a national curriculum, and provides a blueprint for the teacher guides, detailing content and its order.

Why are Scope and Sequences Important?

The scope and sequences are important for connecting the standards to the teacher guides and for teachers to use in curriculum implementation. Under the Uzbekistan Education for Excellence Program, Uzbekistan adopted an existing international series of student textbooks. Therefore, the scope and sequences for ICT were used for teacher guide development rather than traditional textbook development.



FIGURE 1. THE IMPORTANCE OF STUDENT LEARNING STANDARDS AND SCOPE AND SEQUENCES



WHAT WERE THE STEPS OF ICT STANDARDS DEVELOPMENT?

Program staff conducted extensive research on ICT and computer science standards from several countries. They identified, synthesized, and summarized relevant information from countries with well-respected ICT and computer science standards and successful education programs that also reference International Society for Technology in Education standards. The team identified curricular priorities, common themes, and language from standards across the exemplary countries. They mapped connections between/among the identified curricular priorities, common themes, and language to create international standards and then customized the standards for Uzbekistan ICT school curricula to help MoPSE meet the goals of improving ICT teaching and learning. The standards were devised to accommodate a complete, logical, and unified progression of concepts and skills from grades 5–11.

Student learning standards are most useful when they reflect, accommodate, and connect with the priorities, knowledge, resources, and challenges of the educational, economic, and cultural systems in Uzbekistan. External factors and resources may also influence the scope and content of the standards in each subject (UNESCO International Bureau of Education, 2018). Therefore, during development of ICT standards for Uzbekistan, considerations were given for (1) connections, priorities, resources, and challenges within the Uzbekistan school system; (2) subject-specific pedagogy; (3) external factors and resources needed to develop the standards; and (4) the goals specified by MoPSE.

ICT standards are viewed as a hierarchy comprised of high-level domains made up of topics with specific concepts and skills to be learned. For Uzbekistan, domains were created and mapped in all grades. Domains and concepts and skills from earlier grades disappear from the progression when they are prerequisites for more complex domains, concepts, and skills in later grades. In Figure 2, a progression for ICT shows the structure and flow of related domains, topics, concepts, and skills students should learn in each grade and the flow of related concepts and skills from one grade to the next.

FIGURE 2. IMAGE OF ICT STANDARDS

ICT Final Student Standards		
Standard code	Student Standard	Practices
Grade 5		
Digital Literacy and Citizenship		
UEEP.ICT.5.DLC.01	Use appropriate terminology to identify physical components of a computer system and describe their functions. <i>(Computer Components)</i>	Communicating
UEEP.ICT.5.DLC.02	Practice safety and sanitary/hygienic procedures related to this computer lab. <i>(Computer Care)</i>	Applying
UEEP.ICT.5.DLC.03	Label the keyboard with the proper letters, numbers, and special keys, and demonstrate proper hand, finger, and body position when using a keyboard. <i>(Keyboarding)</i>	Applying
UEEP.ICT.5.DLC.04	Perform different navigations between computer applications. <i>(Computer Navigation)</i>	Communicating
UEEP.ICT.5.DLC.05	Properly utilize peripherals. <i>(Computer Navigation)</i>	Applying
UEEP.ICT.5.DLC.06	Recognize similarities and differences between in-person bullying and cyberbullying. <i>(Online Safety/Bullying)</i>	Communicating
UEEP.ICT.5.DLC.07	Practice web searching techniques to find relevant information online. <i>(Online Searching)</i>	Applying
UEEP.ICT.5.DLC.08	Create and explain the purpose of secure passwords. <i>(Password Security)</i>	Communicating Applying
Tech Apps		
UEEP.ICT.5.TA.01	Identify and apply terminology, key features, and navigations to create a word processing document and apply formatting commands. <i>(Word Processing)</i>	Creating, Applying
UEEP.ICT.5.TA.02	Identify and apply terminology, key features, and navigations in a drawing program to create a simple image. <i>(Multimedia Design)</i>	Creating
Social Impacts		
UEEP.ICT.5.SI.01	Distinguish between an in-person personal social network and digital social network. <i>(Digital Communication)</i>	Communicating
UEEP.ICT.5.SI.02	Identify how people use different types of technologies in their professional and personal lives. <i>(Culture)</i>	Communicating
Computing		
UEEP.ICT.5.CMP.01	Translate a simple algorithm into a program. <i>(Programming)</i>	Problem solving, Communicating, Collaborating
UEEP.ICT.5.CMP.02	Create a computer program using a set of written instructions. <i>(Programming)</i>	Problem solving, Communicating, Collaborating
UEEP.ICT.5.CMP.03	Systematically apply the debugging process. <i>(Debugging)</i>	Problem solving
Computing Systems		
UEEP.ICT.5.CSY.01	Identify the inputs and outputs of common computing devices. <i>(Devices)</i>	Communicating Creating
UEEP.ICT.5.CSY.02	Explain the functional components that make a computing device and how they work together. <i>(Computer Components)</i>	Communicating
UEEP.ICT.5.CSY.03	Execute proper commands to save a file. <i>(Storage/Cloud Computing)</i>	Communicating

Concept and skill statements were developed to indicate what students would learn in a topic and provide enough detail to distinguish between related statements at different grades. After completing the progression of concepts and skills for ICT, each concept and skill statement was rewritten in a format that reflected a student learning standard that could be measured.

A key element in moving from concept and skill statements to the creation of standards is the inclusion of Bloom's Taxonomy (Anderson et al., 2001; Krathwohl, 2002) which provides a framework that allows educators to write achievable learning goals, standards, and objectives using verbs that reflect cognitive processes suggested by each concept and skill statement. Cognitive processes are the types of thinking students must use as they demonstrate what they know or can do.

When the draft National Education Program Requirements in ICT were published, they were compared to the Uzbekistan Education for Excellence Program's draft ICT standards. Common topics were identified, and it was confirmed that Program standards covered the major topics included in the draft National Education Program Requirements.

After the standards were drafted, a code for navigating and identifying them was developed. This final code for the standards is called a standard code. It is an important element of standards development that helps make them easy to use and implement.

A critical aspect to the standards development process was the feedback from education experts in Uzbekistan. The Ministry identified individuals among the best ICT teachers, methodologists, and MoPSE staff in Uzbekistan who served as members of the Product Review Group (PRG). The group reviewed the draft standards, provided feedback, and after the Program made revisions, approved the final version.

What Were the Steps of ICT Scope and Sequences Development?

Scope and sequences were developed from the standards. For the scopes, the standards were reviewed to determine the order they should be taught for each topic and which should be taught simultaneously. Additionally, appropriate time for teaching each standard was assigned to outline the sequence of topics. Later, following a pilot of the ICT textbooks, adjustments were made to the scope and sequences based on knowledge gained.

THE STEP-BY-STEP PROCESS

The following describes the nearly yearlong process the Program team followed to (1) devise the organization, coding, and writing of the ICT student standards and (2) engage the PRG members in the review and validation of the standards.



How are the ICT Standards Organized and Coded?

To provide consistency in coding of educational standards, the following coding of ICT standards follows a specific pattern and includes identifiers listed here and illustrated in Figure 3.

Coding of ICT Standards:

- Program (UEEP)
- Subject (ICT)
- Grade (varies between 5–11 given the subject's grade range)
- Domain (varies depending on grade, e.g., DLC = Digital Literacy and Citizenship, TA = Technology Applications, SI = Social Impacts, CMP = Computing, CSY = Computing Systems)
- Standard number

FIGURE 3. CODING OF ICT STANDARDS

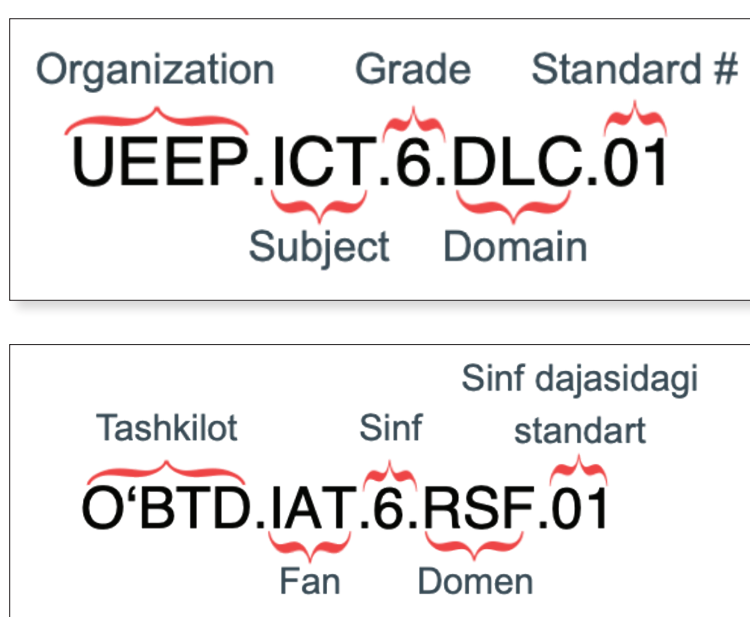


Table 1 provides an example standard code from each domain.

TABLE 1. DOMAIN EXAMPLE STANDARD CODE

Domain	Example Standard Code
Digital Literacy and Citizenship	UEEP.ICT.7.DLC.01
Technology Applications	UEEP.ICT.6.TA.02
Social Impacts	UEEP.ICT.10.SI.01
Computing	UEEP.ICT.9.CMP.02
Computing Systems	UEEP.ICT.8.CSY.02

Impact and Future Recommendations

Although the Ministry has used standards-based documents to guide teachers in all subjects before the implementation of the Uzbekistan Education for Excellence Program (2019–2023), the concept of international standards-based curricula aligned with teaching and learning materials and student learning assessments tied to the standards by grade level are new developments for teaching ICT in grades 5–11 in the Republic of Uzbekistan. The Program enhanced ICT instruction for grades 5–11 in Uzbekistan public schools by developing the ICT student learning standards, scope and sequences, and teachers' guides, and by customizing and international ICT student textbook series to the Uzbek context. The Program developed online platform for managing all learning resources aligns to standards in ICT including standards, scopes and sequences, student textbooks and teacher's guides. These new materials will ensure that over six million students in Uzbekistan have access to high-quality learning materials and textbooks and tens of thousands of teachers will use high-quality guides for ICT instruction.

Thus, the following are recommendations to support continued successful implementation of ICT standards:

1

Make ICT student standards for all grades available to teachers to help sustain current gains and to help build the capacity of teacher educators, policymakers, and curriculum designers.

2

Continue conducting training for new teachers on using the new ICT standards in conjunction with the new teaching and learning materials.

3

Systematically track and review the ICT standards implementation. The constantly evolving nature of ICT means they should be reviewed and revised on a predictable schedule, usually every three to five years, with input from relevant stakeholders.

PROGRAM SUMMARY

USAID partners with the Government of Uzbekistan to enhance student learning in English, information and communication technology, reading and mathematics. The USAID Uzbekistan Education for Excellence Program supports the Ministry of Preschool and School Education to revise student learning standards, provide new teaching and learning materials and comprehensive teacher training aligned to these standards, and conduct rigorous monitoring and research. Working closely with the Ministry, our consortium – led by RTI International includes Florida State University and Mississippi State University – brings the experience and expertise of international and local experts to drive effective program implementation. Together, we aim to foster student engagement and improve learning outcomes.

REFERENCES

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, Mayer, R. E., Pintrich, P. R., Rath, J., & Wittrock, M. C. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, 41(4), 212–218.

UNESCO International Bureau of Education. (2018). Training tools for curriculum development: A resource pack—UNESCO Digital Library. https://unesdoc.unesco.org/ark:/48223/pf0000250420_eng

