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ANALYSIS OF THE COMPETENCE-BASED APPROACH OF THE SCHOOLS' CURRICULUM OF THE REPUBLIC OF KAZAKHSTAN: DIGITAL COMPETENCES

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АНАЛИЗ КОМПЕТЕНТНОСТНОГО ПОДХОДА УЧЕБНЫХ ПРОГРАММ ШКОЛ РЕСПУБЛИКИ КАЗАХСТАН: ЦИФРОВЫЕ КОМПЕТЕНЦИИ

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ABSTRACT

This article presents a qualitative analysis of the content of educational curricula for the presence of elements of a competency-based approach with an emphasis on the development of digital competence of students. As an object of study, educational programs and mid-term plans of senior classes in the subjects of computer science (as a specific subject) and mathematics (as a general education subject), implemented in schools of the Republic of Kazakhstan in the 2020-2021 academic year, were chosen. The results of the analysis show the need to develop a digital competence framework for high school students, which could specify the types and components of digital competence and become a guideline for planned revisions of the content of educational programs in high school.

АННОТАЦИЯ

В этой статье представлен качественный анализ контента образовательных учебных программ на наличие элементов компететностно-ориентированного подхода с акцентом на развитие цифровых компетенции учащихся. В качестве объекта исследования были выбраны образовательные программы и среднесрочные планы старших классов по предметам информатика (как специфический предмет) и математика (как общеобразовательный предмет), реализующиеся в школах Республики Казахстан в 2020-2021 учебном году. Результаты анализа показывают необходимость разработки рамки цифровых компетенции учащихся старших классов, которая могла бы конкретизовать виды и компоненты цифровой компетенции и стать ориентиром при плановых пересмотрах содержания образовательных программ в школе.

Key words: competence-based approach, curricula, digital competencies, digital competencies framework.

Ключевые слова: компетентностный подход, учебные программы, цифровые компетенции, рамка цифровых компетенции.

Introduction

The secondary education system of the Republic of Kazakhstan has been undergoing a large-scale restructuring since 2016 to systematically update educational training programs based on the experience of Nazarbayev Intellectual Schools. Updating the

content of education is conditioned by changes in the economic needs of the state and world standards of education and is based on a competency-based approach [1-2]. The curricula of the network of Nazarbayev Intellectual Schools NIS-Program have been implemented in 19 intellectual schools in all regions of Kazakhstan since 2012. In addition to the subject content, educational programs are aimed at developing a wide range of skills that a modern graduate needs to be competitive in the digital world [3]. The Department of Educational Programs of AEO "NIS" conducts systematic monitoring of the program implementation and carries out gradual improvement of programs with a focus on the development of key competencies, including digital ones. In 2020, based on a large-scale study by the project teams of the Center for Educational Programs and Nazarbayev Intellectual Schools, the NIS-Program Key Competencies Framework was developed, which is formed through values, knowledge, skills and types of literacy. Ultimately, the following competencies are taken as the basis of the programs:

1. Cognition Competencies
2. Self-Regulation Competencies
3. Digital Competencies
4. Applied Competencies
5. Eco-Me Competencies
6. Proactivity
7. Competencies Of Social Interaction
8. Transformation Competencies
9. Global Competencies

As can be seen from this list, the core competencies also include digital competencies. It remains to determine how competency-based approach, in particular the development of digital competencies of students are implemented in various curricula. Therefore, the **purpose of the study** is to analyze the content of educational curricula for the presence of elements of a competency-based approach with an emphasis on the development of digital competencies of students.

Material and methods of research

The methodological basis of the research is the methods of system analysis and knowledge management. [4-5]In order to conduct a qualitative analysis of the content of individual curricula for the presence of elements of a competency-based approach, educational programs and mid-term plans of senior classes in the subjects of computer science (as a specific subject) and mathematics (as a general education subject), implemented in schools in the 2020-2021 academic year, were selected [6-7].

Research results and their discussion

Analysis of the content of these high school curricula (grades 11-12) showed that they have a separate section - "Competence in the use of information and communication technologies", which gives a brief description of the concept of "competence" and defines a list of competencies that the content of this subject develops.

For example, the computer science curriculum (grades 11-12) states that "Students develop Computer Science skills throughout the educational program by

finding, creating and **using** information, **collaborating** and **communicating** information and ideas, **evaluating** and then **improving** their work, as well as using a wide range of equipment and applications" [6]

List of competencies included in the computer science curriculum (from the program):

● creative approach in the use of knowledge on the subject of "Computer Science" in solving practical problems and in the organization of data processing, storage and transmission;

● flexible thinking, self-learning and professional development skills;

● increase of personal values and life priorities containing a worldview on the problems of computerization;

● development of presentation skills, which include collecting materials from various sources selected for a specific purpose and audience;

● collection of materials and their joint use through electronic means of communication group coordinated work on various topics;

● application and development of computer models (for example, using spreadsheets) to simulate real systems and events, as well as the study of these situations for further understanding;

● use of software for text processing, layout of printed publications, creation of web pages and presentations for written work that requires skills and abilities in choosing software, design, model, style, language, content, etc.;

● Use and development of application software through high-level languages that require logic and computational abilities.

As can be seen from this list, the types of digital competence include not only user-based basic skills, but also cognitive skills: self-development, organization, managerial skills, achieving results, solving non-standard tasks, adaptability and communication skills: for example, collecting materials and sharing them through electronic means of communication group teamwork on various topics.

The analysis of Instructional and methodological recommendations on the organization of the educational process in the 2021-2022 academic year revealed that in addition to the compulsory academic subject "Computer Science", a new subject "Programming" was introduced into the Standard Curriculum of Nazarbayev Intellectual Schools [3]. The need to introduce the subject is due to the growing demand for programming skills in Python. In the 2021-2022 academic year, this subject was taught in the 11th grade, in the 2021-2022 academic year it is planned to introduce the 12th grade. This innovation will certainly have a positive impact on the formation of a number of digital competencies of high school students.

Intellectual schools that have passed the CIS (Council of International Schools) international accreditation are developing in a continuous process, thereby keeping pace with global trends [8]. One of the new standards of SMH is the "development of digital citizenship", which is defined as a set of fundamental digital skills that every person needs to use digital

technologies safely, responsibly and ethically [9]. The curricula of intellectual schools are also being reviewed from the perspective of the development of digital citizenship. In our case, we can say that the content of the curriculum and curricula for the subject "computer science" of primary and high school meets the requirements for the development of this aspect. (table1)

Table 1

Reflection of elements of Digital citizenship in the content of the curriculum on the subject "Computer Science" (from the program)

Elements of Digital Citizenship	Class, section
Digital health and well-being	Grade 7 Safe work at the computer
Digital security	Grade 8 Security and Networks Class 9 Health and Safety Class 10 Network and Security
Digital rights and Responsibilities	Grades 11-12 Information security
Digital literacy	Grade 7 Texts, Spreadsheets, Computer networks 10th grade Website creation
Digital Law	Grade 9 Health and Safety
Digital access	Grade 7 Computer networks
Digital commerce	Grades 11-12 Information security
Digital communication	Grade 7 Computer Networks Grade 10 Network and Security Grade 11 Communications and Networks
Digital Etiquette	Grade 9, Health and Safety Grades 11-12, Information security

The instructional and methodological recommendations provide a vivid example of the reflection of the elements of digital citizenship on the example of the section "Information security" of class 11 [10].

The subject of "Computer Science" is specific in relation to the development of digital competencies and, as we see, the curricula clearly reflect the competence approach. Therefore, it was decided to analyze the curriculum on the subject of "mathematics" in high school as a non-specific subject in this aspect.

The analysis of the content of the curriculum on the subject "mathematics" also revealed the existence of a list of digital competencies necessary for development within this subject:

Consistent training of students in the skills of working with an engineering calculator (to provide clarity, free up time when performing voluminous tasks, using them when performing projects, research tasks, etc.).

Teaching students using electronic textbooks that promote the development of self-control skills.

Use of assessment tasks with the help of special programs.

Construction of graphs, drawings by students themselves using software.

Development of students' skills of independent work related to the search for information, its selection, comparison and establishment of connections and differences between facts and phenomena.

Creating a video about the process of performing a creative task.

Providing visibility when studying various branches of mathematics (for example, geometry using GeoGebra software).

Improving students' skills in mathematical modeling using various software environments.

Development of students' ability to put forward hypotheses and test them using various software environments (for example, when solving probabilistic problems).

Participation in Internet Olympiads or Olympiads in which the distance Olympiad is a qualifying round, which contribute to the development of mathematical abilities and creative activity of schoolchildren.

Participation in an online community or forum, which makes it possible to continue a dialogue outside of school on topical topics through which mathematical skills and mathematical language are developed. [7]

This list of competencies also covers such types of competencies as information literacy, programming, communication in the digital environment, creation and development of digital content.

As noted in the NIS-Program curriculum, it is important to "consistently apply information technologies in mathematics lessons, the possibilities of which are revealed in combination with mathematical methods of research and information processing." Teachers are encouraged to use information technology to systematize and process the data obtained [7]. For example, the construction of

inverse trigonometric functions through the GeoGebra application and the creation of an interactive model that will allow students to develop digital competencies along with improving the accuracy of graphical perception of the educational material. The program also provides for the use of the digital educational platform "Online Mektep" to monitor the implementation of level tasks [11].

A good proof of the reflection of a competence-oriented approach in the curriculum is the revision of programs from the perspective of the Program for International Student Assessment (PISA). The PISA (Program for International Student Assessment) is an international comparative study of the quality of education, which evaluates the knowledge and skills of school students at the age of 15 [12]. In 2022, it is planned to assess the mathematical literacy of students. The analysis of the official website showed that mathematical literacy is considered in the context of modern technological changes in an unstable external environment. Mathematical reasoning (both deductive and inductive) includes assessing situations, choosing strategies, drawing logical conclusions, developing and describing solutions, as well as recognizing how these solutions can be applied [13].
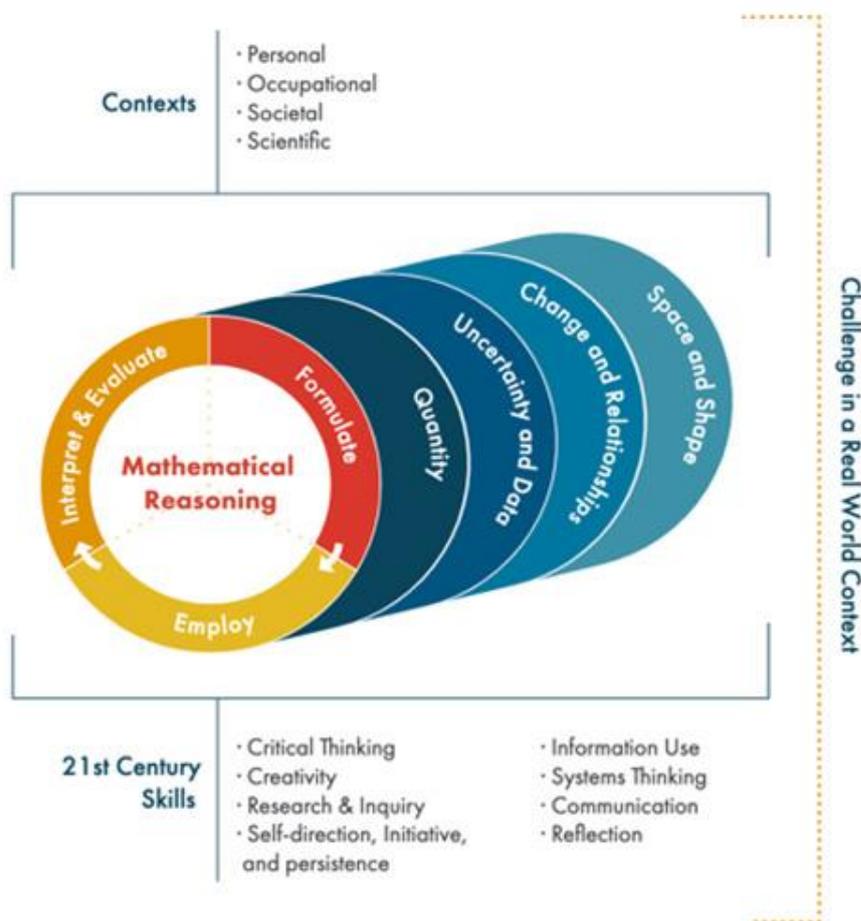

Fig. 1. The concept of the direction "mathematical literacy" of the PISA-2021 study

It is important to note that educational programs should be aimed at using mathematical skills in all spheres of life: personal, scientific, professional and social (Figure 1). The analysis of the curriculum showed that, in general, the CPC takes place in the content of the program, although the development of digital competencies is of a secondary nature, which is legitimate.

In addition to the mandatory subject content, NIS-Program educational resources also contain a cycle of elective courses for elective study. These elective courses are also aimed at developing competencies, including digital ones. Table 2 shows some elective courses developed by the NIS Educational Programs Center. [3]

Table 2

A list of elective courses for the development of personal, language and digital competencies.

№	Direction	Name	Classes	Volume, h	Language
1.	Personal development	Time management	9, 11	34	kaz., rus.
2.		Ethics and psychology of relationships	9	34	kaz., rus.
3.		International Travel Preparation, Safety, & Wellness	12	6	eng.
4.		Fundamentals of safety and life-news	7–9	34	kaz., rus.
5.	Language competencies	Oral and written communication strategies	8	34	kaz., rus.
6.		Media literacy	9	34	kaz., rus.
7.		Academic writing	11	34	eng.
8.	IT competencies	IT Essentials	10	34	rus.
9.		Mobile application development	12	9	eng.
10.		The invisible world of gadgets	7–8	17	kaz., rus.
11.		Fundamentals of financial security	12	10	kaz., rus.

Conclusions

The results of the analysis allow us to conclude that the NIS-Program curricula (2021-2022 academic year) reflect the general approaches of competence-based education based on the CIS (digital citizenship) and PISA (functional literacy) standards. The curricula provide a generalized set of digital competencies necessary for development through subject content. These competencies do not have a clear classification and the algorithm of their development through a system of subject goals requires improvement. In this regard, there is a need to develop a digital competence framework for high school students, which could specify the types and components of digital competence and become a reference point for planned revisions of the content of educational programs in high school. The digital competence framework will also allow for a more systematic definition of the list of competence components in training programs and make clear recommendations for their development through a system of learning objectives.

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